

Table S1. The SWRL rules for calculating CO₂ emission.

Rule 1	Calculating total CO ₂ emission of SCS:	$CO_2 = CO_{2-m} + CO_{2-p} + CO_{2-t} - CO_{2-a}$
	Stabilized_Soil(?SS)^CO ₂ _Cement(?SS,?CO ₂ C)^CO ₂ _Stabilizer(?SS, ?CO ₂ S)^CO ₂ _Transportation(?SS,?CO ₂ T)^CO ₂ _Avoided_Landfilling(?SS,?CO ₂ a)^swrlb:add(?x, ?CO ₂ C, ?CO ₂ S, ?CO ₂ T)^swrlb:subtract(?total_CO ₂ , ?x,?CO ₂ a) -> Total_CO ₂ (?SS, ?total_CO ₂)	
Rule 2	Calculating CO ₂ emission of raw material production:	$CO_{2-m} = W_c \times CO_{2-mf}$
	Soil(?SS)^Weight_Cement(?SS,?WC)^swrlb:multiply(?co ₂ _Cement,?WC,735)-> CO ₂ _Cement(?SS,?co ₂ _Cement)	
Rule 3	Calculating CO ₂ emission of stabilizer preparation :	$CO_{2-p} = E_g \times CO_{2-pf} - W_s \times CO_{2uptake}$
	Stabilized_Soil(?SS)^CO ₂ _Stabilizer(?SS,?CO ₂ S)^Electricity_Grinding(?SS,?EG)^CO ₂ _uptake(?SS,?co ₂ _uptake)^Weight_Cement(?SS,?WS)^swrlb:multiply(?x,?EG,0.7769)^swrlb:multiply(?y,?WS,?co ₂ _uptake)^swrlb:subtract(?CO ₂ S,?x,?y)-> CO ₂ _Stabilizer(?SS,?CO ₂ S)	
Rule 4	Calculating CO ₂ emission of transportation:	$CO_{2-t} = \sum_{i=1}^n W_i \times D_i \times CO_{2-ti}$
	Stabilized_Soil(?SS)^CO ₂ _Transportation(?SS,?CO ₂ T)^Weight_Steel_Slag(?SS,?WS)^Weight_Cement(?SS,?WC)^Transportation_Distance(?SS,?TD)^swrlb:multiply(?x,?WC,?TD,0.162)^swrlb:multiply(?y,?WS,?TD,0.162)^swrlb:add(?CO ₂ T,?x,?y)->CO ₂ _Transportation(?SS,?CO ₂ T)	

Table S2. The SWRL rules for calculating cost.

Rule 1	Calculating the total cost of SCS:	$Cost = Cost_m + Cost_p + Cost_t - Cost_a$
	Stabilized_Soil(?SS)^Cost_Material(?SS,?CM)^Cost_Stabilizer(?SS,?CS)^Cost_Transportation(?SS,?CT)^Cost_Avoided_Landfilling(?SS,?CA)^swrlb:add(?x,?CC,?CS,?CT)^swrlb:subtract(?total_Cost,?x,?CA)->Total_Cost(?SS, ?total_Cost)	
Rule 2	Calculating the cost of raw material:	$Cost_m = \sum_{i=1}^n W_i \times Cost_{mi}$
	Stabilized_Soil(?SS)^Weight_Cement(?SS,?WC)^Weight_Steel_Slag(?SS,?WS)^swrlb:multiply(?x,?WC,67.8)^swrlb:multiply(?y,?WS,10.9)^swrlb:add(?CM,?x,?y)->Cost_Material(?SS,? CM)	
Rule 3	Calculating the cost of stabilizer preparation:	$Cost_p = E_g \times Cost_{pf}$
	Stabilized_Soil(?SS)^Electricity_Grinding(?SS,?EG)^swrlb:multiply(?x,?EG,0.145)^swrlb:multiply(? CS,?EC,?0)->Cost_Stabilizer (?SS,? CS)	
Rule 4	Calculating the cost of transportation:	$Cost_t = \sum_{i=1}^n W_i \times D_i \times Cost_{ti}$
	Stabilized_Soil(?SS)^Weight_Steel_Slag(?SS,?WS)^Weight_Cement(?SS,?WC)^Transportation_Distance(?SS,?TD)^Cost_Transportation(?SS,?CT)^swrlb:multiply(?x,?WS,?TD,0.14)^swrlb:multiply(?y,?WC,0.14)^swrlb:add(?CT,?x,?y)-> Cost_Transportation(?SS,? CT)	

Table S3. The SWRL rules for calculating the sustainability index.

$SUI_{environment} = \frac{CO_2 \times 2070.2}{UCS \times 212.35}$	
Rule 1	Calculating $SUI_{environment}$ of SCS: Stabilized_Soil(?SS)^Total_CO2(?SS,?TCO2)^UCS(?SS,?UCS)^swrlb:multiply(?x,?TCO2,2070.2)^swrlb:multiply(?y,?UCS,212.35)^swrlb:divide(?sui_En,?x, ?y)-> SUI_En(?SS,?sui_En)
$SUI_{economic} = \frac{Cost \times 2070.2}{UCS \times 20.15}$	
Rule 2	Calculating $SUI_{economic}$ of SCS: Stabilized_Soil(?SS)^Total_Cost(?SS,?TC)^UCS(?SS,?UCS)^swrlb:multiply(?x, ?TC,2070.2)^swrlb:multiply(?y,?UCS,20.15)^swrlb:divide(?sui_Ec,?x, ?y)-> SUI_Ec(?SS,?sui_Ec)

Table S4. The SQWRL rules for selecting all the information.

SQWRL	Stabilized_Soil(?SS)^Total_CO2(?SS,?total_co2)^Total_Cost(?SS, ?total_cost)^SUI_En(?SS,?sui_en)^SUI_Ec(?SS,?sui_ec)->sqwrl:select(?SS,?total_co2,?total_cost,?sui_en, ?sui_ec)
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Table S5. The SQWRL rules with sustainability index less than 1.

SQWRL	Stabilized_Soil(?SS)^Total_CO2(?SS,?total_co2)^Total_Cost(?SS, ?total_cost)^SUI_En(?SS,?sui_en)^SUI_Ec(?SS,?sui_ec)^swrlb:lessThan(?sui_en,1)^swrlb:LessThan(?sui_ec,1)->sqwrl:select(?SS, ?total_co2,?total_cost, ?sui_en, ?sui_ec)
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Table S6. The SWRL rules for calculating D_{smax} .

$D_{smax-GWP} = \frac{212.66 - (CO_2 - CO_{2-ts})}{W_s \times 0.162}$	
Rule 1	Stabilized_Soil(?SS)^Total_CO2(?SS,?TCO2)^CO2_Transportation_Steel_Slag(?SS,?CO2TS)^Weight_Steel_Slag(?SS,?WS)^Distance_Steel_Slag(?SS,?DS)->swrlb:subtract(?x,?TCO2,?CO2TS)^swrlb:subtract(?y,212.66,?x)^multiply(?z,?WS,0.162)^swrlb:divide(?DS,?y,?z)->Distance_Steel_Slag (?SS,?DS)
$D_{smax-Cost} = \frac{18.85 - (Cost - CO_{2-tc})}{W_s \times 0.14}$	
Rule2	Stabilized_Soil(?SS)^Total_Cost(?SS,?TC)^Cost_Transportation_Steel_Slag(?SS,?CTS)^Weight_Steel_Slag(?SS,?WS)^Distance_Steel_Slag(?SS,?DS)->swrlb:subtract(?x,?TC,CTS)^swrlb:subtract(?y,18.85,?x)^multiply(?z,?WS,0.14)^swrlb:divide(?DS,?y,?z)->Distance_Steel_Slag (?SS,?DS)