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**Abstract title:**

The tunnel programme of the Netherlands – the second year of less hindrance and more value

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Urban tunnels

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**Abstract text:**

The COB is the Netherlands knowledge centre for underground construction and underground space. Over sixty organizations, from government, industry and knowledge institutes, work together to learn and to develop smart solutions regarding tunnels. This network developed a long-term vision on tunnels in the Netherlands. As a result, nineteen tunnels and all stakeholders participate in our tunnel programme at nine research topics.

We found common ground and the key issues are already addressed in both practice and science:

1. Risks mapped out – can we determine the scope of renovations more precisely?
2. Failure of constructions – what are the gaps in our knowledge around older constructions? We are facing major challenges in the failure of joints, the deformation of tunnels, the degradation of materials, etc.
3. Modular renovation – we believe that most of the tunnel renovation projects in the next ten years will have to be carried out while staying open for business. This makes the development of modular renovation both urgent and complicated.
4. Know your tunnel – a handbook for tunnel owners
5. Tunnels open effortlessly with the aid of a digital tunnel twin – digital instruments may of great value in the process of toward an opening permit for new and renovated tunnels.
6. Virtual testing – by performing (some) tests virtually, a tunnel could be opened quicker.
7. Virtual educate, train and practice – get and keep the tunnel safety stakeholders trained without the tunnel being physically available.
8. Closing the gap between projects and operation – how can digital information and/or system that results from the tunnel construction or renovation be of use for the tunnel owner?
9. From object-safety towards system-safety – tunnel safety is not a 'stand-alone subject'; a tunnel should be considered as part of the environment.

The way clients, science and industry work together within the **COB network** has been a major precondition to achieve these great results in such a short period of time.