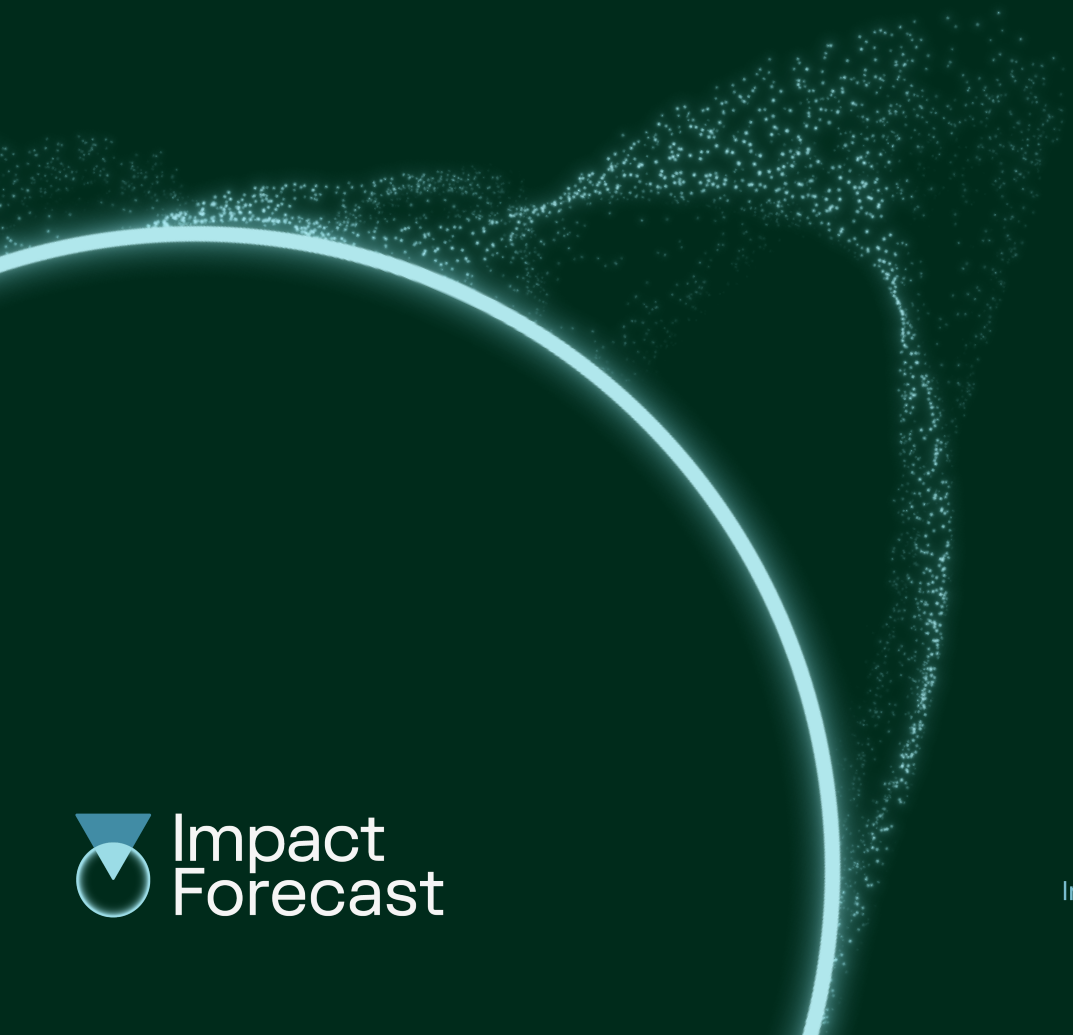
Validation report

Imperfect

21.01.2024

Validation ID: MB2308



Impact Forecast

Impact Insights & additionality

Contents

Details of the validation process

Timestamps and results:
The validation documented in this report was delivered with the following time stamps and results:

Imperfect	Validation request	First review	Feedback call	Hand-in revisions	Final review	Wrap-up call
Date	11/11/23 12h34	11/12/23 09h30	05/01/24 15h00	22/01/24 21h57	01/02/24 12h07	13/02/24 09:30
Result	Invalid, Positive and significant			Plausible, positive and significant		

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Author	Maarten Buysse
Company name	Imperfect
Project CIF lead	Moujan Mahdian, Co-Founder
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More information	www.impact-forecast.com

Introduction to CIF Validation

To determine the validity of self-assessed climate impact forecasts we provide CIF Validation, which is a third party verification of the calculation of the climate and environmental impact of an innovation, in order to conclude if the Climate Impact Forecast is valid, positive and significant.

Problem solved

There are areas of LCA expertise that can not be covered in the Climate Impact Forecast workshops or CIF Training, for example where domain knowledge and experience are required. With self-assessments there is also a risk of optimism bias. Validation assures that forecasts do not contain gaps, scoping errors, unsupported assumptions or inappropriate data sources. CIF Validations are made on the request of the project team, and possibly commissioned by an impact organisation. The results are used by teams and organisations to compare and communicate the climate impact of projects.

A validation process performed by an impartial impact expert, who has read about the innovation, seen the forecast and used a checklist to assess its validity. The validator provides detailed written feedback and offers the opportunity for a revision. The goal of this process is twofold: increase the quality of a forecast and to conclude if the forecast is suitable to draw conclusions about the positive climate impact of the innovation. This Validation report documents the results of that process.

Definitions of key terminology

Climate Impact Forecast (CIF)	A Climate Impact Forecast or CIF is an LCA based calculation of the GHG reduction or climate adaptation potential of a project. Using our CIF tool, the project team found the net climate impact of the key differences between business as usual and their innovative solution.
CIF Validation process	A review process delivered by a validator and guided by a structured check of the information entered into a CIF, a sensitivity analysis and the write-up of an Impact story. This process usually takes two weeks and includes a first review, a first feedback call between the team and validator, time for revisions if needed, a final review and a final results call.
Validator	Validations are delivered by Validators; CIF trainers with LCA expertise who are trained to perform this process in a uniform and objective way. Other than providing this service, Validators have no relationship with or obligations to the company or supporting organisation requesting the validation, assuring an impartial third party review.
Validation result	The CIF Validation result consists of three independent outcomes, which in the best case are valid, positive and significant. These qualifications and the alternative outcomes are explained on the next page.

The CIF Validation result consists of three independent outcomes

Validity of the forecast

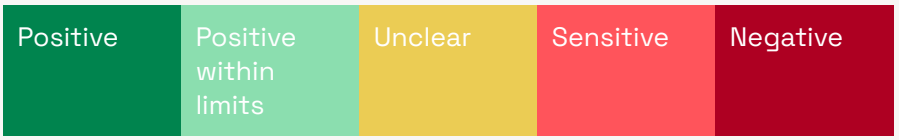
A CIF is valid if it is representative of the project, using appropriate data and well-justified assumptions. Therefore, the CIF and its results are representative of the potential for the project to mitigate, enable or adapt to climate change.

Detailed requirements for validity are specified on www.impact-forecast.com/ CIF-validations. A CIF can be:

Reduction potential

A CIF is positive when it shows that the project has a lower climate impact than business as usual, or improved climate resilience in the case of adaptation. A positive mitigation or enabler CIF file shows the avoided GHG emissions in -tCO_2eq.

This outcome depends on a sensitivity assessment. CIF results can be:



Impact threshold

A CIF is significant when the project has a climate impact (positive or negative) greater than 5 tonnes of CO_2eq per year. This is roughly the global average annual CO_2 emissions per person and the mass of a male African Elephant.

The threshold for significant impact can be set to a higher amount for a particular organisation or occasion. The result can be:

Imperfect CIF Validation

This validation consists of the following sections

Impact story	An impact story is a summary of how a project makes a positive climate impact. It is written by the validating impact expert and contains the key impact data from the Climate Impact Forecast.
Climate Impact Forecast and Validation result	The Climate Impact Forecast shows the scope and parameters of the impact calculation. This includes the resources used and saved by the innovation, their amount and climate impact, the climate impact per unit of user, and the total climate and environmental impact for all units or users in the timeframe. Validator feedback is included on strong and weak points of the forecast as a whole, as well as the conclusion from the sensitivity assessment and the approval status of individual parameters. The conclusion of the validation process is noted in the Validation result.
Sources and assumptions	The differences (resources used and reduced by the innovation, compared to the baseline solution) and quantities (of materials, energy etc.) in the forecast are based on sources and assumptions specified in this section.

Impact story

Enabling circular practices in construction projects

Imperfect has created a digital platform that enables construction projects to step away from resource intensive and waste producing practices. They offer a circular alternative that encourages the reuse of materials. Their platform acts as an online inventory and marketplace where construction companies can easily find and offer materials for reuse.

How does this make a positive climate impact? Compared to which baseline?

Imperfect contributes to a positive climate impact primarily by addressing the high resource intensity and waste generation prevalent in the construction sector. The baseline for comparison here is the conventional construction practice where new materials are consistently used for building and renovation projects, leading to high production impacts and significant waste production. In traditional construction methods, materials are often used once and then discarded, leading to a linear consumption pattern.
Imperfect is a solution that provides a direct link between reclaimed material audit and marketplace, addressing the challenge of connecting suppliers to the circular market in the building materials reuse sector. The platform offers an online inventory tool that allows construction actors to quickly catalogue and assess reusable materials, resulting in faster processes and cost savings. Imperfect's value proposition includes monitoring circularity performance, minimising waste, and maximising the benefits of materials.

The main impact is made by avoiding the production of all those new materials which include bricks, steel, wood, aluminium, glass PVC, insulation etc.. Also the avoided waste that would end up having to be collected, transported and processed is another avoided impact.

The platform enables these practices but the construction companies that joined the platform still have to decide themselves how many materials they will reuse or recycle.

How much of a climate impact, and what does the impact depend on?

For an average construction project, Imperfect is expected to have an impact of 16 118 kgCO_2eq compared to the baseline behaviour that construction projects would follow without any circular practices. For the total number of construction projects they aim to reach, this results in 404 tCO_2eq The main drivers for this positive impact are the materials that can be reused in new construction projects and therefore not need to be produced again. The impact of Aluminium is the biggest while also the avoided steel, bricks and glass are contributing well. Looking at specific construction projects, we can conclude that the impact will depend a lot on the possibilities per specific project to reuse certain materials so the impact per project can vary a lot. However, in all cases, the impact will always be positive, even when a small amount of materials will be reused.

Validity

The forecast is plausible, positive and significant. Plausible as there was one case of double counting, however this does not influence that much the final forecast. Positive as the forecast is expected to stay positive, even after correcting the double counting. Significant as the current yearly climate impact is expected to be more than 5t CO_2eq.

Co-benefits

It is important to note that reusing and recycling materials is not always more sustainable in terms of carbon footprint, compared to using newer materials. However, in terms of cradle-to-cradle and circular practices, there are clear benefits to the reuse of valuable materials.

Climate Impact Forecast and Validation result

Imperfect enables construction projects to implement circular practices including identification of materials and better waste management in construction sites via a platform that links an online inventory of reclaimed material to a costume-built marketplace. The difference in impact of Imperfect per year is calculated assuming that 900 construction projects are reached, of whom 5% are expected to change on average 66% of their current traditional non-circular practices such as use of new materials and waste management. That is equivalent to 30 fully changed users.

Validation	By: Maarten Buysse, Started: Thu Feb 01 2024 11:17:32 GMT+0100 (Central European Standard Time), Completed: Thu Feb 01 2024 12:07:00 GMT+0100 (Central European Standard Time)
Strong points	Correct scope with clear innovation, baseline etc. Assumptions and calculations are explained in detail, most categories well chosen and numbers are clearly stated.
Weak points	The baseline and innovation mentioned is not 100% in line with the calculations made e.g. what is the improvement in waste management? Is the baseline of only new materials used fully correct? There is double counting with both assuming that 1) baseline uses new materials and part of those can be replaced by reusing, 2) baseline recycles materials and part of those can be replaced by reusing. The assumptions do not have any references so hard to see if numbers are conservative or optimistic. My limited experience makes me feel that some numbers are on the optimistic side.
Sensitivity	It is clear that Imperfect will have a positive impact and changes in reuse rate of material will only influence the amount of positive impact. In any case, in all scenarios, their impact will stay positive.

per reached user	$kgCO_2eq.$	quantity per reached user	$kgCO_2eq.$ per 900 reached users
+ Electricity EU-27	0.09389 per MJ	1,08 MJ	91.26

per changed user	$kgCO_2eq.$	quantity per changed user	$kgCO_2eq.$ per 30 fully changed users
− Red Clay Brick, for housing and roads, pac	0.2776 per kg	8000 kg	-65958
− Dabema FSC/PEFC 690 (kg/m3)	0.2449 per kg	2200 kg	-16004
− Steel (21% sec = trade mix average) EU	0.9576 per kg	2500 kg	-71099
− AlMgSi0.5 (6060)	12.95 per kg	300 kg	-115341
− Ideamt2022 glass cladding and windows	1.413 per kg	2400 kg	-100695
+ Electricity EU-27	0.09389 per MJ	270 MJ	752.9
− cork slab insulation	1.083 per kg	400 kg	-12866
− PVC (Polyvinylchloride, trade mix)	2.104 per kg	900 kg	-56240
− Waste to recycling prosesses	0.09309 per kg	16700 kg	-46174

User-independent	$kgCO_2eq.$	quantity per Imperfect	$kgCO_2eq.$ per Imperfect
		0	

[The model continues on the next page]

Imperfect's total impact per year

eco-costs of human health euro	-5270
eco-costs of eco-toxicity euro	-13600
eco-costs of resource depletion	-25913
eco-costs of carbon footprint	-53795

	Carbon footprint CO_2eq.
Impact per changed user	-16118 kg
Impact of Imperfect in total	-484t

Validation ID:
MB2308

Date:
12-02-2024

Imperfect
Enabler project

Impact reduction potential	-484 tCO_2eq./year

Validity of the forecast	Plausible
Reduction potential	Positive
Impact threshold	Significant

Sources and assumptions

The differences and quantities in the forecast are based on the following sources and assumptions:

Per Reached User

The operational efficacy of our digital platform and services is contingent upon electrical energy consumption, which also extends to user access requirements.
To facilitate a comprehensive understanding of our offerings, users are anticipated to engage with our website via internet and computer usage for an average duration of two hours.

Calculation:
1 watt-hour (Wh) is equal to 0.0036 MegaJoules (MJ)
Power Consumption: 100 watts (including additional 50% for data centers and network, it becomes 150 watts)
Usage Time: 2 hours
Energy Consumption (MJ)=100W×2hrs×1.5×0.0036MJ/W\cdotphr = 1.08

Per Changed User

A. Our selection prioritizes commonly used construction materials and components that are suitable for reclamation. However, current reclamation volumes are modest relative to the overall scope of the project, due to existing challenges. For materials that are not reclaimable, our waste management strategy favors recycling over landfill disposal. This approach is simpler and accounts for a larger portion of the materials we handle.

The transportation logistics are optimized to support the inclusion of reclaimed materials and recyclables. This ensures that our process does not increase transportation demands compared to traditional practices.

B. Assuming a small project: a 5-story residential building in the EU with 200 sqm per story, totaling 1000 sqm. We estimate the average weight of one square meter of such a building to be between 400kg and 600kg. Therefore, the total weight of the building would be approximately 500 tons, or 500,000 kg.

The majority of a building's weight comprises cement and concrete (about 60%, or 300kg/sqm), which cannot be reused or repaired. Therefore, we do not consider this part at all. This leaves about 200kg/sqm. To approach reality, we assume that 30% of the material is not reusable or repairable. For the remaining 140kg/sqm, we would be conservative and keep the numbers even lower than recent studies that show on pilot projects we can reclaim 50% of the construction materials.

The detailed assumptions are as follows:

Average weight per square meter needed for a residential building:

Red Clay Brick: Approximately 80 kg/sqm. 10% reclamation rate (difficult to repair and reuse): 1000 sqm * 82 kg/sqm * 0.1 = 8000 kg

Dabema FSC/PEFC: Approximately 11 kg/sqm. 20% reclamation rate (moderately difficult to repair and reuse): 1000 sqm * 11 kg/sqm * 0.2 = 2200 kg
Steel: Approximately 25 kg/sqm. 10% reclamation rate (difficult to repair and reuse): 1000 sqm * 25 kg/sqm * 0.1 = 2500 kg
Aluminium: Approximately 1 kg/sqm. 30% reclamation rate (easier to repair and reuse): 1000 sqm * 1 kg/sqm * 0.3 = 300 kg
Ideamt2022 Glass Cladding and Windows: Approximately 12 kg/sqm. 20% circularity rate (moderately difficult to repair and reuse): 1000 sqm * 12 kg/sqm * 0.2 = 2400 kg
Cork Slab Insulation: Approximately 8 kg/sqm. 20% reclamation rate (moderately difficult to repair and reuse): 1000 sqm * 8 kg/sqm * 0.2 = 400 kg
PVC: Approximately 3 kg/sqm. 30% reclamation rate (easier to repair and reuse): 1000 sqm * 3 kg/sqm * 0.3 = 900 kg;

Total weight of the building: 500kg/sqm * 1000 = 500 Tons
Weight of the recyclable and reusable material: 140kg/sqm * 1000sqm = 140,000kg = 140 Tons
Total reclamation: 16,700 kg = 16,7 Tons
Reclamation rate over total weight: 3.4%
Reclamation rate over recyclable material: 12%

In the end, it will be 16,7 Tons fewer waste materials than need to be in the recycling process.

C. Sources are based on different studies and the hands-on experience of founders. One of the main sources is the very recent (2023) holistic research/project founded by the EU that did, FCRBE - Facilitating the circulation of reclaimed building elements in Northwestern Europe.
One of the outcomes is: Practical guides for specialised trades of the construction industry: https://vb.nweurope.eu/projects/project-search/fcrbe-facilitating-the-circulation-of-reclaimed-building-elements-in-northwestern-europe/news/practical-guides-for-specialised-trades-of-the-construction-industry/

D. Users are anticipated to engage with our website via internet and computer usage for an average duration of one hour per day.

calculation:
1 watt-hour (Wh) is equal to 0.0036 MegaJoules (MJ)
Power Consumption: 100 watts (including additional 50% for data centers and network, it becomes 150 watts)
Usage Time:1 hours
One year working days: 250 days
Energy Consumption (MJ)=100W×2hrs×1.5×250×0.0036MJ/W\cdotphr = 270

More information

For more information about this validation, and Climate Impact Forecast Validation in general, reach out to Impact Forecast.

Impact Forecast B.V.
The Netherlands
info@impact-forecast.com