

Beton Reinvented – summary in English

Concrete is responsible for 8% of annual CO2 emissions worldwide and the production of cement and concrete have been identified by the EU and the World Economic Forum as one of the hard-to-abate sectors. With that, concrete has a decarbonization challenge similar to those of the chemical, steel and aviation industries. While we cannot build without concrete, the use of current concrete is not only unsustainable but will also become more and more expensive.

In 2033 concrete is reinvented – instead of concrete as we know it today, only climate neutral and circular concrete will be used for building new infrastructure and housing. Reuse of concrete elements will be the norm rather than the exception.

We aim to achieve this by removing bottlenecks, stimulating and upscaling innovations, implementing digitization and promoting new forms of collaboration in the supply chain.

The NGF contribution is essential because the concrete sector is highly operationally oriented and has low profit margins. Therefore, it lacks sufficient R&D capacity for complex innovation projects. The concrete sector is originally conservative and fragmented, but is willing to take social responsibility for its sustainability. A necessary radical renewal cannot be realized without additional financial impulse from the NGF because it requires sector-wide cooperation and culture change.

Rijkswaterstaat, the governmental body which is responsible for the design, construction, management and maintenance of the main infrastructure facilities in the Netherlands buys and maintains 30% of all concrete used in the Netherlands. In our project, it will therefore serve as a launching customer and accelerate the use of sustainable and circular concrete with their tenders. Next to developing this proposal, the ministry of infrastructure and water also took the initiative to initiate a launching customer program in which public buyers, such as provinces, municipalities and committed to the use of sustainable and circular concrete.

Internationally operating companies in the Netherlands see the Netherlands as a testing ground because it has a better innovation climate (especially through quadruple-helix cooperation). Also, the concrete used in the Netherlands already has a lower footprint compared to other countries, because of successful incremental innovations during the past years.

The programme consists of 6 overall activities:

1. Speeding up and scaling up innovations
2. Performance-based standards and norms for new materials that can replace concrete
3. Platform for reuse of concrete materials and components
4. Improving the system for circular concrete
5. Human Capital
6. Monitoring and steering the programme

The overall planning is presented below (in Dutch, numbers correspond to the translation of activities above):

WP	Activiteiten	23	2024		2025		2026		2027		2028		2029		2030		2031		2032		2033	
		Q3/4	Q1/2	Q3/4	Q1/2	Q3/4	Q1/2	Q3/4	Q1/2	Q3/4	Q1/2	Q3/4	Q1/2	Q3/4	Q1/2	Q3/4	Q1/2	Q3/4	Q1/2	Q3/4	Q1/2	Q3/4
	Programmamanagement																					
MP	Sturen op materiaal (MIJLPAAL)																					
MP	Sturen op ketenniveau (MIJLPAAL)																					
1	Versneld (opschalen) van innovaties																					
1.1	Open Calls Use Cases																					
	Evaluatiemoment Use Case(s)																					
	Uitvoeren Use Cases																					
2	Prestatiegerichte aanpak standaarden																					
2.1	Inventarisatie																					
2.2	Roadmap + structuur																					
2.3	Ondersteuning Use Cases																					
2.4	Prestatiegerichte onderbouwing																					
2.5	Digitaal platform testgegevens																					
2.6	Publiceren en kennisdelen																					
2.7	Inbedding in regelgeving																					
3	Digitaal platform voor hergebruik																					
3.1.1	Inventarisatie behoefte stakeholders																					
3.1.2	Vraagformulatie behoeften																					
3.1.3	Keuze opzet digitale platform																					
3.2.1	Marktconsultatie digitale ecosysteem																					
3.2.2	Aanbesteding digitale ecosysteem																					
3.2.3	Opzetten marktregels digitale platform																					
3.2.4	Contractuele handreiking handel in elementen																					
4	Sturen op systeemniveau																					
4.1	Harmonisering aanbestedingseisen materiaal																					
4.2	Instrumentarium afwegingskaders ketenniveau																					
4.3	Standaarden afwegingsmethodiek en protocollen																					
4.4	Bijstellen standaarden en protocollen																					
4.5	Coördinatie en verbinding Use Cases																					
4.6	Procesinnovatie																					
5	Human capital																					
5.1	Techniek promotie																					
5.2	Kennisdisseminatie Use Cases																					
5.3	Toerusten middenkader																					
6	Monitoren en bijsturen van output																					
6.1	Uitvoeren verkenning																					
6.2	Creatieve sessies / hackatons																					
6.3	Inzet PL en deelname expert(s)																					

opstarten en inrichting organisatie, governance etc.

We achieve our goals when new, sustainable materials, concrete products and design approaches have been developed and are being applied widely in new and renovated infrastructure and buildings. In the application a balance between costs of construction, speed of construction, environmental impact and costs throughout the life cycle will be taken into account. Concrete products are designed for reuse. Existing buildings and infrastructure that cannot be maintained, will be recycled fully into new concrete materials. The sector's economic potential will be maintained due to continuous and reliable demand for sustainable concrete from clients. Far-reaching innovation, digitization and industrialisation make the sector an attractive place to work for a new generation. Dutch solutions for sustainable concrete will enable the transition abroad.

The impact of this program consists of (1) a 65% reduction of CO2 emissions in 2030 compared to 1990, representing a structural value of 180 million euros per year. In addition, it creates (2) an increase in domestic production and market share in Europe, as Dutch companies produce sustainable alternatives. This corresponds to a structural increase in Dutch earning capacity of nearly 400 million euros per year. Other benefits consist of (3) reduction of biodiversity loss due to reduced resource extraction, (4) more secure jobs and (5) an increase in labour productivity, due to increased industrialization. Finally, (6) price increases on the housing and infrastructure markets resulting from CO2 pricing are avoided, creating room for sustainable and affordable growth elsewhere.

For this program, all parties in the concrete chain have united to achieve this fundamental system change. Clients, suppliers of raw materials, concrete mortar and precast, binders and reinforcement, construction companies, demolition and recycling companies, engineering firms and knowledge institutions are involved. The new TKI Construction and Engineering (TKI Bouw en Techniek) will play a

central role in operationalizing this sector-wide program. Because of the system transition, a board, broad sounding board group and a monitoring committee are foreseen. All subsidies and public procurement contracts that will be used to implement the programme will be open to new partners.

The Ministry of Infrastructure and Water Management is ultimately responsible and therefore submits the proposal.

Partners have been selected because they have submitted project plans that aim to develop new materials and the technologies and facilities to produce them, new methods for approaching the design and construction processes, or specific reuse and recycling approaches. They cases were reviewed by the core team that wrote the proposal and have been reviewed by experts before they were accepted. Most partners have a history of innovation and have skilled staff to deliver the projects.

Cooperation will be facilitated by the TKI Bouw & Techniek (Building & Construction), a foundation that was founded by the sector for the purpose of facilitating innovation processes. Therefore, the programme will benefit from synergies and alignment with other innovation programmes in the sector.

See under 1.e. for a description of the international playing-field. Several international partners have chosen their Dutch subsidiaries to implement specific innovation projects under the umbrella of Beton Reinvented. Several partners – both industry and academic – are members of the Global Concrete and Cement Association and thus have valuable international contacts they can leverage. This will allow Beton Reinvented to stay ahead of the curve internationally and avoid duplication of other programmes.

The total financial costs of the proposal are estimated at €642.582.942. €357.245.754 will be contributed by private partners and €9.598.500 by public partners. These contributions are mostly in cash, but some of them are in-kind, for example when it comes to the time of experts contributing from both the public and the private side. These contributions are evidenced by over 70 signed letters of commitment and support to the proposal.

As a result, we request a contribution from the NGF of €275.738.688.

Financial setbacks are expected to be limited, because for a large part of the proposal (Activity one), we will make use of open calls for proposals and use a tendering approach: only the best proposals will be funded. As part of the evaluation of project proposals, the implementation plans will be assessed. However, because innovation projects have their inherent risks, progress will be carefully monitored. In the case that financial setbacks do happen, for instance when one of the partners implementing a project becomes financially unstable or cannot meet its goals, they will be limited to the one project and will not affect the outcomes of other projects under the programme.

For the other activities, a collaboration between public and private partners is foreseen. This will ensure that in the collaboration, partners collaborate regularly. If one of the partners can no longer contribute, a new partner can be sought to replace them with the help of the programme management and, if necessary, the programme board. The members of the programme board have a broad network in the sector, and can thus help to ensure continuity of collaborative projects.

Finally, as mentioned above, almost all of the financial contributions have been confirmed in writing to avoid unexpected financial setbacks.