

TOWARD BIO-BASED GEO- & CIVIL ENGINEERING FOR A SUSTAINABLE SOCIETY

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ABSTRACT

The since 2010 running research program 'Bio-Based Geo & Civil Engineering for a Sustainable Society (BioGeoCivil)', funded by the Dutch technology foundation STW, aims to revolutionize the manufacturing and application of materials and products used in geo and civil construction. Currently, geo and civil engineering produce vast amounts of waste, not only at the end of the life-cycle (e.g. as construction and demolition waste), but also in the beginning where the materials are designed and made. Using biological processes to design upgrades of raw materials, reduce waste production, to convert low grade waste materials to high value and sustainable resources in construction, as well as to enhance the beneficial re-use of resources in high quality applications, are major challenges that will have a profound impact on the sustainability of society. The challenge of the six projects within the BioGeoCivil program is to develop biology-based materials, technology and processes that solve engineering challenges addressing sustainable performance (in terms of resource depletion and required functionalities related to strength, permeability, climate control, air quality improvement and more), while at the same time reducing the impact on the environment compared to traditional solutions. The six projects comprise: 1. Fungal biofilms (coating) for wood protection, 2. Bacteria-based repair and performance improvements of aged concrete structures, 3. Bacteria-based ground stabilization to mitigate liquefaction and piping of granular sediments, 4. Engineering of bacterial biofilms on buildings and infrastructure as a basis for natural protection, 5. Lift up Lowlands: upgrading of natural materials (bio-remediation of sludge) for sustainable lift up of low lying polder areas, and 6. Towards the development of carbon dioxide neutral renewable cement.