

Self-Replicating Pavement Stones

(example concept)

Self-maintaining and self-regenerating pavement with (semi-)organic / bioengineered self-replicating pavement "stones", that is, some sufficiently stiff and robust organisms or colonies that on a special substrate grow to become pavement "stones" of suitable form, color, and size.

The **special substrate** required for growing the stones is sufficiently different from any naturally occurring substrate, so that the stones cannot spread anywhere outside the desired specially prepared location.

The resulting material of the stones could resemble, for example, wood or concrete or corals, depending on the particular implementation. Accordingly, during growth the stones would likely be **sequestering carbon dioxide (CO₂) from the air**. This would be beneficial in multiple ways: it reduces the amount of substrate needed for growth, and it also helps to remove the excess CO₂ from the air.

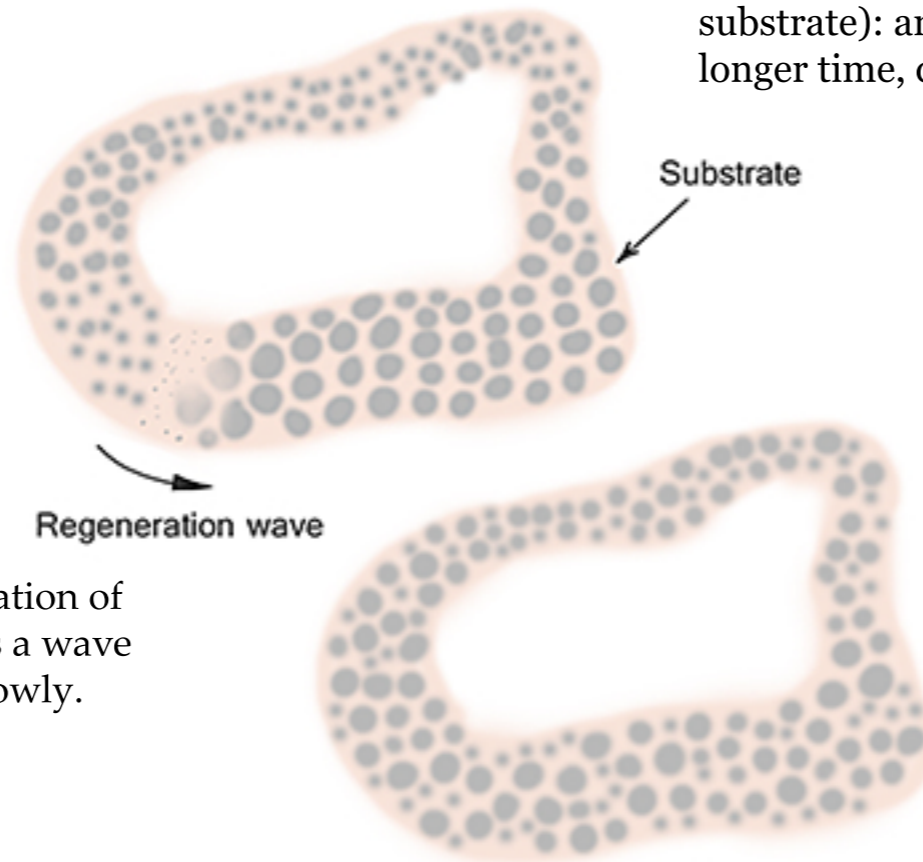
One promising way to realize self-replicating CO₂-sequestering pavement stones is to use **microbiologically induced calcium carbonate precipitation**, where certain kinds of bacteria convert the atmospheric CO₂ into solid calcium carbonate. Research and development work for using such bacteria in building materials is already ongoing in multiple research groups and companies around the world (for example TU Delft is working on self-healing concrete, bioMASON is developing a technology to 'grow' bricks, etc.).

For cases where more dynamic pavement structure with shorter component lifetimes is desired, various other bioengineering approaches can be considered. **Shorter lifetime of the stones allows making the pavement dynamically (slowly) change its coverage, location, and visual looks.**



Lifecycle of an organic / bioengineered self-replicating pavement stone (side view, a vertical cut through the substrate): an initial seed, growth, stable size for a longer time, disintegration back into substrate.

A footpath made of the self-replicating pavement stones growing on a special substrate (outside of which they cannot grow). Regeneration of the pavement occurs here as a wave circling the footpath very slowly.



Same as before, except that the new stones grow here uniformly anywhere on the footpath where some older stones have reached the end of their lifespan and left an open spot for the new ones to appear.

Such stones could also be used on various nonhorizontal and nonflat surfaces — in landscape design, in some cases possibly even on facades (with extra care for making sure that the stones stay firmly attached to the facade). **With some modifications, similar principles could be used to create three-dimensional structures, such as buildings.**