A team of researchers at Texas A&M University has developed the concept of a toolkit that would allow builders to create structures via 3-D printing using local soil as the building material. In their paper published in the journal *Frontiers in Materials*, they outline their ideas and possible ways to create such a toolkit, and describe a test project they built.

Concrete is one of the most basic ingredients used to build both large structures and walkways. Its use, however, contributes to global warming—concrete manufacture releases CO$_2$. The researchers note that prior research has shown that as much as 8% of global CO$_2$ emissions can be traced back to concrete production. They also point out that it is difficult to get rid of the concrete used in a structure or walkway once its useful life has ended. They suggest there is a better way—using local soils to create replacement building materials.

The researchers note that many ordinary soils, particularly those with high clay content, could be processed to produce a material with applications similar to concrete, i.e., that can be poured as a semi-liquid that hardens in place. They further suggest that such materials could be produced on-site using local soils and put into place using very large 3-D printers. For such scenarios to be realized, they propose the idea of a toolkit that could be used to produce concrete replacement materials using local soils. Such a toolkit would have a means for analyzing a local soil supply and then producing a recipe for a material that could be poured like concrete and harden in place.

To demonstrate their idea, they collected soil from the back yard of one of the researchers and devised a recipe for it. They then used the recipe to create a mix using the soil sample, sodium silicate and an alkaline catalyst. Next, they used the mix they created to create a small walled-structure in their lab. They acknowledge that the materials they have made thus far are best suited for nonstructural
parts of a building, such as façades, but believe they will soon be able to produce materials suitable for general use.


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