# Business and Natural Capital Accounting Case Study: Ambuja Cement - India

## Report of the NCAVES Project

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United Nations
System of Environmental Economic Accounting

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## Foreword

*The United Nations Committee of Experts on Environmental-Economic Accounting (UNCEEA) welcomes the two case studies with Holcim under the NCAVES project, which is led by the United Nations Statistics Division. As the intergovernmental body responsible for the overall vision, prioritization and coordination in the field of environmental-economic accounting, the Committee fully recognizes the importance of bringing together the public and private sectors when it comes to natural capital accounting. These case studies contribute to a better understanding of how public and private sector natural capital accounting approaches can be aligned, resulting in benefits for both sides. It is the Committee's intention that these case studies are the start of greater collaboration between the public and private sectors when it comes to natural capital accounting and the System of Environmental-Economic Accounting (SEEA).*

Bert Kroese
Head of the UN Committee of Experts on Environmental-Economic Accounting
Deputy Director General, Statistics Netherlands

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*Holcim is committed to understand and address the impact from our business to biodiversity. This is why we developed the Biodiversity Indicator and Reporting System (BIRS) in partnership with IUCN and are a founding member of the Value Balancing Alliance (VBA). We are also convinced about the need to have a standard natural capital accounting methodology that integrates nature into business decisions. We acknowledge the increasing need from businesses to have access to accurate and granular natural capital data, which is vital to measure and value nature. Therefore, we decided to engage in the NCAVES (Natural Capital Accounting Valuation of Ecosystem Services) project, led by the United Nations Statistics Division, with two pilot cases, one in Spain (Holcim Spain) and one in India (Ambuja Cement) to share our learning and raise awareness in that context. Both reports are the first in-depth assessments on how public and private sectors natural capital accounting compare. The outcomes are extremely useful for advancing the ongoing debate on natural capital accounting within a business context.*

Magali Anderson
Chief Sustainability and Innovation Officer
Holcim

# 1 CONTEXT

This work is undertaken as part of the project advancing the SEEA Experimental Ecosystem Accounting. This pilot case is executed under the Project "Natural Capital Accounting and Valuation of Ecosystem Services" (NCA VES) which has been established to advance the knowledge agenda on environmental-economic accounting, particularly ecosystem accounting, by initiating pilot testing of the System of Environmental Economic Accounting (SEEA) Experimental Ecosystem Accounting (EEA) in five strategic partner countries to the European Union (EU), namely Brazil, China, India, Mexico and South Africa. The United Nations Statistics Division (UNSD), the United Nations Environment Programme (UN Environment) and the Secretariat of the Convention on Biological Diversity are the implementing agencies of the project "Natural Capital Accounting and Valuation of Ecosystem Services. This project is funded by the European Union.

The main objectives of the NCAVES project include:

1. improving the measurement of ecosystems and their services (both in physical and monetary terms) at the (sub)national level;
2. mainstreaming biodiversity and ecosystems in (sub)national level policy-planning and implementation;
3. contributing to the development of internationally agreed methodology and its use in partner countries.

As part of the objective to mainstream ecosystem accounting and promote its use in partner countries, the project also includes a **workstream on business accounting**. While businesses and governments may have different aims when it comes to environmental accounting and the questions that they are trying to answer, it's worth exploring if and how the work undertaken by governments and businesses could be made (more) mutually supportive Therefore, this workstream aims to:

a) contribute to the alignment of natural capital accounting between the public and private sectors;
b) explore how to harness synergies between the public and private sectors in the collection and use of statistics and data for natural capital accounting;
c) provide a technical methodological contribution at the level of methods or of indicators that promotes alignment.

To reach these objectives, there is a need to bring together the public and private sectors to look at the intersection of business accounting and the SEEA, particularly with regards to ecosystems and ecosystem degradation and restoration.
In 2019, four main activities have taken place to advance this workstream:

1. a literature review of current practices in business accounting and reporting related to ecosystems and ecosystem degradation and restoration; the findings were reported in a 'background paper' (13 June 2019)
2. a business consultation: interviews with 12 companies to explore their interests and needs in terms of data collection and accounting/reporting related to impacts and dependencies on ecosystems; the business consultation paper includes the results of the interviews and provides first options for aligning national and corporate natural capital accounting;
3. the organization of a scoping workshop on 16 and 17 Oct in New York; the workshop report provides a description of the presentations, discussions and main findings;
4. based on the outcomes of these three activities, the needs, opportunities, and challenges for aligning private and public sector approaches to natural capital have been summarized for the purpose of developing a **strategic roadmap** including objectives and actions over the next five years; the roadmap suggests concrete areas of work that UNSD and/or its SEEA partners can facilitate between companies and the statistical community, as well as ideas on how to embed this work in the wider agenda on natural capital accounting; the execution of **pilot cases** is one of the **priority actions** of the roadmap.

For the pilot cases, presentations were made in relevant meetings to solicit expressions of interest from companies to participate, after which a selection was made. This work contributes to and builds further on the work by the Combining Forces program[1], set up by the Capitals Coalition.

# 2 INTRODUCTION TO THE NCAVES PILOT CASE

## 2.1 Objectives

This pilot case applies to Ambuja Cement Ltd (ACL), headquartered in Mumbai, one of India's leading cement manufacturers and a subsidiary of Holcim.

The objectives of this pilot case, as agreed in the Terms of Reference between UNSD and ACL, focus on both the methodological approach and data aspects. Four objectives are defined:

1. To assess alignment of the natural capital assessment approach applied by ACL with the SEEA EA
2. To explore the availability of natural capital information at the national level (National Statistical Office), and/or global level (global data sets) and the extent to which it could be of use for the natural capital assessment approach applied by ACL
3. To identify strengths and weaknesses in a) the type of national and or global natural capital information available (from the business perspective), and b) the current natural capital assessment approach applied by ACL (from a SEEA EA perspective)
4. To identify opportunities for improvement, i.e. a) for making higher level natural capital information more user friendly and tailored to the needs of the company, and b) for better alignment of ACL's natural capital assessment approach with the SEEA EA.

These objectives are reflected in the structure of this report which contains two key chapters, i.e. Chapter 3 'Alignment of ACL's natural capital assessment approach with the SEEA EA' and Chapter 4 'Data needs and availability'. Both chapters include an assessment of the current situation and data availability, identify strengths and weaknesses of the approach and provide opportunities for improvement.

The thematic focus of this case is on water and biodiversity (including ecosystem services) and the spatial focus is on two operations sites of ACL.

[1] https://naturalcapitalcoalition.org/projects/combining-forces-on-natural-capital/

## 2.2 Methodological approach

The pilot case was carried out by Johan Lammerant (UNSD consultant) in the period June 2020 to April 2021. The project steering group consisted of the following persons:

- Sanjay Kumar Singh (General Manager Environment & Sustainability Ambuja Cement India)
- Pearl Tiwari (Director and CEO of Ambuja Cement Foundation)
- Ms. Anagha Mahajani (CSR team Ambuja Cement India)
- Chandrakant Kumbhani (CSR team Ambuja Cement India)
- Maria Rosario Chan (Water and Biodiversity, Group Sustainability Department, Holcim) until 2020, and Renata Pollini (Water and Biodiversity, Group Sustainability Department, Holcim) from 2021
- Maria Eugenia Ceballos Hunziker (Impact Valuation, Group Sustainability Department, Holcim)
- P. Bhanumati (National Statistical Office, India)
- Bram Edens (UNSD)
- Jessica Ying Chan (UNSD).

The 6 activities under this pilot case relied on desk research and an interactive approach (video calls, email exchanges) amongst project steering group members and the UNSD consultant:

- Action 1: kick off meeting to align on scope, objectives, work program and to discuss the outcome of Act 2
- Action 2: familiarizing with natural capital assessment approach ACL and identifying natural capital data needs
- Action 3: assessment of ACL's natural capital assessment approach and identification of available regional, national and/or global natural capital information
- Action 4: assessment of strengths and weaknesses in a/the type of this natural capital information from the business perspective and b/ ACL's natural capital assessment approach (from a SEEA Ecosystem Accounting (SEEA EA) perspective), as well as opportunities for improvement
- Action 5: case study report
- Action 6: review and validation of case study report (UNSD)

## 2.3 Site description

For this pilot case, two sites are selected, i.e. the Ambujanagar site in the north-western coastal state of Gujarat and the Rabriyawas site in the north-western state of Rajasthan (north of Gujarat). For the purposes of this pilot case the boundaries of both sites comprise the whole integrated plant and the currently active quarries (see Figure 1 and Figure 2).

The difference in vegetation on both figures reflects the different climatic zones: while Gujarat has warm and humid zones, Rajasthan is a hot and arid desert area.

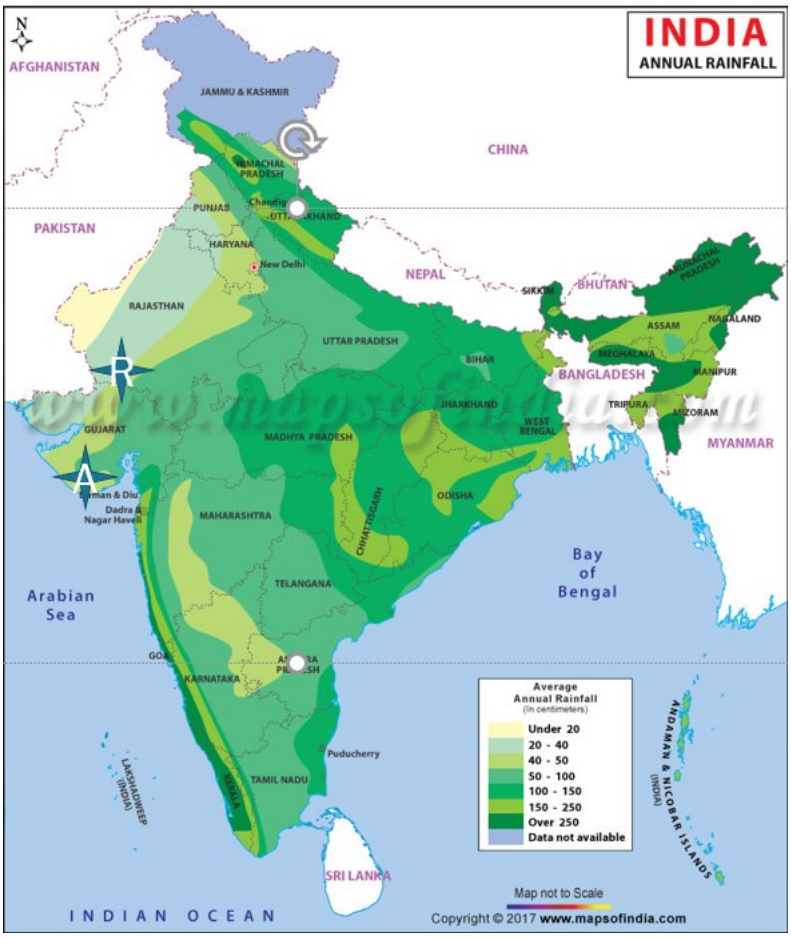


*Figure 1: Annual rainfall map of India with location of both sites, R = Rabriyawas, A = Ambujanagar (Source: www.mapsofindia.com)*

*Figure 2: Aerial view of the Ambujanagar integrated plant, with the currently active quarry circled in red (Source: Google Maps)*

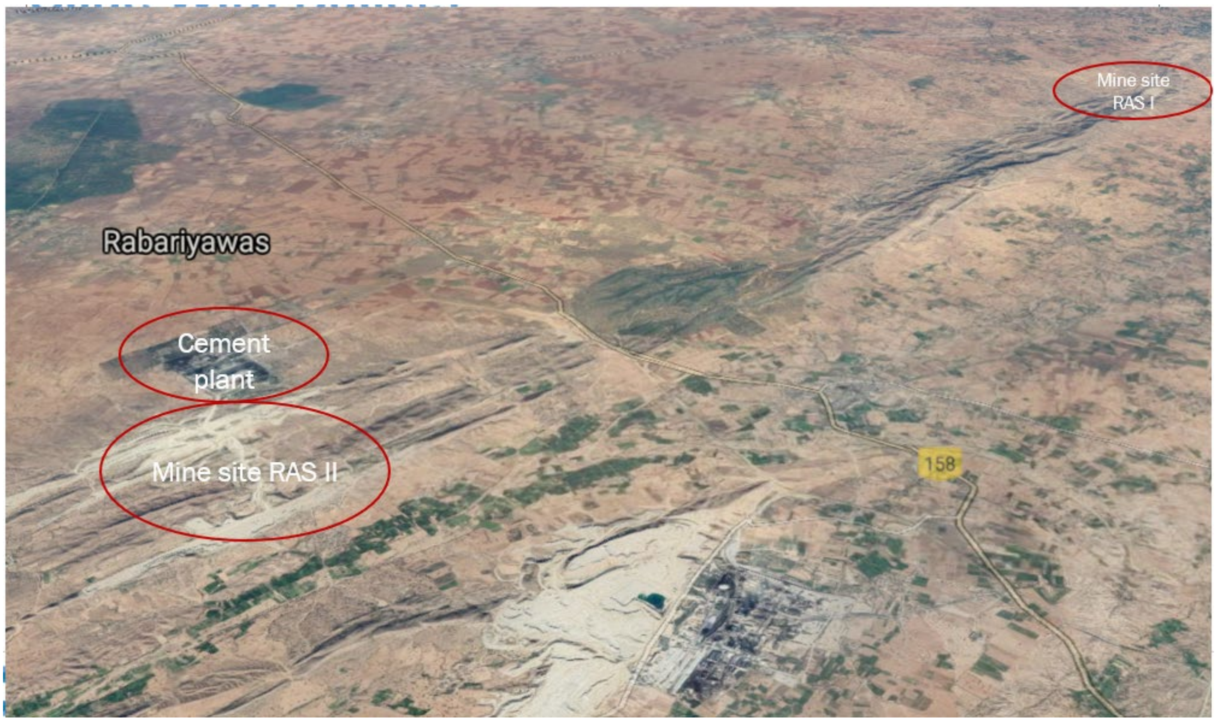

*Figure 3: Aerial view of the Rabriyawas site; the cement plant and both quarries (RAS I and RAS II) are circled in red (Source: Google Maps)*

According to ACL, environmental challenges related to the Ambujanagar site are seawater intrusion in the coastal area and water scarcity in combination with competition for water (e.g. water intensive farming). Main solutions in this area are rainwater harvesting and groundwater recharge, building dams and reservoirs, linking channels and farming practices such as applying crop diversity. Environmental challenges related to the Rabriyawas site are the scarce and erratic rainfall, the hot weather harming water conservation, the low drinking water quality and the inability to recharge groundwater. Potential solutions in this area are building water harvesting structures and applying sustainable farming practices.

# 3 DESCRIPTION OF AMBUJA CEMENT'S NATURAL CAPITAL ASSESSMENT AND ACCOUNTING APPROACH

This section first describes the general strategic approach that Holcim applies for natural capital accounting (NCA) at site and corporate level and which is based on the concept of 'true value'. Then, the corporate-level Integrated Profit & Loss (IP&L) approach is described before we dive into Holcim's site level approach to assessing biodiversity and ecosystem services. We deliberately apply both the terms 'accounting' and 'assessment' as both are valid in this case[2].

## 3.1 General strategic approach

Ambuja, a subsidiary of the Holcim Group, is India's third-largest cement manufacturer. The company demonstrates a longstanding commitment to supporting social and environmental initiatives. The Ambuja Cement Foundation (ACF)—the Corporate Social Responsibility (CSR) arm of Ambuja— is considered a CSR pioneer in India. Since 2012, Ambuja is quantifying its social and environmental impact in order to improve its understanding of resource use, climate protection, and community engagement. Following the 'True Value' methodology, developed by KPMG (see 3.1.2), Ambuja identifies the social and environmental impact of its activities, classifies them as positive or negative, and applies a financial value to these externalities. Once the impact is quantified, the company's 'True Value' would be its real earnings if all its significant externalities were internalized. Furthermore, stakeholders can see where the company is creating value for society and reducing negative externalities. The company published its first IP&L statement in 2014 (see 3.1.2). This approach was adopted by Holcim at corporate level, based on data provided by the operational countries of the company. Ambuja calculates an annual 'True Value' Independently from corporate level but based on the same methodology.

Feeding these IP&L statements requires aggregating a significant amount of local data on natural capital performance for the respective facilities and activities of Holcim in all countries of operation. Until now, often generic coefficients are being used for calculating corporate performance, while more accurate local data would reflect a more realistic situation. However, Holcim – as most other companies – is facing issues with external data collection related to granularity, outdated data, lack of data on threshold values or carrying capacity. Therefore, Holcim expresses strong interest in the business work stream of the NCAVES project and its particular research on exploring the links between national level NC data and private company level NC data.

### 3.1.1 KPMG True Value methodology

KPMG True Value is a tool to understand how a business creates value or reduces value for the society which is likely to affect the overall value it creates for shareholders. This knowledge provides a new lens

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[2] **Natural capital assessment** is the process of identifying, measuring and valuing relevant ("material") natural capital impacts and/ or dependencies, using appropriate methods. The scope can be broad and it is primarily about providing information to inform decisions rather than disclosure. Natural capital assessment is the method most typically used in the private sector. The majority of assessments will use natural capital information to answer a specific question or inform a decision. A key step in the process is to identify an objective prior to undertaking the assessment (a so-called business application) - the aim is not about collecting a set of indicators. **Natural capital accounting** is a framework or method that approximates financial accounting standards by collecting and structuring information on natural capital by compiling consistent, comparable and regularly produced data using an accounting approach on natural capital and the flow of services generated in physical and monetary terms. It can be used for disclosure either in national or business accounts, although so far the majority of applications are done at a national level and by the public sector. Natural capital accounts are a possible output from a natural capital assessment. (from https://naturalcapitalcoalition.org/wp-content/uploads/2017/11/21799_NCC_This-is-Natural-Capital_2017_WEB_04-12-17.pdf)

for decision-making to improve performance and inform strategy. KPMG True Value is a 3-step process (see Figure 4) that can be applied across sectors and geographies. It is scalable and can be applied to a whole company, a division or a specific project.

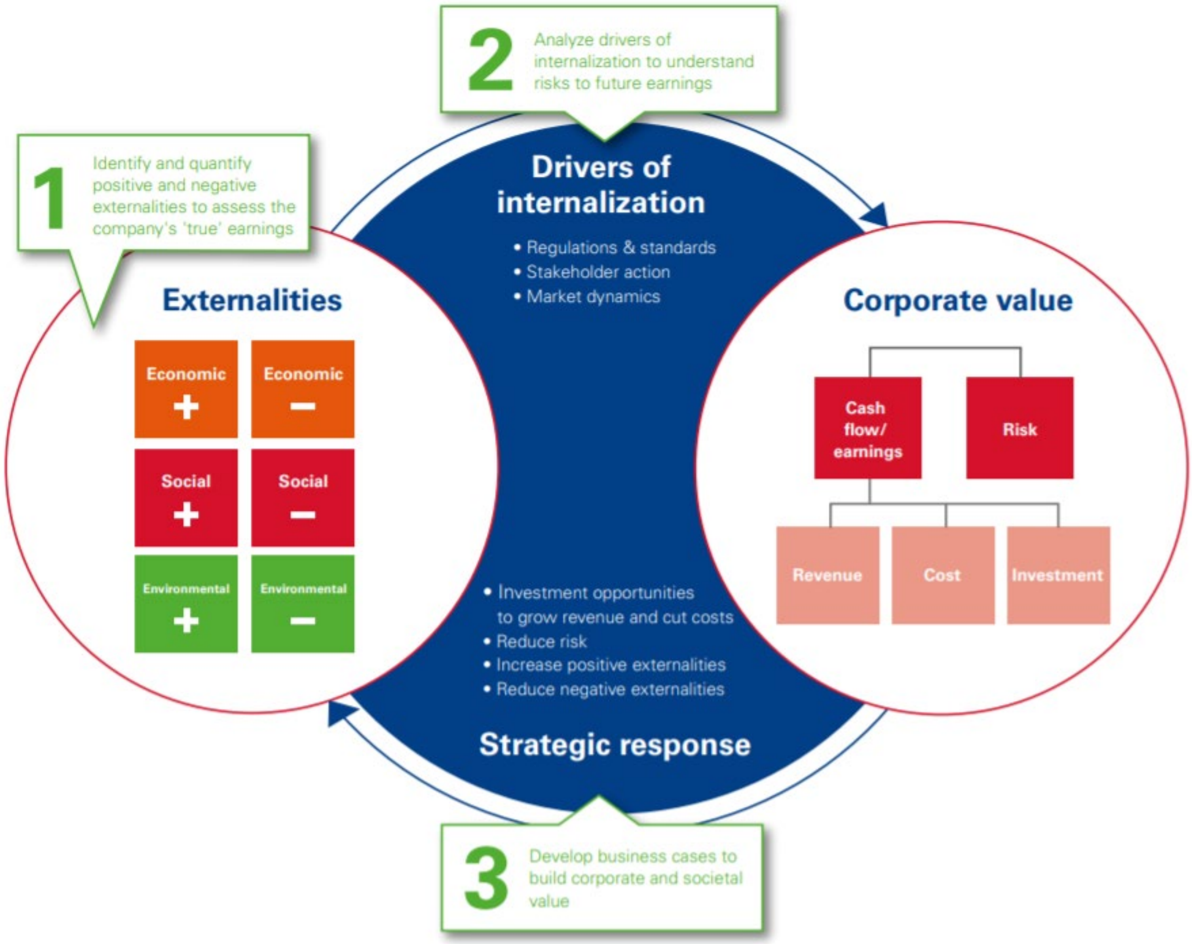



*Figure 4: KPMG's three step True Value methodology*

Examples of Ambuja's positive externalities include:

- Harvesting more water than it uses in its manufacturing ('Water Positive'), through check dams, farm ponds, ground water recharge structures, river linking, and turning former quarries into manmade lakes or wetlands, promoting water efficient irrigation methods like micro irrigation among farmers.
- Using waste from other industries in its manufacturing process, avoiding the need for landfill disposal
- Supporting income-generating activities for members of the local community

Examples of Ambuja's negative externalities include:

- Emissions of greenhouse gases
- Other emissions, such as fine particles
- Extracting surface or groundwater

Results are presented by means of the so-called 'true earnings bridge', designed to show the cumulative effect of sequentially introduced positive or negative values and combining the company's financial profits with its monetized positive and negative externalities. The calculation of Ambuja's 'true' earnings showed that in 2012, on balance, Ambuja generated net-positive socio-environmental value in 2012, i.e. its 'true' earnings were higher than only its financial profit.


*Figure 5: Concept of Ambuja Cement's 'true earnings' bridge (simplified example from 2012) (Source: KPMG brochure on True Value methodology, March 2015)*

An updated figure for 2019 at corporate level is presented in Figure 6.

### 3.1.2 Integrated Profit and Loss

#### 3.1.2.1 General concept

The Holcim IP&L, building on the 'true value' concept, represents the company's approach to the growing discipline of impact valuation. It is also a key element of Holcim's sustainability reporting tools and plays a vital role in achieving Holcim's sustainability ambitions. The IP&L is not intended to be a definitive statement of the company's financial accounts. Rather, it is a tool to allow the company to understand and share with stakeholders the **extent of their impacts** and to **track progress** against their sustainability ambitions. The tool enhances decision-making processes by **raising awareness of risks and opportunities** posed by **externalities** (through quantification) and enabling analysis on what the impact could be on the bottom line. The IP&L statement thus complements the traditional financial and sustainability metrics by providing an indication of the scale of the company's extended impacts.

Holcim's IP&L results for 2019 at corporate level are presented in Figure 6. Ambuja Cements's IP&L results for 2019 are presented in Figure 7. At a corporate level, aggregated results for water and biodiversity are negative. For Ambuja, these results are positive (please note that both IP&L statements are not fully comparable as Ambuja applies different IP&L categories).

Holcim is looking for maximum alignment of its approaches, tools and metrics (including reference values for ecosystem services) with globally accepted frameworks (e.g. UNSEEA, EU MAES initiative). It faces challenges in terms of, for instance, globally accepted reference values for valuing cultural ecosystem services. Finding national or regional natural capital data with a sufficient granularity in the context of quarries is a difficulty. Holcim is actively involved in the Value Balancing Alliance (VBA), a non-profit organisation formed to develop a standardized methodology to assess and monetize the value of a company and its financial and non-financial value contributions to society (impacts and dependencies).

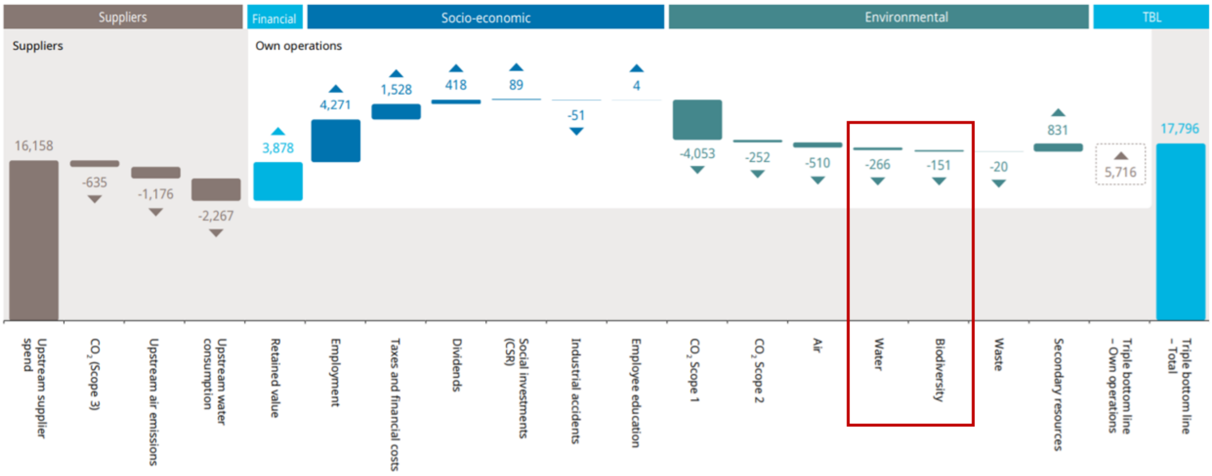



*Figure 6: Integrated Profit and Loss 2019 statement of Holcim*

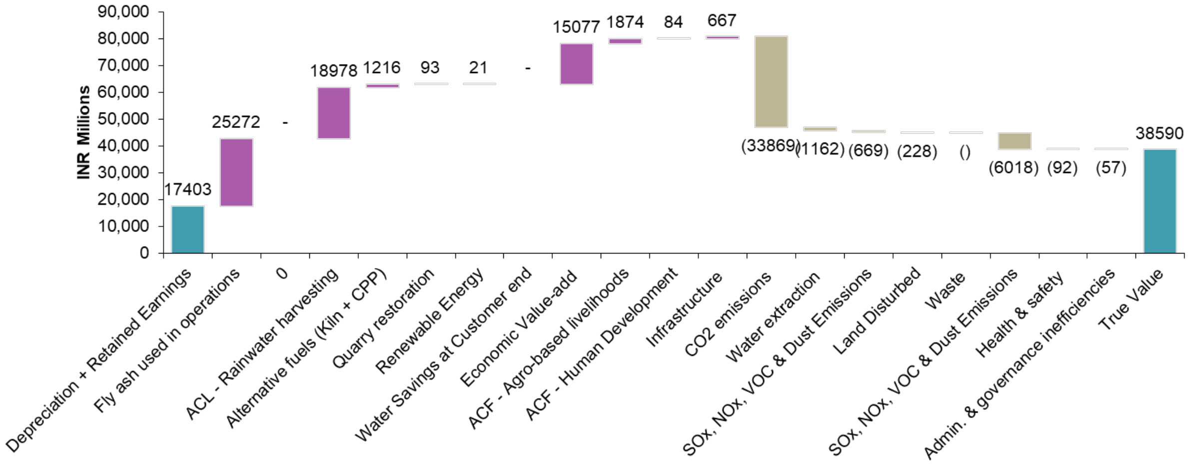



*Figure 7: Integrated Profit and Loss 2019 statement of Ambuja Cement*

### 3.1.2.2 General approach for water

For water, the cost is calculated by multiplying the amount of water consumed in own operations by CHF 3.7/m3 and the amount of water harvested by CHF 4.7/m3. These are corporate averages. Ambuja applies a similar coefficient for consumed and harvested water, i.e. 8.2 $/m3 for Ambujanagar and 2.8$/m3 for Rabriyawas for 2019 (see Figure 8). These costs were derived using the following assumptions:

- The societal cost of water is calculated based on the **scarcity level of the location** where water is consumed or harvested. For water, with the decommissioning of the WBCSD Global Water Tool, Holcim has applied the **Aqueduct Water Risk Atlas** (WRI)[3] to identify which of their sites are located in water stressed areas. A site is considered under water stress if the baseline water stress is >40% (baseline water stress measures the ratio of total water withdrawals to available renewable surface and groundwater supplies[4]). While Aqueduct is a good screening tool, in some cases, it does not provide sufficient granularity at local level. Thus, further verification is carried out at site level together with other water indicators (what is the water efficiency of the site, potential reduction, potential contribution at global level, etc).

[3] https://www.wri.org/resources/maps/aqueduct-water-risk-atlas

[4] see also https://wriorg.s3.amazonaws.com/s3fs-public/aqueduct-30-updated-decision-relevant-global-water-risk-indicators.pdf

- The (site-specific) scarcity price is provided by a 2013 Trucost report[5] and the water scarcity levels from that report are aligned with the categories from WRI. Since water is withdrawn and harvested in different locations, the resulting average cost per cubic meter is different.

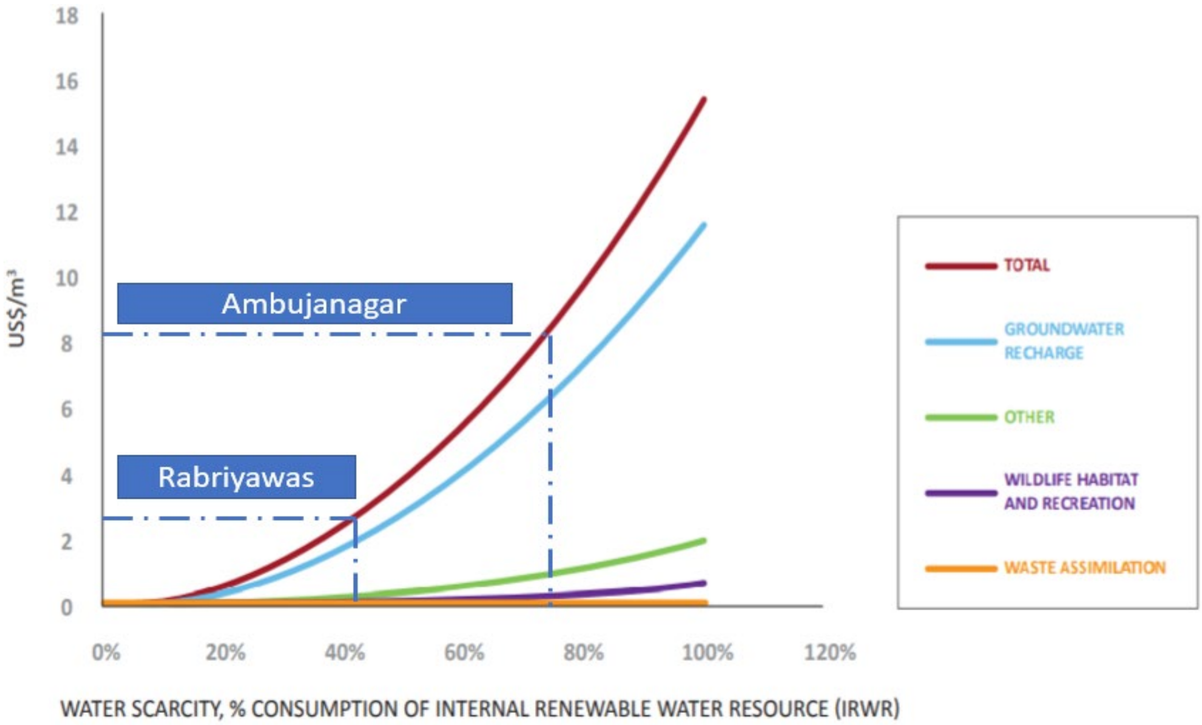



*Figure 8: The relationship between the components of the social cost of water and water scarcity according to Trucost analysis (Trucost, 2013)*

### 3.1.2.3 General approach for biodiversity

Until a few years ago, Holcim restored quarries only after a site had gone for a significant amount of time without mining activity. The revegetation works were executed and completed in little time (less than 2 years). However, in these cases, opportunities were often identified that related to new habitats that had been occupied by interesting species, and gradually initiatives were taken to support them. Now, Holcim applies a new concept of quarry restoration with the main objective of restoring the quarry into an important biodiversity site and thus, providing an added value in conservation that positively affects its environment and society (e.g. promoting diverse native vegetation species). The approach aims at optimizing the positive contribution to biodiversity through an effective, science based but practical, robust process.

To support progress tracking of quarry restoration across all its sites globally, Holcim relies on the Biodiversity Indicator and Reporting System (BIRS), a tool developed by IUCN (see 3.3.2.). It is also applied by Ambuja Cement. Using BIRS, Holcim has an excellent biodiversity accounting system in place to measure the changes in biodiversity and identify the key elements that could impact the quality of biodiversity. This is interesting as this approach aligns with the SEEA EA approach (see 4.2 for more details).

[5] https://www.naturalcapitalcoalition.org/wp-content/uploads/2016/07/Trucost-Nat-Cap-at-Risk-Final-Report-web.pdf

In addition, Holcim is monetizing the value of the ecosystem services provided by rehabilitated quarries in its IP&L by multiplying the number of hectares (ha) – provided by BIRS – by CHF 5.332/ha. These figures were derived using the following assumptions:

- The net area rehabilitated or disturbed is calculated by subtracting the total hectares of rehabilitated land from the total hectares of disturbed land. These figures do not apply to the changes observed in the reporting year but to the total number of hectares under company responsibility.
- The evaluation is based on an estimated distribution of habitats: in forests; shrublands/woodlands; grasslands; ruderal habitats; bare rocks; wetlands; rivers/streams; lakes/ponds; mangroves; salt marshes; coastal zones; and cultivated land.
- Based on a 2009 Economics of Ecosystems and Biodiversity (TEEB) report[6] and estimated habitat distribution of impacted land, the weighted average estimated annual restoration benefits are between USD 1.010/ha and USD 73.900/ha.

However, Holcim is aware that such default figure is far from accurate. More refined data at local level (quarries and mines within all countries of operation) are not available. Therefore, Holcim started a pilot project in Spain on valuing ecosystem services generated by quarry rehabilitation[7]. If the methodology proves to be scientifically robust and practical, it could be replicated to other countries and finally a more accurate value could be used in the I P&L. It must be noted however that apart from this indicator which is based on monetization, Holcim applies an additional set of process based biodiversity indicators in its sustainability report (see Table 1).

*Table 1: Holcim corporate biodiversity indicators (Holcim Sustainability Report 2020[8])*

| Biodiversity indicators | unit | 2018 | 2019 | 2020 |
|---|---|---|---|---|
| Sites assessed using the BIRS methodology | % | 31 | 36 | 40 |
| Quarries with rehabilitation plans in place | % | 83 | 84 | 86 |
| Quarries with biodiversity importance | # | 275 | 271 | 259 |
| Quarries with biodiversity importance with biodiversity management plans in place | % | 85 | 91 | 93 |
| Total rehabilitated area | ha | 14,258 | 14,633 | 14,363 |

## 3.2 Ambuja's approach on water assessment and accounting

### 3.2.1 Externalities related to water

The main focus of the Ambuja Cement pilot case in India is on water. In India, 600 million people face high to extreme water scarcity issues while 70% of water is contaminated[9]. A majority of Ambuja's plants are located in water-stressed locations. Having implemented an entirely dry process in its kilns, cement making at Ambuja is not water intensive but other parts of the process consume significant amounts of water, such as the use of water in captive power plants and the use of water-cooled condensers. Water is also required in the crushing and mixing process to cool machinery and to suppress dust. Given

[6] http://www.teebweb.org/wp-content/uploads/Study%20and%20Reports/Additional%20Reports/TEEB%20climate%20Issues%20update/TEEB%20Climate%20Issues%20Update.pdf
[7] Lammerant, Johan (2021). Business and Natural Capital Accounting Case Study: Quarry restoration by Holcim, Spain. United Nations Statistics Division, Department of Economic and Social Affairs, New York
[8] Sustainability Performance Report 2020 (holcim.com)
[9] https://niti.gov.in/writereaddata/files/document_publication/2018-05-18-Water-index-Report_vS6B.pdf

increasing shortages in India, water use by industry is a politically sensitive issue. As a result, ACL has concentrated on responsible water management by ensuring best practices of conservation and closely monitored utilization at its manufacturing sites and 'beyond its fence'. ACL is very aware that their plants would be the first thing to get scrutinized if the surrounding communities would face water shortages that came in the way of farming or people's health.

To achieve local water security, Ambuja Cement Foundation (ACF) initiated programs with communities and government on rainwater harvesting, micro-irrigation and efficient end use[10]. Water harvesting initiatives include building and maintaining water-related infrastructure such as rain capture systems (e.g. rooftop water harvesting), check dams[11], irrigation networks and reservoirs (e.g. mined out pits), which regenerate the groundwater level and reduce the consumption of groundwater. On a larger scale, ACF develops projects on watershed development and interlinking of local river streams and canals, to help farmers secure adequate ground water for irrigation. Not only do such projects provide water supply year-around, seawater ingress in the coastal areas (especially in the Ambujanagar area) was arrested as ground water levels rose due to ground water recharge. The rainwater and irrigation programs had succeeded in raising the water table between 2 and 12 meters in certain regions. Simultaneously, ACF works to educate local communities, specifically farmers, about the efficient use of water and the upkeep of existing infrastructure. After more than two decades of work, hundreds of villages enjoy safe drinking water and farming livelihoods are enhanced with 3 crop rotation cycles every year.

ACL has defined the following targets related to water:

- water positive', i.e. harvesting of water exceeds consumption in manufacturing;
- social: the goal of ACF's water program is to 'create drought resistant villages and ensure farmers and residents have adequate water throughout the year'
- science-based targets for nature; for groundwater extraction acceptable amounts are defined in specific permits.

Based on the above description, negative and positive externalities related to water are the following (see also Figure 5):

1. Extraction of groundwater by the company for cooling and for suppressing dust (-)
2. Rainwater harvesting by the company (ACF) (+)
3. Reduced water use (+)
4. Seawater intrusion arrested (+) (Ambujanagar)

Only 'extraction of groundwater' (amount of water for use in own operations) and 'water harvested' are measured (in m3) and recorded in annual accounts. These are used for calculating the cost of water use (see below). Overall, as compared to 2011, the total water withdrawal volume in 2015 reduced by about 14% and water harvesting volume increased by 73%. Ambuja reused and recycled about one million cubic meter of water in 2015, or about 14 % of its total water withdrawal. The company has no discharge of water or wastewater into natural resources like streams, lakes or ponds. So, in this case water abstraction is equal to water use. The water used in own operations is indeed not becoming a part of the final product (cement) but after use for cooling purposes and suppressing dust it is partly used as sanitary water and partly returned to the environment through irrigation in gardens of the plant.

The separate reference to 'reduced water use' as a positive externality might be confusing as this could be interpreted as double counting with the measurement of own operations water use but ACL confirms that only own water use is reported.

[10] http://www.ambujacementfoundation.org/programs/water/drinking-water

[11] A check dam is a small, sometimes temporary, dam constructed across a swale, drainage ditch, or waterway to counteract erosion by reducing water flow velocity (from Wikipedia).

Rainwater harvesting is achieved through a series of measures, such as rooftop rainwater harvesting, check dams, river linking, groundwater recharge, turning former quarries into manmade lakes or wetlands, and sustainable farming practices. The total amount of harvested water is measured[12] and expressed in $m^3$.

Ambuja keeps records of water quantity and quality measurements. Examples with regard to groundwater levels are shown in Figure 9 and Figure 10).

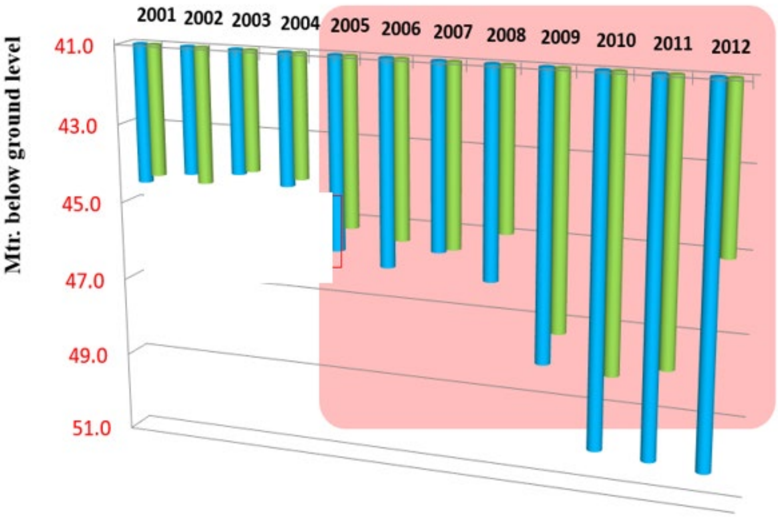



*Figure 9: Trend in groundwater level at Rabriyawas site between 2001 and 2012*

| Well No | Water level (feet.) from GL in year 2009 | Average Water Level in 2009 (65 Feet) | Water level (feet) from GL in year 2019 | Average Water Table in 2019 (35 Feet) |
|---|---|---|---|---|
| Well 1 | 58 | 65 | 26 | 35 |
| Well 2 | 67 | 65 | 14 | 35 |
| Well 3 | 65 | 65 | 61 | 35 |
| Well 4 | 52 | 65 | 24 | 35 |
| Well 5 | 66 | 65 | 23 | 35 |
| Well 6 | 66 | 65 | 14.5 | 35 |
| Well 7 | 68 | 65 | 61 | 35 |
| Well 8 | 67 | 65 | 22 | 35 |
| Well 9 | 69 | 65 | 61 | 35 |
| Well 10 | 66 | 65 | 58 | 35 |
| Well 11 | 53 | 65 | 45 | 35 |
| Well 12 | 68 | 65 | 37 | 35 |
| Well 13 | 71 | 65 | 7 | 35 |
| Well 14 | 52 | 65 | 48 | 35 |
| Well 15 | 63 | 65 | 31 | 35 |
| Well 16 | 62 | 65 | 40 | 35 |
| Well 17 | 70 | 65 | 33 | 35 |
| Well 18 | 54 | 65 | 19 | 35 |
| Well 19 | 92 | 65 | 42 | 35 |
| Well 20 | 64 | 65 | 32 | 35 |
| Well 21 | 60 | 65 | 39 | 35 |
| Well 22 | 65 | 65 | 20 | 35 |
| Well 23 | 62 | 65 | 40 | 35 |
| Well 24 | 86 | 65 | 39 | 35 |

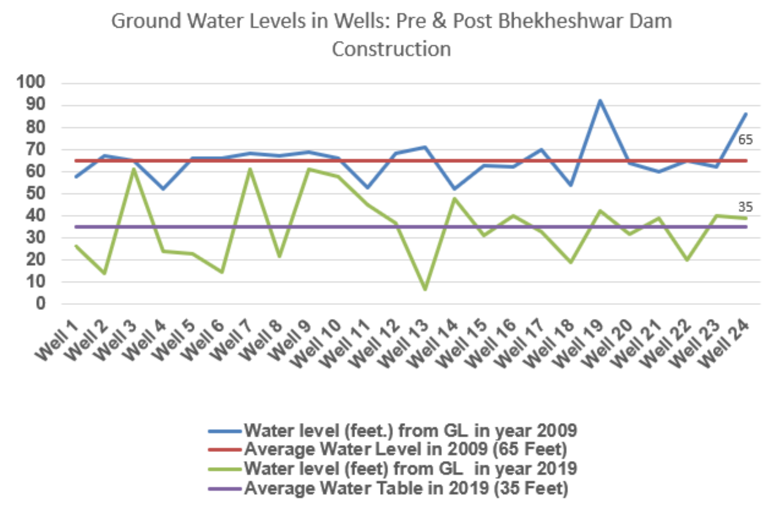



*Figure 10: Difference in ground water level before and after construction of a checkdam*

Groundwater level and salinity level are measured at different places at irregular intervals, but these are not recorded in specific accounts that would provide information on the level of seawater intrusion. Seawater intrusion due to drought (low freshwater levels) can damage agricultural productivity. As a consequence, the economic benefits of avoided damage could in principle be calculated, but this is not included in the current calculations yet.

[12] Specific measurement methods and calculations are out of scope for this pilot case

### 3.2.2 The social value of water

In order to determine the cost of water use, Ambuja first records water use across its sites. It then applies the WRI's Aqueduct software to determine plant-wise scarcity percentage levels. Using those scarcity levels, it correlates the social cost of water using an analysis undertaken by TruCost, an environmental data and research agency. Finally, the company multiplies the water use figures (per site) with the social cost of water use. The true value calculation shows the value erosion through water use. To calculate the positive value generated by its water harvesting investments, Ambuja uses the same methodology. It multiplies 'water credits'[13] earned per site by the social cost of water in the region (see Figure 11).

From Figure 11 it's clear that in 2015 the company generated $110.1 million (Rs. 7.30 billion) in value through its water investments for 3 selected sites, while the cost of water use amounted to $19.9 million. In Figure 11 water scarcity levels for different sites correspond to a 'social cost of water' coefficient, based on the curves in Figure 8. As a result of its efforts, Ambuja was certified as water positive[14] for all its sites by 4.03 times in 2015, which increased to 5.5 times water positive in 2016. It was the only water positive cement company in India.

Measuring the **social value of water** presents interesting challenges. In a good rainfall year, water scarcity levels drop, reducing the social benefit of water conservation efforts and resulting in a decreased value addition by Ambuja. Moreover, rainfall in India is seasonal with the majority of rainfall coming during the monsoon season. Further, ACF had to make some decisions looking at factors beyond efficiency. As an example, rooftop rainwater harvesting is the most expensive water harvesting initiative, but it is also the best solution for accessing drinking water. In this case, the community's needs are prioritized over cost. Unlike for carbon, locality and immediacy is important for water, especially in water stressed areas. Therefore, the location of the water debits and credits also needs to be considered. Third, some argued that water saved from any intervention needed to be allocated to another use in order for it to gain value (an example is the increase in the crop rotation cycles per year). Finally, since only water of certain purity can be used for humans, agriculture and livestock, the quality of water also needs to be considered.

| Plant | Net Water Consumption Debits (in 1000m3) | Water Scarcity Level (%) | Social Cost of Water ($/m3) | True Value Reduced (million INR) |
|---|---|---|---|---|
| | (A) | | (B) | (A * B) |
| Bhatapara | 2,083 | 14 | 0.10 | 14.3 |
| Ambujanagar | 1,390 | 71 | 7.60 | 704.1 |
| Rabriyawas | 659 | 39 | 2.60 | 112.8 |
| **Total for All Sites** | **7,421** | | | **1,312.6** |

| Plant | Total Water Credits (in 1000m3) | Water Scarcity Level (%) | Social Cost of Water ($/m3) | True Value Credited (million INR) |
|---|---|---|---|---|
| | (A) | | (B) | (A * B) |
| Bhatapara | 8,336 | 14 | 0.1 | 57.1 |
| Ambujanagar | 9,302 | 71 | 7.6 | 4,712.8 |
| Rabriyawas | 7,668 | 39 | 2.6 | 1,312.4 |
| **Total for All Sites** | **30,901** | | | **7,302.3** |

[13] In the context of the 'water positive' calculations by Ambuja, the term 'credits' (related to water harvesting) is applied here as opposed to debits (related to use of water)

[14] Third party assurance by DNV (new name for Det Norske Veritas)

*Figure 11: Environmental Negative Value for water extraction (top table) and Environmental Positive Value for rainwater harvesting at selected Ambuja plant sites (2015) (INR = Indian rupees; 1 US $ = 66,4 INR) (Source: company documents)*

## 3.3 Ambuja's approach on biodiversity assessment and accounting

### 3.3.1 Biodiversity Indicator and Reporting System (BIRS)

Already in 2014, IUCN (International Union for Conservation of Nature) created the Biodiversity Indicator and Reporting System (BIRS)[15] to guide companies in the cement and aggregates sector in adopting a standardized system for monitoring biodiversity at their extractive operations, and to encourage regular reporting on biodiversity attributes at the company level. BIRS was designed specifically for Holcim[16] as an easy-to-apply system that can be largely implemented by existing company staff. The system can be adapted to various geographical locations and provides for incorporating data in various categories. This allows cement and aggregates companies, and mining companies in general, to have an overview of the effects of their operations on biodiversity at various levels, from national to regional to global.

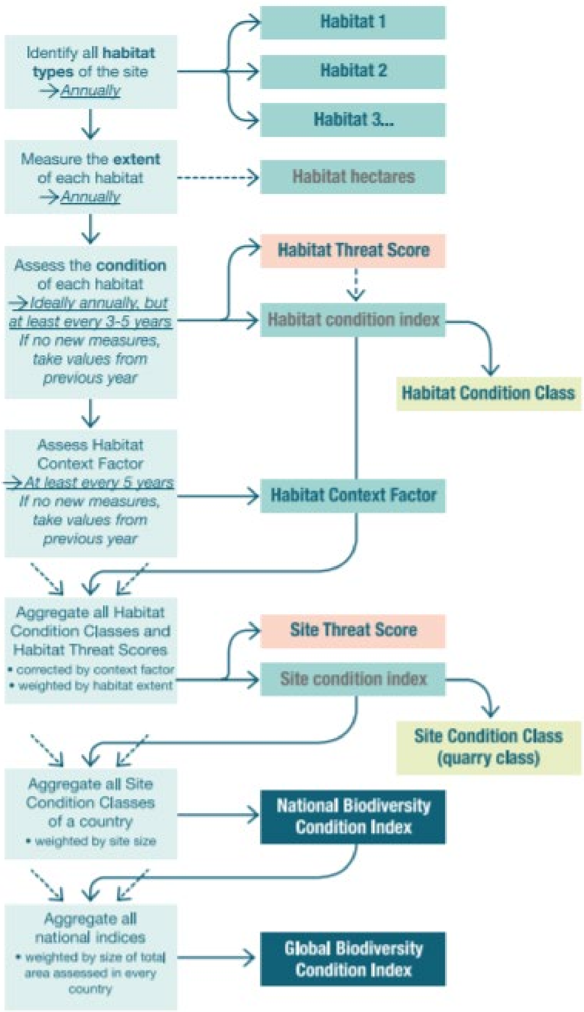

[15] https://portals.iucn.org/library/sites/library/files/documents/2014-055.pdf
[16] Holcim merged with Lafarge in 2015 to become Lafargeholcim. Since July 2021 it is again Holcim.

BIRS can help companies determine how they are affecting habitats and ecosystems, the effectiveness of their biodiversity mitigation and habitat rehabilitation measures, and how they can measure and report on their management activities. The system is not designed to provide a biodiversity inventory of which is usually determined earlier as part of an Environmental Impact Assessment (EIA) or an Environmental and Social Impact Assessment (ESIA) process.

BIRS is an easy-to-apply system for calculating an **annual biodiversity condition index** for every active or disused extraction site and reserve landholdings, taking into account (1) the extent of every habitat type found on a site (including operational and rehabilitation areas), (2) the ecological condition of these habitats, especially their suitability for biodiversity and (3) the uniqueness and ecological importance of each habitat in the regional context. BIRS essentially represents a **balance sheet of a company's 'biodiversity assets'** and summarizes the composite value of its landholdings for supporting biodiversity.

Implementing BIRS involves several steps (see Figure 12) that ultimately lead to the determination of an overall **Site Biodiversity Condition Class** for each individual operational site assessed. The first steps involve identifying and delineating the different habitats that make up the site, and then estimating the total area for each habitat type. Next, it is necessary to determine the Habitat Context Factor for each habitat block, based on how widespread it is in the landscape, the intrinsic biodiversity value of the habitat, the degree of threat and its ecological importance. Building on this, the next steps involve assessing the condition of each habitat and assigning each a Habitat Condition Class, based on the potential for enhancements and the level of current threat. The final step of the process combines this information on the extent of each habitat type and their context factor and condition indices, to determine an overall Site Biodiversity Condition Class (see Figure 13).

Once these Site Biodiversity Condition Classes are determined, the indices of all sites in a selected region or country can then be **aggregated** into a **regional/national index** that can, in turn, be combined on a global level – indicating whether the overall biodiversity suitability of the global landholdings over which a company has management control is increasing or decreasing. Once it is well-established, BIRS can be used for regular and standardized reporting on changes to biodiversity conditions, as well as to set biodiversity-related targets expressed through a Key Performance Indicator (KPI) on biodiversity at the local, national and/or global level.




**Step 1 – Identify and delineate habitats.**

- Subdivide the entire site into different habitat types, and delineate on a map.

**Step 2 – Estimate the area of each habitat type.**

- Estimate the surface area (in hectares) for each identified habitat type, rounding to the nearest hectare for large areas and the nearest 0.25 hectares for smaller areas and water bodies.
- Each habitat block larger than 1 ha should be identified and evaluated, and disconnected areas of the same habitat type can be combined.

**Step 3 – Determine context factor of each habitat/habitat block.**

- Habitat Context Factor is determined by the answers to four questions:
  - How widespread is the habitat in the surrounding landscape?
  - What is the intrinsic biodiversity value of the habitat likely to be?
  - What is the degree of threat to this habitat nationally?
  - What is the ecological importance of this habitat in the surrounding landscape?

**Step 4 – Assess condition of each habitat/habitat block.**

Step 4a – Decide on survey method.
Step 4b – Choose survey locations.
Step 4c – Record the condition of the habitat.

**Step 5 – Evaluate the Habitat (or habitat block) Condition Class.**

Step 5a – Record possible habitat enhancements.
Step 5b – Record habitat threat score.
Step 5c – Calculate Habitat Condition Class.

**Step 6 – Determine the overall Site Biodiversity Condition Class.**

- This value is derived from the extent of each habitat type, and the context factor and condition index of those habitats, and is recorded in the Site Biodiversity Summary Sheet.

*Figure 12: BIRS Step by Step approach*

| | | Extent | Habitat condition score | Context Factor | Calculations | |
|---|---|---|---|---|---|---|
| | | ha | CS | CF | CS*CF | (CS*CF)*ha |
| 1 | Operational Area | 20.0 | 1.0 | 1.0 | 1.0 | 20.00 |
| 2 | Habitat A | 3.6 | 2.7 | 1.7 | 4.59 | 16.52 |
| 3 | Habitat B | 15.9 | 3.1 | 1.0 | 3.10 | 49.30 |
| 4 | Habitat C | 6.5 | 2.2 | 1.0 | 2.20 | 14.30 |
| 5 | Habitat D | 1.8 | 3.4 | 2.8 | 9.52 | 17.14 |
| | Total SUM | 47.8 | | | | 117.26 |
| Composite score for site | | SUM((CS*CF)*ha) / SUM (ha) | | | | 2.45 |

*Figure 13: Example of a composite site biodiversity condition index calculation*

### 3.3.2 Ambuja's specific approach related to biodiversity

In terms of externalities and based on the activities of Ambuja Cement and Ambuja Cement Foundation, the following positive and negative externalities related to biodiversity can be identified:

1. Removal of habitats for mining (-)
2. Rehabilitation of quarries by creating lakes and wetlands (+)
3. Greening of local sites (+)
4. Restoring groundwater balance resulting in improved biodiversity performance (+)

The first two externalities are measured by applying BIRS[17]. However, in contrast to usual rehabilitation programs for quarries which rely on revegetation (plantations or natural succession), for many of ACL's sites (including Ambujanagar), quarries which are not operational anymore are filled with surface water as a means of 'rainwater harvesting'. Surface water from local rivers or canals is deviated to those quarries until artificial lakes are created. These contribute to the recharging of groundwater and provide water reservoirs that can be used for irrigation in local farming activities. It's clear that such artificial lakes, which often evolve into wetlands with gradients of deep and shallow water and associated habitats, can be very important for biodiversity and even more in water scarcity areas. They can act as breeding habitats for wetland birds, amphibians and fish and might function as stepping stone for migratory birds. Lakes and wetlands provide specific ecosystem services such as water provisioning, fish production and a range of cultural values.

Another positive externality is the greening of the plant sites (clearly visible on Figure 2). Again, this is not only beneficial for local fauna and flora but it also provides ecosystem services such as carbon sequestration and – mainly for employees – air purification, noise reduction and recreational value.

Last but not least, is the beneficial impact of rainwater harvesting measures on biodiversity. Biodiversity values to a large extent depend on the availability of water. Groundwater depletion has often detrimental impacts on habitats and species which are sensitive to drought. Seawater intrusion leads to changes in abiotic conditions which again results in shifting habitats and species compositions. As a consequence, groundwater recharge programs resulting in substantial increases in the groundwater level provide opportunities for restoring original biodiversity. Sustainable farming practices focused on reduced water use and more efficient use of pesticides and fertilizers also contribute to halting biodiversity loss.

Rainwater harvesting measures should always be considered in a holistic way, i.e. carefully considering the potentially adverse impacts on biodiversity. Check dams are intended to reduce water flows in order to halt erosion processes and to maximise water infiltration. A backside however might be that barriers are created for migrating fish species. Linking rivers and canals – if not planned carefully – might result in reduced water availability elsewhere and potentially in wetlands which are important for biodiversity. However, these risks might be well under control as ACF closely cooperates with local water authorities and experts.

ACL has not started yet with ecosystem services valuation, so the third and fourth externalities as mentioned in the above overview are not measured yet.

[17] There is no BIRS report but only Excel sheets of evaluation

# 4 ALIGNMENT OF AMBUJA CEMENT'S NATURAL CAPITAL ASSESSMENT AND ACCOUNTING APPROACH WITH SEEA EA

This section starts with a discussion on the business applications that Ambuja Cement wants to feed with natural capital data. The main part however is dedicated to an exploration of the way ACL's approach is in line with the principles of SEEA EA and opportunities to improve alignment.

## 4.1 Business applications

The concept of 'business applications' in a natural capital context is introduced in the Natural Capital Protocol (2016). It is defined as "the intended use of the results of your natural capital assessment, to help inform decision making". For the purposes of this case study, it is important to have a good understanding of these business applications so that synergies between the public and private sector with regards to the collection and use of statistics and data for NCA can be achieved. NSOs need to understand for which decision contexts businesses need natural capital data.

In the context of the Aligning Biodiversity Measures for Business initiative, UNEP-WCMC and the EU Business @ Biodiversity Platform have identified 8 different business applications[18]. It is very likely that these business applications are also relevant for other natural capital thematic areas such as water, air, etc. although this has not been explored yet. In the context of this pilot case for Ambuja Cement, the following business applications are relevant:

- "tracking progress to target", which is:
  - achieving net positive impact (NPI) or net gain, to be measured by ES monetized value, for the quarries
  - achieving a 'water positive' target for all sites
- "measuring current performance"; for this application aggregation of site level data to corporate level should be possible, although today this is limited to the indicator 'hectares restored';
- "comparing options"; this might be applicable in the case of responsible water management programs by ACF, where different water harvesting measures can be compared and ranked according to their return in terms of water savings.

## 4.2 Alignment with SEEA Central Framework and SEEA EA

### 4.2.1 Short introduction to SEEA

The **System of Environmental-Economic Accounting** 2012—SEEA Central Framework (SEEA CF)19, which was adopted as an international standard by the United Nations Statistical Commission in March 2012 is the first international statistical standard for environmental-economic accounting. The SEEA CF is a multipurpose conceptual framework for compiling official statistics on the interactions between the economy and the environment, and for describing stocks and changes in stocks of environmental assets (e.g. water, energy, etc.).

The SEEA CF is based on agreed concepts, definitions, classifications and accounting rules. As an accounting system, it enables the organization of information into tables and accounts in an integrated

18 https://ec.europa.eu/environment/biodiversity/business/assets/pdf/European_B@B_platform_report_biodiversity_assessment_2019_FINAL_5Dec2019.pdf

19 https://seea.un.org/sites/seea.un.org/files/seea_cf_final_en.pdf

and conceptually coherent manner. This information can be used to create coherent indicators and aggregates to inform decision-making and for a wide range of purposes.

The SEEA CF provides information related to a broad spectrum of environmental and economic issues including, in particular, the assessment of trends in the use and availability of natural resources, the extent of emissions and discharges to the environment resulting from economic activity, and the amount of economic activity undertaken for environmental purposes.

The SEEA CF is complemented by the **SEEA Ecosystem Accounting**. The SEEA Ecosystem Accounting (SEEA EA) constitutes an integrated and comprehensive statistical framework for organizing data about habitats and landscapes, measuring ecosystem services, tracking changes in ecosystem assets, and linking this information to economic and other human activity. The SEEA EA is the product of a revision of the SEEA Experimental Ecosystem Accounting and was recently adopted by the UN Statistical Commission in March 2021. The SEEA EA complements the SEEA CF by taking the perspective of ecosystems. While the CF looks at "individual environmental assets", such as water resources, energy resources, etc. and how those assets move between the environment and the economy, the SEEA EA takes the **perspective of ecosystems** to consider how individual environmental assets interact as part of natural processes within a given **spatial area**. Annex 1 provides an overview of some key characteristics of SEEA EA.

### 4.2.2 Compliance check of Ambuja Cement's natural capital accounting approach with SEEA CF and SEEA EA

In the tables below, the level of alignment between the company's natural capital accounting approach and SEEA EA (Table 1) and SEEA CF (Table 2) is presented by listing key characteristics of SEEA EA and SEEA CF and describing how Ambuja Cement's approach is in line with these characteristics. A useful and pragmatic description of relevant key characteristics of SEEA EA can be found in the draft white cover version which was adopted by the United Nations Statistical Commission (subject to editing). Table 2 specifically addresses alignment with the water resources section in the SEEA CF. Coverage of biodiversity by SEEA CF is still in early stages (only expenditures related to biodiversity restoration or conservation) and within SEEA EA only first steps are set in relation to species accounts (in addition to extent and condition accounts).

#### 4.2.2.1 Comparison with SEEA EA

*Table 2:Compliance check between Ambuja Cement's natural capital accounting approach and SEEA EA*

<table>
<tr><th>Characteristics SEEA EA</th><th>Application by Ambuja Cement</th></tr>
<tr><td>

**Overall accounting structure and core accounts**

For accounting purposes, **stocks** refer to the underlying assets that support production and the generation of income. Stocks are measured at the beginning and end of each **accounting period** (e.g. the end of the financial year) and these measurements are aggregated to form a **balance sheet** for that point in time. Information about stocks may be recorded in **physical terms** (e.g. the hectares of plantation forest) and in **monetary terms** (see Figure 14).

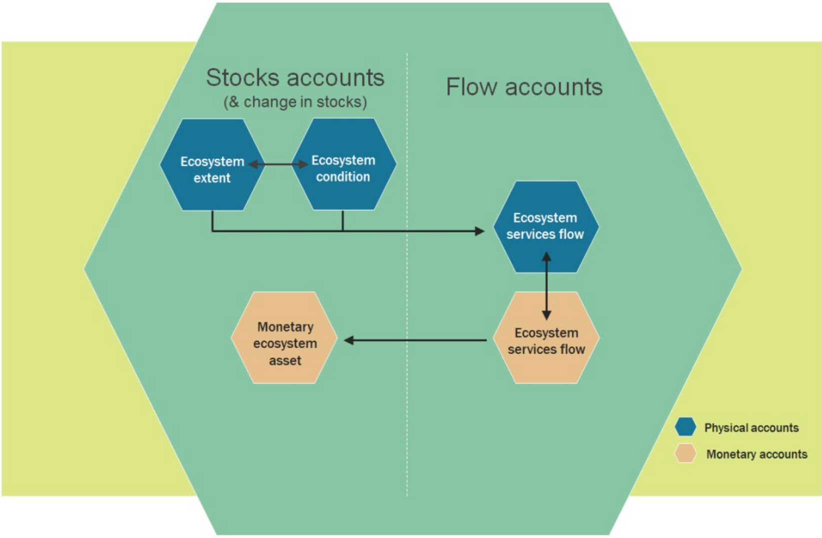



*Figure 14: Connections between the ecosystem accounts, SEEA EA*

There are five core ecosystem accounts (see Figure 14):

- Ecosystem extent account – physical terms
- Ecosystem condition account – physical terms
- Ecosystem services supply and use account – physical terms
- Ecosystem services supply and use account – monetary terms

</td><td>

Holcim's IP&L approach also relies on the concepts of a balance sheet and annual accounting periods. It contains information on stocks (e.g. rehabilitated quarries) and flows (e.g. emissions of GHG) in physical and monetary terms.

Overall, this approach aligns with the SEEA EA in principle, as the environmental externalities can be recorded in the SEEA EA compliant physical accounts (see Figure 15). However, the SEEA EA does not price these externalities. Strictly speaking, the SNA/SEEA do not record externalities, as they are not transactions (i.e. undertaken mutually). Apart from this more conceptual problem, there is also a practical issue related to the availability of information at the side of the company: information on stocks and flows is partial (e.g. no information on stocks of groundwater, no information on flows of separate ecosystem services – only generic coefficient applied for quarries).

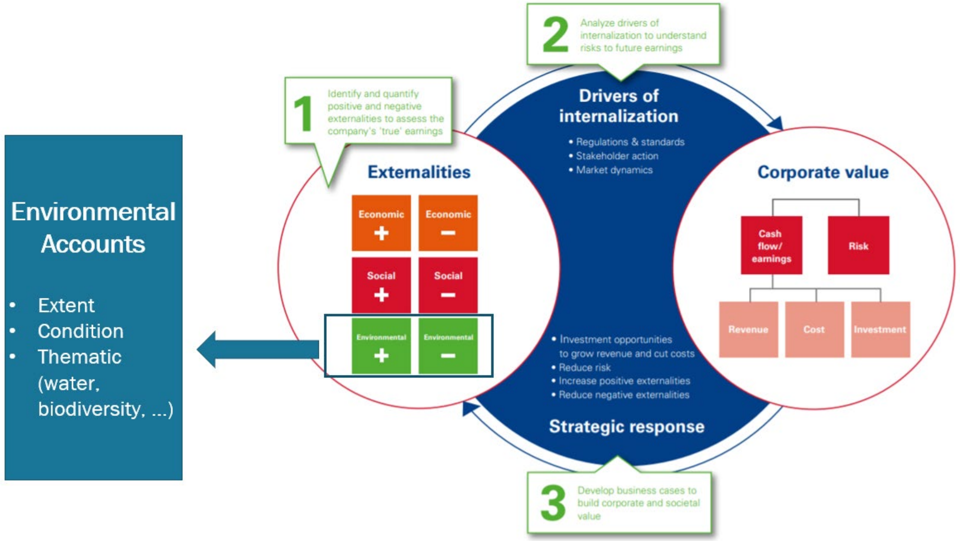



*Figure 15: Link between KPMG's True Value methodology and environmental accounting according to SEEA EA*

</td></tr>
</table>

| | |
|---|---|
| • Ecosystem monetary asset account – monetary terms | |
| **Stock accounts: extent and condition**<br><br>A key feature of all SEEA EA accounts is its use of spatial units to integrate spatially referenced data on ecosystems. There are two types of spatial units in the SEEA EA—the **ecosystem asset (EA)** and **ecosystem accounting area (EAA).** The stocks of primary focus are the EA, which are delineated within the area in scope of the accounts, or the EAA (see 1.15).<br><br>**Ecosystem assets** are contiguous spaces of a specific ecosystem type, for example individual, mutually exclusive occurrences of deserts, wetlands, etc.[20] An EAA comprises multiple EAs and defines the scope of the set of ecosystem accounts. In the implementation of the SEEA EA, the EAA usually used is a country or region. While the total area being accounted for will generally remain stable, the configuration of EAs, in terms of their area, will change over time through natural changes and land use changes. These changes are shown in the ecosystem extent accounts, which record the compositional changes within an ecosystem accounting area, summarized by ecosystem type.<br><br>The **ecosystem condition** account captures, in a **set of key indicators**, the state or functioning of the ecosystem in relation to both its ecological condition and its capacity to supply ecosystem services. Furthermore, indicators in the ecosystem condition account should also reflect the relevant trends, **policy priorities** and **pressures on ecosystems**. Generally, different ecosystem types require different indicators, so ecosystem condition accounts report by ecosystem type.<br><br>Conceptually, information about each ecosystem asset, for example **information on its extent, condition and monetary value**, can be recorded at the beginning and end of each accounting period and thus contribute to understanding the potential for the stock to support the generation of ecosystem services into the future (ecosystem capacity). | Holcim's IP&L approach doesn't rely on the concept of ecosystem assets and ecosystem accounting area. However, the application of the BIRS at site level (for quarries) and Holcim's attempts to monetize the flows of ecosystem services at site and corporate level (IP&L) together constitute an approach that fully complies with the definition of 'natural capital accounting', i.e. "the process of compiling consistent, comparable and regularly produced data using an accounting approach on natural capital and the flow of services generated in physical and monetary terms" (from Capitals Coalition). It also has the following similarities with the SEEA EA:<br><br>• The respective quarries can be considered as 'ecosystem accounting areas' (EAA), i.e. the area in scope of the accounts. The specific occurrences of different ecosystem types or habitats within the quarry can be considered as 'ecosystem assets'.<br>• BIRS applies a spatial approach where different habitats (comparable to 'ecosystem assets') are measured in terms of extent and condition. BIRS also applies an **additional account**, **i.e. the uniqueness, ecological importance of each habitat (both in terms of biodiversity value as in terms of capacity to generate ecosystem services), as well as threats, in the regional context**; this is compatible with SEEA EA too, as SEEA EA allows for ecosystem condition accounts to be captured by a set of key indicators (see 4.2 in left column).<br><br>However, at this moment Ambuja Cement is only monitoring stocks, i.e. presence of ecosystem assets within the quarries and expressed in terms of extent and condition, as well as annual changes in these stocks. BIRS is not suitable for measuring ecosystem services flows. Ambuja Cement doesn't apply a specific complementary tool to measure (and value) these ecosystem services yet.<br><br>Other areas with biodiversity positively or negatively affected by Ambuja Cement's activities are not addressed by BIRS or a similar approach. There are however opportunities to expand the concept of BIRS to for instance the green areas of the cement plants and even to the rural areas supported by ACF's responsible water programs. The latter might reveal substantial improvements in biodiversity value and ecosystem services due to amongst others increase of |

[20] (3.8) SEEA EA allows for considerable flexibility in the way in which these different areas may be delineated in practice. Both relatively coarse and relatively fine delineations may be applied, for example, linear landscape elements such as hedgerows may be distinguished as specific ecosystem assets. Further, the criteria used to delineate ecosystem assets may be quite varied, involving ecological factors only or also taking into account aspects of ecosystem use and management.

| | |
|---|---|
| | groundwater level, creation of temporary ponds by means of check dams, sustainable farming practices involving reduced use of fertilizers and pesticides. |
| **Recording stocks and flows for accounting**<br><br>Two types of flows are recorded in accounting, namely (i) changes in stock and (ii) changes in flows related to production, consumption and income:<br><br>• **Changes in stock** include additions to stock as a result of investment or, in the case of ecosystem assets, natural growth and improvements in condition; and reductions in stock due to managed (i.e. deforestation due to direct human activity) or unmanaged losses (i.e. associated with natural processes).<br><br>• **Concepts of production, consumption and income are all flow concepts**. For ecosystem accounting, the relevant flows relate to the supply and use of ecosystem services between ecosystem assets and beneficiaries including businesses, governments and households. Benefits as described in ecosystem accounting are also flows. | Changes in stock are only measured for quarries, i.e. evolution of different habitat types over time (see above discussion on BIRS).<br><br>It would be very interesting to measure and record changes in, for instance, the groundwater stock (see also Table 2 and Table 3) but Ambuja Cement doesn't do this. The reason is simple. In contrast to regional or national authorities who have the responsibility and authority to manage natural capital stocks over an entire area, an individual company is just one of the many actors in the landscape or the region which rely on a common groundwater body. It is very hard for an individual actor to measure stocks and changes in stocks which are used by several actors.<br><br>This is different for flows. Ambuja Cement measures its groundwater use and can perfectly monitor changes from year to year. Ambuja Cement Foundation, for calculating the Social Return on Investment (SROI) of their responsible water programs, has measured changes in income of the rural communities as a result of these programs. |
| **Biodiversity**<br>The measurement of ecosystems overlaps with the measurement of biodiversity[21]. In the ecosystem accounting framework, biodiversity is considered to be a key component in the measurement of ecosystem assets rather than being considered an ecosystem service in its own right. | Only species diversity is measured in the quarries. Ambuja Cement has field inventories of different species groups[22]. |
| **Thematic accounts**<br>In addition to the core ecosystem accounts, there are also thematic accounts. Thematic accounts are those for specific topics including water, biodiversity, climate change, ocean, urban accounts and more. Data from thematic accounts may be used in compiling ecosystem accounts and may also provide important | Ambuja Cement has thematic water accounts related to amongst others, groundwater levels (see Figure 9 and Figure 10) and salinity levels. Ambuja Cement also measures pollution levels (e.g. drinking water for rural communities by means of amongst others TDS[23]). Some of them can be considered as consistent, comparable and regularly produced – which is a requirement |

[21] The SEEA EA uses the Convention on Biological Diversity definition of biodiversity: the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

[22] Biodiversity is measured at full site level including quarries and plant surroundings. In EIA biodiversity is measured within a radius of 10km around the site. BIRS is only conducted in the area under control by Ambuja keeping in view that action plans will be implemented in area of control

[23] total dissolved solids as a simple measure of pollution

| | |
|---|---|
| contextual information in their own right and support analysis of ecosystem accounting information. | for SEEA EA compliance – while other measurements are more ad hoc and in different locations.<br><br>The same applies to biodiversity. Each site/quarry has a biodiversity inventory in the form of EIA Reports (which are one-off measurements) as well as separate Flora-Fauna studies/inventories which are more in line with the principles of being consistent, comparable and regularly produced. |
| **Stock accounts: Asset accounts**<br>Asset accounts record the monetary value of ecosystem assets by ecosystem type in terms of the net present value of the ecosystem services supplied by the asset. The account also records whether changes in the monetary value are due to:<br>• ecosystem degradation (associated with a decline in condition);<br>• enhancement (associated with improved condition);<br>• conversions of ecosystem type (e.g. forest to farmland);<br>• revaluations (due to changes in unit prices of ecosystem services); or<br>• other changes (for example, catastrophic losses or reappraisals). | This is applied with the BIRS tool (stocks and changes in stocks due to natural succession of vegetation or implementation of restoration measures) and the subsequent translation to a monetary value in the corporate level IP&L. |

#### 4.2.2.2 Comparison with SEEA Central Framework with scope on water

The SEEA CF includes guidance on how to compile physical asset accounts for water resources[24]. It states that physical asset accounts for water resources should be compiled by type of water resource and should account for both the stock of water at the beginning and end of the accounting period and the changes in the stock of water. The accounts are generally compiled in terms of millions of cubic metres of water. Changes in the stock of water should consider additions to the stock, reductions in the stock and other changes in the stock (paragraphs 5.481 and 5.482 in SEEA CF).

In Table 3, the structure of a potential water asset account is presented for a watershed area Ambuja Cement is operating in. It is completely aligned with Table 5.25 of the SEEA CF. Below, a more detailed analysis is done regarding the way this table could be completed by Ambuja Cement.

[24] See section 5.11.3 in https://seea.un.org/sites/seea.un.org/files/seea_cf_final_en.pdf

*Table 3: Compliance check between Ambuja Cement's natural capital accounting approach and the SEEA Central Framework (numbers refer to paragraphs in SEEA CF)*

| SEEA Central Framework | Potential application by Ambuja Cement (see also Table 3) |
|---|---|
| **Defining the stock of water**<br>The **stock of surface water** is related to the quantity of water in a **territory of reference** measured at a specific point in time (usually the beginning or end of the accounting period). The stock level of a river is measured as the volume of the active riverbed determined on the basis of the geographical profile of the riverbed and the water level. This quantity is usually very small compared with the total stock of water resources and the annual flows of rivers. | As mentioned in Table 1, Ambuja Cement does not measure water stocks in a specified 'territory of reference'. In contrast to regional or national authorities who have the responsibility and authority to manage natural capital stocks over an entire area, an individual company is just one of the many actors in the landscape or the region which rely on a common surface water or groundwater body (aquifer). So, it is very hard for an individual actor to measure stocks and changes in stocks which are used by several actors.<br><br>Instead of measuring stocks, companies can measure a **baseline** and track changes (either positive or negative) compared to this baseline over time. Examples of obvious baseline indicators related to water are groundwater level and salinity level. It is not clear if Ambuja Cement is consistently measuring baseline situations for each new development, as Ambuja is more focused on achieving a 'water positive' target (i.e. amounts of harvested rainwater exceed amounts of extracted groundwater) than achieving specified targets related to groundwater level - which is more the responsibility of the government, according to Ambuja. This might change if Ambuja will subscribe science-based targets for nature in the future.<br><br>Another challenge is to define the 'territory of reference' for water. First of all – and this relates to the abovementioned issue – the territory of reference for water is ideally the watershed area for surface water and the aquifer for groundwater (which might include several watershed areas in case of deeper groundwater layers). So, the activities of a company usually affect only a (small) part of this territory of reference. For water, it doesn't make sense to delineate a specific territory of reference which is only affected by a company's activities. A second issue in the case of Ambuja Cement is that their assumed 'territory of reference' for water not only includes an area which is affected by the activities of the company but also one or more areas where ACF is implementing responsible water management programs. In most cases these overlap – at least partially – with the area affected by the company.<br><br>Defining a specific accounting catchment for the company is challenging. |
| **Stocks of groundwater and soil water**<br>These stocks are measured consistent with the definitions above. The measurement of soil water may extend to cover all soil but may also be limited (e.g. to soil water in agricultural and forestry areas), depending on the analytical purposes of the water account.<br><br>Water statistics can provide data for water management at many geographical levels, ranging from local levels and river basin level to national and multinational levels. The **choice of spatial reference** for the compilation of water accounts ultimately depends on the data needed by users and the resources available to data producers. The choice of spatial scale is important, as countries may experience significant geographical variation in the availability of water (e.g., areas of very high or very low rainfall) and national aggregates may not accurately reflect the issues facing particular countries.<br><br>It is recognized internationally that a river basin is the most appropriate spatial reference for integrated water resource management (see, e.g. Agenda 21 (United Nations, 1993) and the European Water Framework Directive (European Parliament and Council, 2000)). This is because the people and economic activities within a river basin will have an impact on the **quantity and quality** of water in the basin, and conversely the water available in a basin will affect the people and economic activities that rely on this water. In areas where groundwater is an important source of water, **aquifers** may also be appropriate spatial references for the compilation of water statistics.<br><br>Although data for specific spatial scales within a country are often more appropriate for the analysis of water resources, integration of physical data on water at relevant spatial levels, e.g., river basins, may not align with the available spatial detail for economic data (which are more commonly compiled based on administrative boundaries). In these situations, **common areas of observation, accounting catchments**, should be defined. | |

| | |
|---|---|
| **Additions to the stock of water resources** consist of the following flows:<br>(a) **Returns**, which represent the total volume of water that is returned to the environment by economic units into surface water, soil and groundwater during the accounting period. Returns can be disaggregated by type of water returned, for example, irrigation water, and treated and untreated wastewater.<br>(b) **Precipitation**, which consists of the volume of atmospheric precipitation (rain, snow, hail, etc.) on the territory of reference during the accounting period before evapotranspiration takes place.<br>(c) **Inflows**, which represent the amount of water that flows into water resources during the accounting period. The inflows are disaggregated according to their origin: (i) inflows from other territories/countries; and (ii) inflows from other water resources within the territory. Inflows from other territories occur with shared water resources. For example, in the case of a river that enters the territory of reference, the inflow is the total volume of water that flows into the territory at its entry point during the accounting period. Inflows from other resources include transfers, both natural and man-made, between the resources within the territory. They include, for example, flows from desalination facilities and flows of infiltration and seepage. | Returns by Ambuja Cement are irrigation water and recharged groundwater (by means of enhanced infiltration measures such as check dams and artificial lakes). Treated domestic wastewater from the plant is returned to soil water by irrigating the green parts of the industrial estate. Irrigation water is also used for farming purposes by local communities.<br><br>Precipitation is recorded by Ambuja's environment department at sites as one of the meteorological parameters. It is however acknowledged that fluctuating rainfall from year to year or within a year (monsoon season) is challenging for calculating the social cost of water.<br><br>A typical inflow in the case of ACF's responsible water programs is water being transferred from other 'territories' by linking rivers and canals (only for Ambujanagar). ACF does not measure the transferred amounts of water. |
| **Reductions in the stock of water resources** consist of the following flows:<br>(a) **Abstraction**, which is the amount of water removed from any source, either permanently or temporarily, in a given period of time. It includes the abstraction of water by households for own consumption, water used for hydroelectric power generation and water used as cooling water. Given the large volumes of water abstracted for hydroelectric power generation and for cooling purposes, these flows are separately identified as part of the abstraction of water.<br>(b) **Evaporation and actual evapotranspiration**, which constitute the amount of evaporation and actual evapotranspiration that occurs in the territory of reference during the accounting period, excluding amounts already recorded as abstracted from soil water. Evaporation refers to the amount of water evaporated from water bodies such as rivers, lakes, artificial reservoirs, etc. Actual evapotranspiration refers to the amount of water that evaporates from the land surface and is transpired by the existing vegetation/plants when the ground is at its natural moisture content as determined by precipitation and soil properties. Actual evapotranspiration will typically be estimated using models;<br>(c) **Outflows**, which represent the amount of water that flows out of water resources during the accounting period. Outflows are disaggregated according to the | In the case of Ambuja Cement, the main abstraction category is groundwater extraction by the company for cooling purposes and for process water. Surface water is also extracted in other plants (Maratha). In Ambujanagar, mine pit water is used for cooling water in the captive power plant.<br><br>Rural communities, which are part of ACF's responsible water management programs, also use groundwater, mainly for consumption by households. Farmers use water from rivers and canals and from artificial lakes for irrigation purposes. This is not measured in absolute terms but the general groundwater trend over time is monitored by measuring the water level in selected wells around different water structures.<br><br>Evaporation is an important abstraction category in dry and hot areas such as for the Rabriyawas site. In the Ambujanagar area evapotranspiration will be important too. This is not measured by ACL/ACF but maybe these figures are available with national or regional authorities (such as meteorological institutes). |

| | |
|---|---|
| destination of the flow; i.e., (i) other water resources within the territory, (ii) other territories/countries and (iii) the sea/ocean. | |

*Table 4: Potential water accounts table for Ambuja Cement, in line with SEEA (adapted from SEEA Central Framework); accounts which are already in place with Ambuja Cement are marked in green*

| | Type of water resource | | | |
|---|---|---|---|---|
| | Surface water | | Groundwater | Soil water |
| | Artificial reservoirs | Rivers and canals | | |
| **Opening stock of water resources** | X m3 | X m3 | X m3 | X m3 |
| **Additions** | | | | |
| **Returns – 'irrigation water'** | | | | X m3 |
| **Returns – 'groundwater recharge'** | | | X m3 | |
| **Precipitation** | X m3 | X m3 | X m3 | X m3 |
| **Inflows from other inland water resources ('linking rivers and canals')** | X m3 (in case of active filling of mined out pits) | X m3 | | |
| **Reductions** | | | | |
| **Abstraction – 'cooling water'** | | | X m3 | |
| **Abstraction – 'process water'** | | | X m3 | |
| **Abstraction – 'households'** | | | X m3 | |
| **Abstraction – 'farming' (irrigation)** | X m3 | X m3 | | |
| **Evaporation** | X m3 | X m3 | | X m3 |
| **Outflows – 'to other inland water resources'** | | X m3 | Xm3 | |
| **Outflows – 'to sea'** | | X m3 | | |
| **Closing stock of water resources** | X m3 | X m3 | X m3 | X m3 |

### 4.2.3 Conclusions

**Strengths**

- Holcim's IP&L approach relies on the concepts of a balance sheet and annual accounting periods. It contains information on stocks (e.g. rehabilitated quarries) and flows (e.g. emissions of GHG) in physical and monetary terms.
- The True Value methodology (KPMG, 2015) which is the basis for Holcim's IP&L approach fits well for alignment with SEEA EA, as the environmental externalities can be recorded in SEEA EA compliant physical accounts, but the monetary valuation of externalities is not a usual application of SEEA EA.
- The application of the Biodiversity Indicator and Reporting System (BIRS) at site level (for quarries) and Holcim's attempts to monetize the flows of ecosystem services at site and corporate level (IP&L) together constitute an approach that fully complies with the definition of 'natural capital accounting', i.e. "the process of compiling consistent, comparable and regularly produced data using an accounting approach on natural capital and the flow of services generated in physical and monetary terms" (from the Capitals Coalition). Moreover, it has the following similarities with the SEEA EA:
    - The respective quarries can be considered as 'ecosystem accounting areas' (EAA), i.e. the area in scope of the accounts. The different ecosystem types or habitats within the quarry can be considered as 'ecosystem assets'.
    - BIRS applies a spatial approach where different habitats (comparable to 'ecosystem assets') are measured in terms of extent and condition: the concept of 'extent accounts' and 'condition accounts' is key in SEEA EA.
    - BIRS also applies an additional account, i.e. the uniqueness, ecological importance of each habitat (both in terms of biodiversity value as in terms of capacity to generate ecosystem services), as well as threats, in the regional context; this is compatible with SEEA EA too, as SEEA EA allows for ecosystem condition accounts to be captured by a set of key indicators.

**Barriers**

- Apart from biodiversity, Holcim's IP&L approach doesn't rely on the concept of ecosystem assets and ecosystem accounting area. Changes in stock are only measured for quarries, i.e. evolution of different habitat types over time. It would be very interesting to measure and record changes in for instance the groundwater stock but compiling a specific account at catchment level for the company is challenging, as individual companies are just one of the many actors in the landscape or the region which rely on a common aquifer. Instead of measuring stocks, companies can measure a baseline and track changes (either positive or negative) compared to this baseline over time. Examples of obvious baseline indicators related to water are groundwater level and salinity level.
- In line with the first barrier, it is very difficult for Ambuja Cement to compile a water stock account table as presented above; it may be easier to focus on flows of water abstraction and consumption as is currently being done. Information about stocks may be derived from external data sets, so that benchmarking can be undertaken.
- Lack of knowledge on how to measure and value ecosystem services flows (see 'opportunities for improvement').

## Opportunities for improvement

- With regard to biodiversity, Ambuja Cement is only monitoring stocks, i.e. presence of ecosystem assets within the quarries and expressed in terms of extent and condition, as well as annual changes in these stocks. BIRS is not suitable for measuring ecosystem services flows. Ambuja Cement doesn't apply a specific complementary tool to measures (and value) these ecosystem services yet. It might be useful to explore the ESVD (follow up of TEEB database) to see if country-specific valuation data on ecosystem services are available that could be transferred to sites of ACL (e.g. quarries). Another potential source of information is the EVL for India. Holcim is piloting an ecosystem services assessment and valuation approach in Spain now. Based on the outcomes, a similar or more locally adapted approach for India could be implemented. Bringing the outcomes of the different operating countries of Holcim together will ultimately result in a much more refined figure of monetized ecosystem services values at corporate level.
- It is worth expanding the BIRS philosophy to other ecosystems where biodiversity is affected by the company's activities. Examples of ecosystems where biodiversity is created or restored (positively affected) are green areas in industrial estates, farmland under more sustainable farming practices, check dam reservoirs, etc.
- Get better understanding of relationships between water and biodiversity (holistic approach) in order to identify the right set of parameters to be monitored (e.g. groundwater level as an indication for habitat quality in certain types of habitats)
- Ambuja Cement has thematic water accounts related to e.g. groundwater levels and salinity levels. Such information may also be integrated in an ecosystem condition account. Ambuja Cement measures pollution levels too (e.g. drinking water for rural communities). Some of them can be considered as consistent, comparable and regularly produced – which is a requirement for SEEA EA compliance – while other measurements are more ad hoc and in different locations. The same applies to biodiversity. Each site/quarry has a biodiversity inventory in the form of EIA Reports (which are one-off measurements) as well as separate Flora-Fauna studies/inventories which are more in line with the principles of being consistent, comparable and regularly produced.
- A water accounts table for the local watershed and/or aquifer should preferably be compiled by the local water authorities (e.g. river basin management authorities) but major actors in that area, like Ambuja Cement, could provide full cooperation in providing data (see green cells in Table 3). This would also provide a more solid underpinning of Ambuja Cement's 'water positive' target. It would also avoid the risk of double counting, as at this moment in principle farmers can also report their water consumption[25].

[25] Please note that in the context of this case study farmers are not suppliers of Ambuja Cement, but different actors in the same watershed area. This is different from corporates including supplier impacts in overall corporate performance. SEEA makes a distinction between direct emissions/uses (production site level) and indirect emissions/uses (in supply chain) and explicitly excludes indirect emissions/uses with the aim to avoid double counting.

# 5 NATURAL CAPITAL DATA NEEDS AND AVAILABILITY

## 5.1 Data needs

From the above discussion, it's clear that assessments in the field of water and biodiversity by Ambuja Cement require collection and analysis of natural capital data. Some of these data are collected by own measurement campaigns by the company (primary data) while for other data the company relies on external data sources (secondary data). An overview is presented in Table 4.

*Table 5: Natural capital data needs of Ambuja Cement in relation to water and biodiversity*

| Data needs | Way of collecting | Remarks |
|---|---|---|
| **WATER** | | |
| Groundwater level and groundwater quality in groundwater wells for process and cooling water | Own measurement | Basis for calculating 'consumed water' by the company |
| Groundwater level and salinity level of groundwater in groundwater wells of rural communities. | Own measurement | As part of ACF's responsible water management programs |
| Drinking water quality in rural communities | Own measurement | Measured twice a year. Basis for various interventions including awareness raising on water quality issues in communities. |
| Water scarcity level | India Water Tool v3<br>Aqueduct Water Risk Atlas | More refined data available in Central Groundwater Board of Government of India? (see 5.2.1) |
| Acceptable amount of extracted groundwater | Groundwater permitting process | Limits are defined by responsible authorities |
| Amounts of recharged groundwater | Own measurement and estimations | As part of 'Water positive' calculations |
| Coefficients (debits and credits) | Literature (TruCost) | Potential to replace with values from EVL Tool (under development) |
| BIODIVERSITY | | |
| Extent and condition of habitats in quarries | Own measurement (in line with BIRS methodology) | |
| Species inventories in quarries | Own measurement | once in every 5 years either in EIA report or in a separate Flora-Fauna study |
| Species inventories in other ecosystems | Covered in EIA | The EIA covers an area with a 10 km radius around the site |
| Presence of protected areas | | |
| Presence of threatened species | | |
| Ecosystem services | Is not measured yet, but a default value is applied at corporate level for the ecosystem services benefits of quarry restoration (see 3.1.2.3). | No ecosystem services maps with sufficient granularity available within NSO India, but planned for the future |

## 5.2 Data availability

### 5.2.1 National level

Based on an interview with NSO India (P. Bhanumati), the following information has been identified as potentially relevant for this particular study:

- Information on the groundwater status in India; the website of the Central Groundwater Board of India provides useful links such as https://indiawris.gov.in/wris/#/: India-WRIS Wiki is a collaborative knowledge sharing web interface for exploring, sharing updated information regarding the various aspects of the water resources of the nation in textual format. India-WRIS Wiki provides a platform to link non-spatial information with spatial themes through a content management system; WIMS (Water Information Management System) is an important tool which is being developed for web-based water data entry and management platform for Surface/Groundwater for historical and real time data and thus creating a centralized pool of information at country level (see for example the huge differences in groundwater level between Rajasthan (red) and Gujarat in Figure 13).
- A nationwide report discussing the state of groundwater http://cgwb.gov.in/GW-Assessment/GWRA-2017-National-Compilation.pdf; it mainly consists of textual information but it includes a few relevant maps such as a water scarcity map with indication of safe and over-exploited assessment units
- More detailed information per state can be found in the Ground Water Year Books of States, see http://cgwb.gov.in/GW-Year-Book-State.html

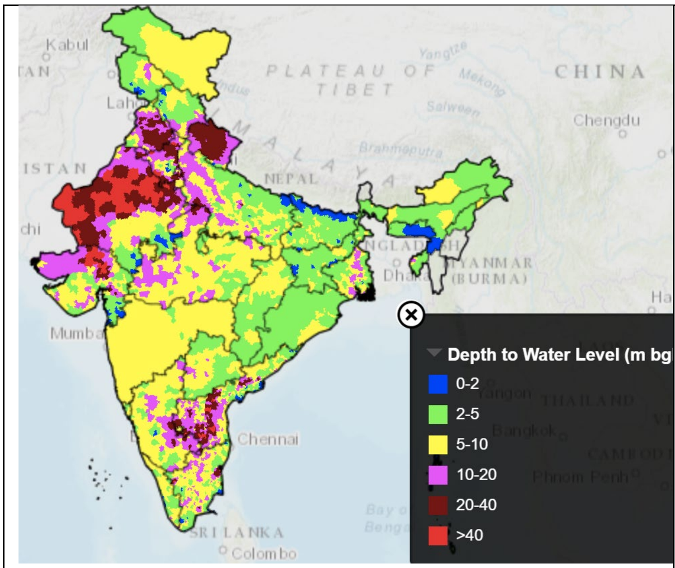



*Figure 16: Depth of groundwater level (from WIMS, see https://indiawris.gov.in/wris/#/)*

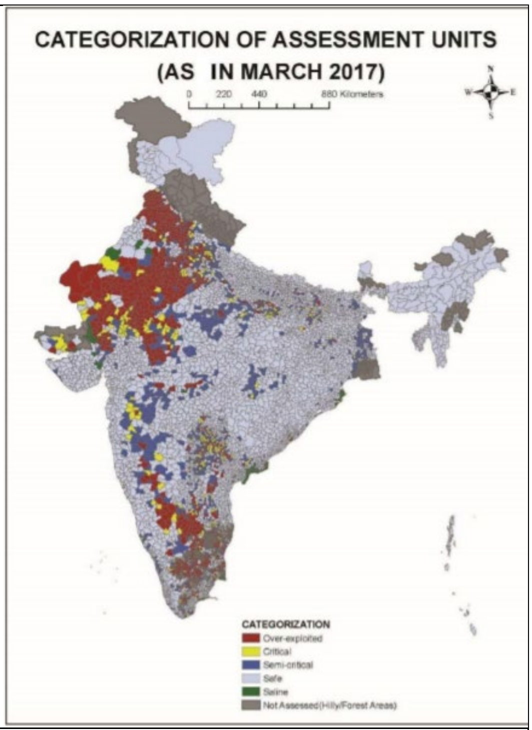



*Figure 17: Assessment of exploitation levels of groundwater in India (Central Groundwater Board of India, July 2019)*

- Information on biodiversity can be found on the website of the National Biodiversity Authority; an interesting source of information are the s-called 'People's Biodiversity Registers', i.e. records of traditional biodiversity knowledge in local communities (what people recall about species that have been present historically); this helps to develop and implement restoration plans for restoring populations and habitats of traditional fish species, crops, locally endangered species, etc.: the process of collecting this information is ongoing but it is worth exploring the state of the art in the areas of both pilots as insights in locally endangered species helps to define relevant and science-based' targets for nature (see http://nbaindia.org/blog/580/57//UnderstandingPeople.html)
- Another useful source of information is the website of ENVIS 'Centre on Environmental Problems of Mining' which contains a whole list of case studies on restoration of biodiversity in mines - http://ismenvis.nic.in/Database/Ecorestoration_6541.aspx

The India Water Tool IWT3.0 probably includes the data sources on groundwater referred to by NSO India. Coordinated by the World Business Council for Sustainable Development India, the tool has been developed by 20 companies, including Ambuja, and three knowledge partners over three successive versions. It is a comprehensive and user-friendly application that makes water data from government and other organizations available on a publicly accessible platform. The goal is to assist key stakeholders identify water risks and plan for better water management in India. y. The IWT 3.0 differs from global water tools, such as WRI's Aqueduct Water Risk Atlas, by introducing additional datasets that are at higher resolution. It includes over 20 datasets from key Indian government authorities and other organizations (see Table 5), a dataset on real-time satellite capture of surface water availability from NASA and U.S. Geological Survey (USGS) and water stress models developed by the World Resources Institute (WRI) and Columbia Water Center (CWC). According to Table 5, although IWT 3.0 covers many data sources, the data risk to get outdated (many data 10 years or more) which is definitely a continuous opportunity for improvement.

*Table 6: Overview of data sources used by the India Water Tool version 3.0*

| Dataset | Source | Resolution | Year(s) Available |
|---|---|---|---|
| Groundwater level | Central Ground Water Board | Observation well | 2007-2017 |
| Groundwater yield | Central Ground Water Board | Observation well | 2011 |
| Hydrogeological Map | Central Ground Water Board | N.A. | 2013 |
| Aquifer System | Central Ground Water Board | N.A. | 2011 |
| Net Groundwater availability | Central Ground Water Board | District | 2013 |
| Stage of groundwater development | Central Ground Water Board | District | 2011 |
| Groundwater Block categorization | Central Ground Water Board | Block | 2004, 2009, 2011, 2013 |
| Notified Areas | Central Ground Water Authority | Block | 2015 |
| Projected demand for domestic and industrial uses in 2025 | Central Ground Water Board | District | 2013 |
| Net groundwater availability for future irrigation use in 2025 | Central Ground Water Board | District | 2013 |
| Total annual rainfall | India Meteorological Department | District | 2004-2013 |
| Surface Water Availability Index (NDWI - Normalised Difference Water Index) | National Aeronautics and Space Administration, and U.S. Geological Survey | District | 2001-2016 |
| Surface water quality | Central Pollution Control Board | Observation station | 2013 |
| Baseline Water Stress | World Resources Institute | Sub-catchment | 2010 |
| Normalized Deficit Index | Columbia University | District | 2012 |
| Normalized Deficit Cumulated | Columbia University | District | 2012 |
| Localized Data (Watershed Features) | ICRISAT (from modelling studies at watershed level) | Meso-watershed | 2017 |

In addition to the above data sources, UNSD referred to the EVL tool which assesses and summarizes all known ecosystem services valuation studies In India to date. The India EVL tool has been developed for the UN Environment Programme (UNEP), Indian Ministry of Statistics and Programme Implementation (MoSPI) and the United Nations Statistics Division (UNSD), as part of the EU funded "Natural Capital Accounting and Valuation of Ecosystem Services" (NCAVES) project. This tool is for use by MoSPI staff and related Indian government departments to navigate a database of over 80 valuation studies conducted in India, which have been identified as applicable for value transfer. Unfortunately, so far, none of the studies included cover the areas of either sites.

### 5.2.2 Global data sources

Natural capital data is increasingly being made freely available at the global scale, given the proliferation of remote sensing and satellite data. The increasing use of Earth observation has helped countries which would like to compile ecosystem accounts but may not have sufficient data on hand. The SEEA EA's spatial approach requires spatial modelling of ecosystem accounts which require substantial time, expertise and data. Thus, global data sources have lowered barriers to entry, allowing countries to compile accounts to improve on at a later stage. Theoretically, these data sources could potentially be used by businesses as well.

There are several ongoing initiatives focusing specifically on ecosystem accounting, including (but not limited to):

- the Earth Observation for Ecosystem Accounting (EO4EA) initiative, focusing on developing methods and tools to allow Earth observation technology to enable the widespread adoption of ecosystem accounting
- Essential Biodiversity Variables, made available by GEOBON, which includes a variety of essential biodiversity variable raster datasets focusing on status and trend in elements of biodiversity
- The international Research & Innovation platform ARtificial Intelligence for Environment and Sustainability (ARIES), which will soon have an easy-to-use application for SEEA Ecosystem Accounting (SEEA EA), with the intent to also eventually support compilation of some Central Framework accounts, enabling ecosystem account production anywhere on Earth.

As part of the pilot case study, UNSD looked at the potential for using these global datasets at the business level, focusing on the ARIES explorer. They found that global datasets were useful in providing contextual, benchmarking data at the larger scale (e.g. watershed, administrative region). However, at the business level, the data was not granular enough. That said, global datasets and tools for ecosystem accounting are constantly improving and may provide useful data at the business level in the not-too-distant future.

Finally, the Ecosystem Services Valuation Database (ESVD)[26] would be a highly recommended alternative for the "The Economics of Ecosystems and Biodiversity" (TEEB) database. Due to lack of local context specific data, default values from TEEB are used by Holcim corporate to calculate the ecosystem services value generated by quarry restoration (see 3.1.2.3). ESVD is a follow-up to TEEB. The current version of ESVD contains +/- 4.000 value records (i.e. three times as much as the original TEEB database). In addition to the TEEB ecosystem services classification, the values are also linked to CICES V5.1. In the excel database filters can be applied according to amongst others 'biome', 'country', 'ecosystem service'. The ESVD summary report includes summary tables of the value estimates contained in the ESVD. However, it must be emphasized that this summary of values is for illustrative purposes only to provide an impression of the order of magnitude of the values obtained from the literature and to identify data gaps. It is not advised to use these summary statistics for value transfers since they reflect the underlying ecological and socio-economic contexts of diverse (but not necessarily representative) study sites. For the purposes of value transfer, users are advised to access the ESVD excel to find original values most closely related to their sites or to use value functions that allow the prediction of values that reflect site specific characteristics. As a consequence, the applied biodiversity coefficient in Holcim's I P&L approach deserves to be updated based on this ESVD. This will require quite some work as ESVD does not provide data for 'quarries' but only for different biomes (spread over different countries and different ecosystem services), etc. Holcim acknowledges the drawbacks of using such generic coefficient, as the company is very much aware of the large differences in local ecosystem services value across its different sites. As a result, Holcim has initiated some pilots in Spain exploring the added value of an ecosystem services methodology incorporating the local context (see 3.3.3).

[26] ESVD – Download & Use (es-partnership.org)

## 5.3 Conclusion

Ambuja Cement needs a lot of natural capital data. In the field of water and biodiversity, they are mainly relying on own measurements. They currently use few data sources from third parties, such as data from national, regional or local authorities or data from international data sources. An exception is the use of the India Water Tool. For some key data, such as the social cost of water, Ambuja relies on probably outdated and very generic data (see Figure 8). Own measurements are expensive but are deemed necessary due to the fact that available data sources are either not providing the required level of accuracy or are unknown to the company (e.g. ESV database and India EVL Tool for ecosystem services). Efforts by governments and developers of tools and databases are increasing to strengthen the granularity and quality of natural capital datasets globally and locally. However, communication with the business community is essential in order to provide data which are really fit for purpose by the business community.

# ANNEX 1: KEY CHARACTERISTICS OF SEEA EA

Discussing potential alignment or synergies between natural capital assessment and accounting approaches developed and applied by businesses and the ecosystem accounting approach as developed by SEEA EA assumes a basic insight and understanding of key concepts and terms applied by SEEA EA. Therefore, a short description of key characteristics of SEEA EA is provided below (the numbers refer to the paragraphs in the https://unstats.un.org/unsd/statcom/52nd-session/documents/BG-3f-SEEA-EA_Final_draft-E.pdf).

## GENERAL CONCEPTS OF ECOSYSTEM ACCOUNTING

- **Ecosystem accounting** is a coherent framework for integrating measures of ecosystems and the flows of services from them with measures of economic and other human activity. In the SEEA Central Framework, environmental assets are accounted for as individual resources such as timber resources, soil resources and water resources. In ecosystem accounting as described in the SEEA Ecosystem Accounting (SEEA EA), the accounting approach recognises that these individual resources function in combination within a broader system by taking a spatial approach.
- (1.25-1.32) Recording stocks and flows for accounting
    - For accounting purposes, **stocks** refer to the underlying assets that support production and the generation of income. Stocks are measured at the beginning and end of each **accounting period** (e.g. the end of the financial year) and these measurements are aggregated to form a balance sheet for that point in time. Information about stocks may be recorded in physical terms (e.g. the hectares of plantation forest) and in monetary terms.
    - For ecosystem accounting, the **stocks of primary focus** are the **ecosystem assets (EA)** delineated within **the area in scope of the accounts, i.e. the Ecosystem Accounting Area (EAA)** (as the SEEA is implemented, this is usually a country or region) (see 2.12). Ecosystem assets are usually continuous areas of a homogenous ecosystem type such as forests, wetlands or rivers (see also footnote[27]). Conceptually, information about each ecosystem asset, for example information on its extent, condition and monetary value, can be recorded at the beginning and end of each accounting period and thus contribute to understanding the potential for the stock to support the generation of ecosystem services into the future (ecosystem capacity).
    - Two types of flows are recorded in accounting, namely (i) changes in stock and (ii) changes in flows related to production, consumption and income:
        - **Changes in stock include additions to stock as a result of investment or, in the case of ecosystem assets, natural growth and improvements in condition; and reductions in stock due to degradation or natural loss**.
        - Concepts of production, consumption and income are all flow concepts. For ecosystem accounting, the **relevant flows relate to the supply and use of ecosystem services between ecosystem assets and beneficiaries including businesses**, governments and households. Benefits as described in ecosystem accounting are also flows.

[27] (3.43-3.44) SEEA EA allows for considerable flexibility in the way in which these different areas may be delineated in practice. Both relatively coarse and relatively fine delineations may be applied, for example, linear landscape elements such as hedgerows may be distinguished as specific ecosystem assets.

- (3.22-3.34) **Spatial structure and ecosystem assets**. An area referred to as the **ecosystem accounting area**, such as a country or region within a country, defines the scope of the set of ecosystem accounts. The ecosystem accounting area is considered to comprise multiple ecosystem assets (generally represented in accounts in terms of homogenous and continuous areas of different ecosystem types such as forests, lakes, desert, agricultural areas, wetlands, etc.). While the total area being accounted for will generally remain stable, the configuration of ecosystem assets and types, in terms of their area, will change over time through natural changes and land use changes. For accounting purposes, each ecosystem asset is considered a separable asset where the delineation of assets is based on mapping mutually exclusive ecosystem asset boundaries.
- (2.40) **Ecosystem extent accounts** record the compositional changes within an ecosystem accounting area, with information about different ecosystem assets usually grouped by ecosystem type.
- (2.41) **Ecosystem condition**. Each ecosystem asset will also change in condition over time. An **ecosystem condition account** is structured to record the condition at specific points in time and the changes in condition over time for ecosystem assets and is grouped by ecosystem type. These changes may be due to natural causes or human/economic intervention. Recording the changes in condition of multiple ecosystem assets within a country (or sub-national region) is a fundamental ambition of ecosystem accounting.
- (5.16-5.22) The ecosystem condition account captures, in a set of key indicators, the state or functioning of the ecosystem in relation to both its ecological condition and its capacity to supply ecosystem services. Furthermore, (5.58-5.62) indicators in the ecosystem condition account should also reflect the relevant trends, policy priorities (e.g. preservation of native habitat) and pressures on ecosystems (e.g. deposition levels of acidifying compounds versus critical loads for such compounds). Generally, different ecosystem types require different indicators. For example, condition indicators relevant for forests will be less relevant for cropland.
- (6.9) **Ecosystem services** are the contributions of ecosystems to the benefits that are used in economic and other human activity. Ecosystem services are recorded as flows between ecosystem assets and economic units (e.g. business, governments and households).
    - (6.16) Ecosystem services are regarded as contributions to benefits, which are defined as the goods and services which are ultimately used and enjoyed by people and society. In other words, benefits reflect a gain or positive contribution to wellbeing from the use of ecosystem services. Depending on the service in question, the contribution of ecosystems to the benefit maybe the same as the benefit, or it may be smaller than the benefit, depending on the ecosystem's role (e.g ecosystems contribute to crop provisioning, but so do produced assets and labour).
- (10.1) Ecosystem services can be accounted for in monetary terms as well. Monetary ecosystem service accounts can also be used to derive ecosystem asset accounts, which record a monetary value of ecosystem assets in terms of the net present value of the ecosystem services supplied by the asset.
    - (8.13) Monetary values in the SEEA EA are based on **exchange values**, or the values at which goods, services, labour or assets are in fact exchanged or else could be exchanged for cash.
    - (12.4) Exchange values are distinct from **welfare values**, but there are relationships between the two. Bridging tables can help link SEEA EA accounting values to welfare values.

- (6.60) The measurement of ecosystems often overlaps with the measurement of **biodiversity**. In the ecosystem accounting framework, biodiversity is considered to be a key component in the measurement of ecosystem assets rather than being considered an ecosystem service in its own right.
- (2.49) A distinction has been drawn between **ecosystem accounts** and **thematic accounts**. Ecosystem accounts are those covering specifically stocks and changes in stocks of ecosystem assets, and flows of ecosystem services, and may be compiled in both physical and monetary terms. Thematic accounts are those for specific topics **including land, carbon, water and biodiversity**. Data from thematic accounts may be used in compiling ecosystem accounts and may also provide important contextual information in their own right and support analysis of ecosystem accounting information.
- (2.44) Asset accounts are designed to record information on stocks and changes in stocks (additions and reductions) of ecosystem assets. **This includes accounting for ecosystem degradation**. The **ecosystem monetary asset account** records this information in monetary terms, based on valuation of ecosystem services and connecting to information ecosystem extent and condition.
- (2.38) There are **five core ecosystem accounts**:

| 1 | **Ecosystem extent account** | **physical terms** |
|---|---|---|
| 2 | Ecosystem condition account | physical terms |
| 3 | Ecosystem services supply and use account | physical terms |
| 4 | Ecosystem services supply and use account | monetary terms |
| 5 | Ecosystem monetary asset account | monetary terms |

This is well visualized in the below figure.

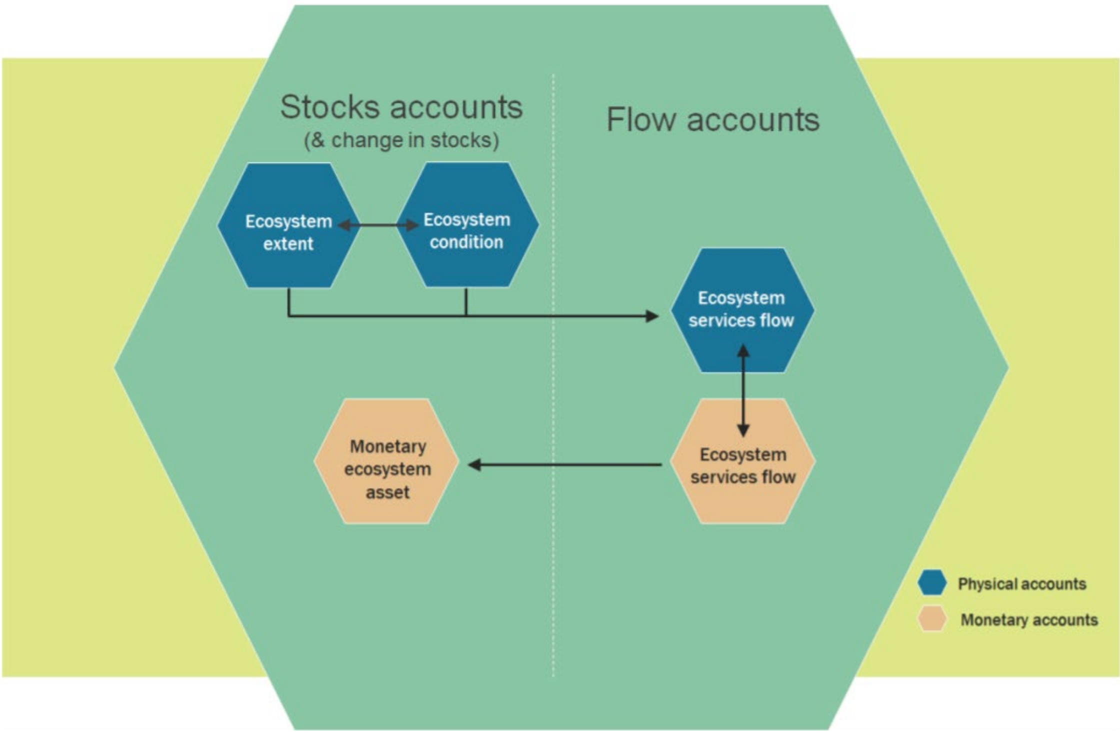



*Figure 18: Connections between ecosystem and related accounts and concepts (Figure 2.2, white cover of SEEA EA)*