

**Table S1.** i-Messe assessment items

Environmental load	Safety impact	Socioeconomic factor
Energy consumption	Health factor of feedstock	Loss to manufacturers
Resource consumption	Disaster factor of feedstock	Loss to users
Emissions	Health factor of manuf./use	Loss to region/society
Waste use volume	Disaster factor of manuf./use	Loss to earth/ecosystem

i-Messe, impact metrics for environmental, safety, and socioeconomic.