Biokull som klimatiltak: Verdikjeden fra råstoff til produkt

Webinar Onsdag 2 sep 2020

Scandi Energy AS

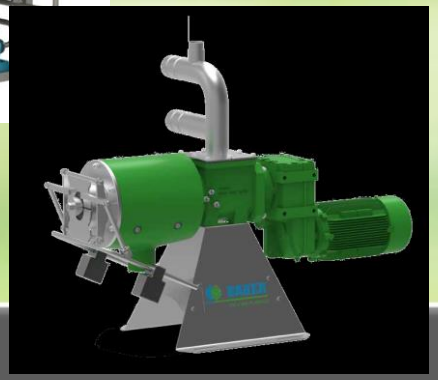
Toralf Ekelund

A Near Energy Systems based on following main technologies:

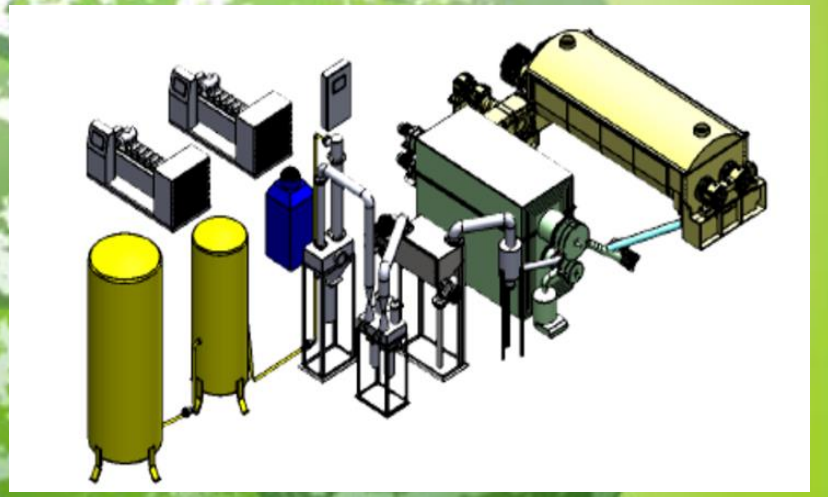
- **Scandi Vacuum Gasification : Processing dry and semi-dry organic & synthetic waste SVG – Patented and owned by Scandi Energy**
- **SSR- Scandi Slurry Reformer - Sono – Electrostatic Flocculation water treatment and nutrient recovery SSR**

Product

Wet waste – dewatering to:

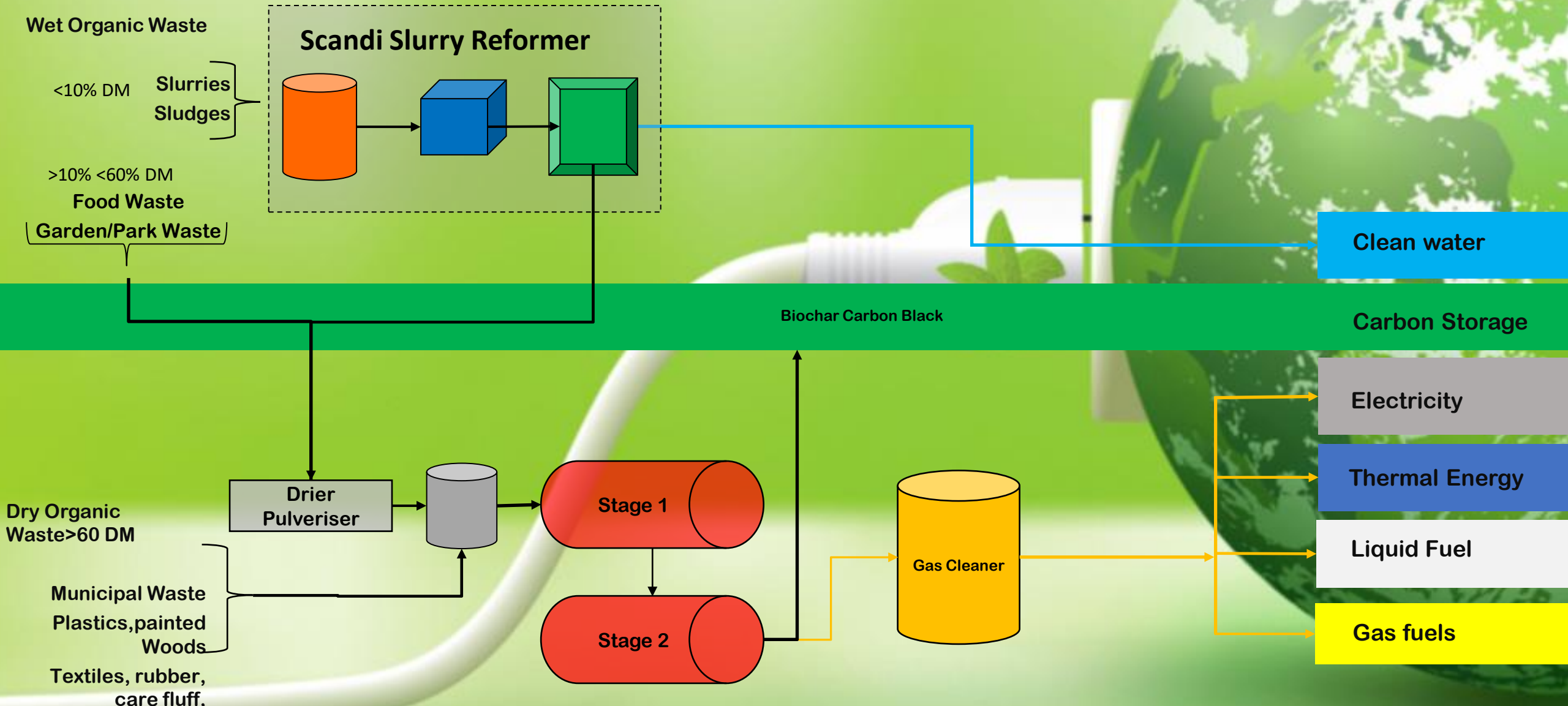


Dry waste



Scandi Slurry Reformer SSR & Scandi Vacuum Gasifier-SVG

VACUUM GASIFIER



The Scandi Energy system-”Waste to Energy” can replace the following technologies :

- **Anaerobic Digestion (Biogas):**

  processing wet organic waste
- **Incineration**
- **Sewage plant**
- **Landfill**

Status

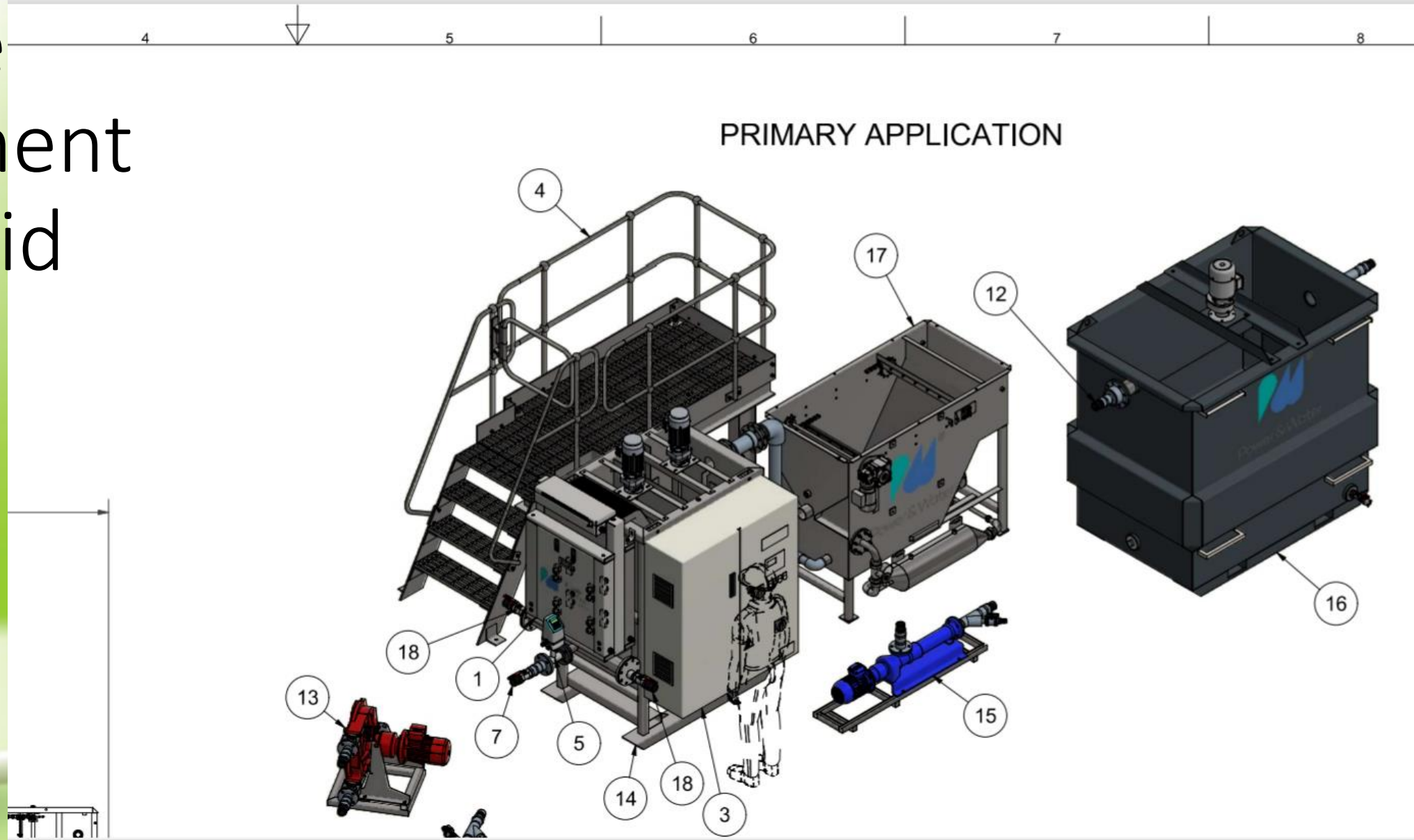
Substrat	Land	Størrelse	Status
Kommunalt avfall RDF	Fayum, Egypt	SVG Pilot 100kg/t	Levert i august
Kylling møkk	Tyrkia	SVG 700 kg/t	Under bygging
Storfe møkk	Tyrkia	SVG 700 kg/t+3500kg/t	Under bygging
Bark	Tyrkia	SVG 600kg/t	Under bygging
"End of Waste" test ulike substrater	Fredrikstad Norge	SVG 100 kg/t	Under bygging
Testrigg for slamavvanning	Norge, VEAS, Slakteri,Havbruk	SSR	Under bygging
Rundt 20 andre potensielle prosjekter i tilbuds/forhandlingsfase			

End of Waste AS

100 kg/t klar for factory test

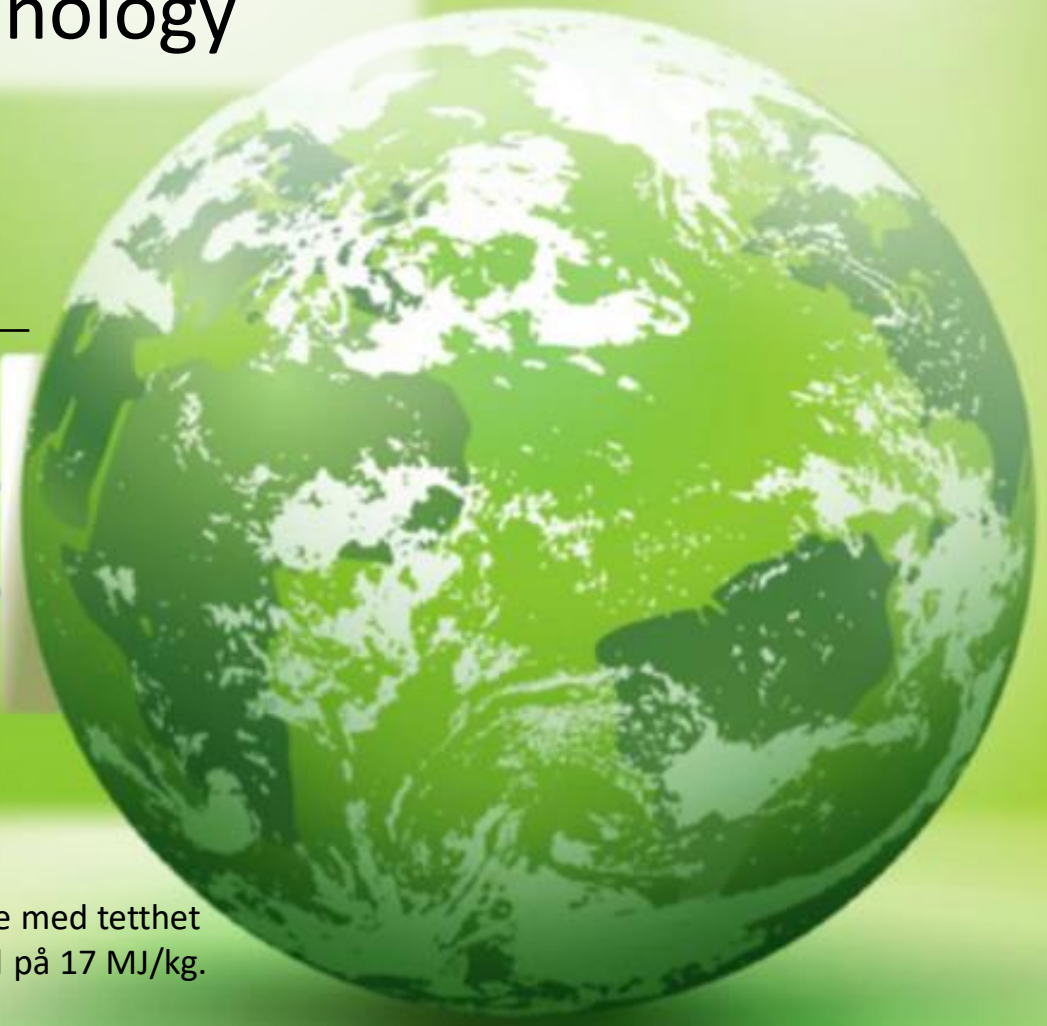
VACUUMGASIFIER

Sludge treatment test skid



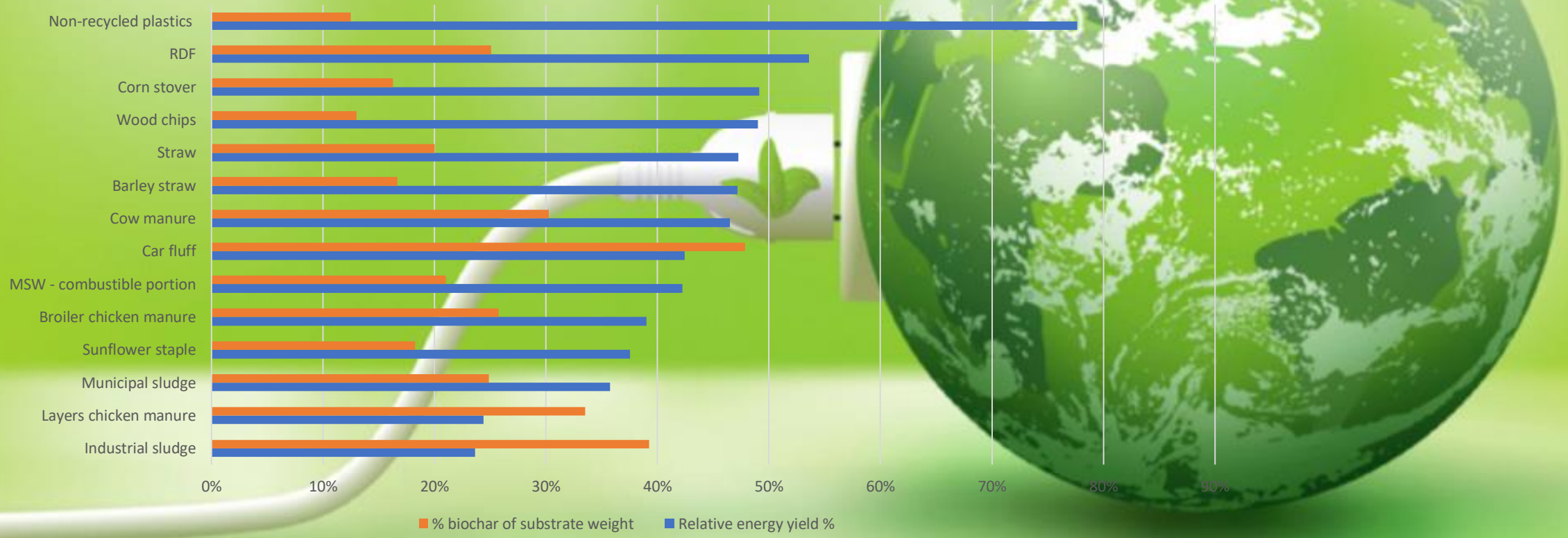
Scalable technology

Enhet	Elektrisk produksjon årlig	Termisk produksjon årlig	Biokull produksjon årlig
SVG 50 kg/t	0.35 GW	0.55 GW	56 - 150 tonn
SVG 100 kg/t	0.7 GW	1.1 GW	112 - 300 tonn
SVG 200 kg/t	1.4 GW	2.2 GW	225 - 600 tonn
SVG 1000 kg/t	7.1 GW	11.2 GW	1100 - 3000 tonn
SVG 2000 kg/t	14.3 GW	22.4 GW	2200 - 6000 tonn
SVG 4000 kg/t	28.6 GW	44.8 GW	4400 - 12000 tonn



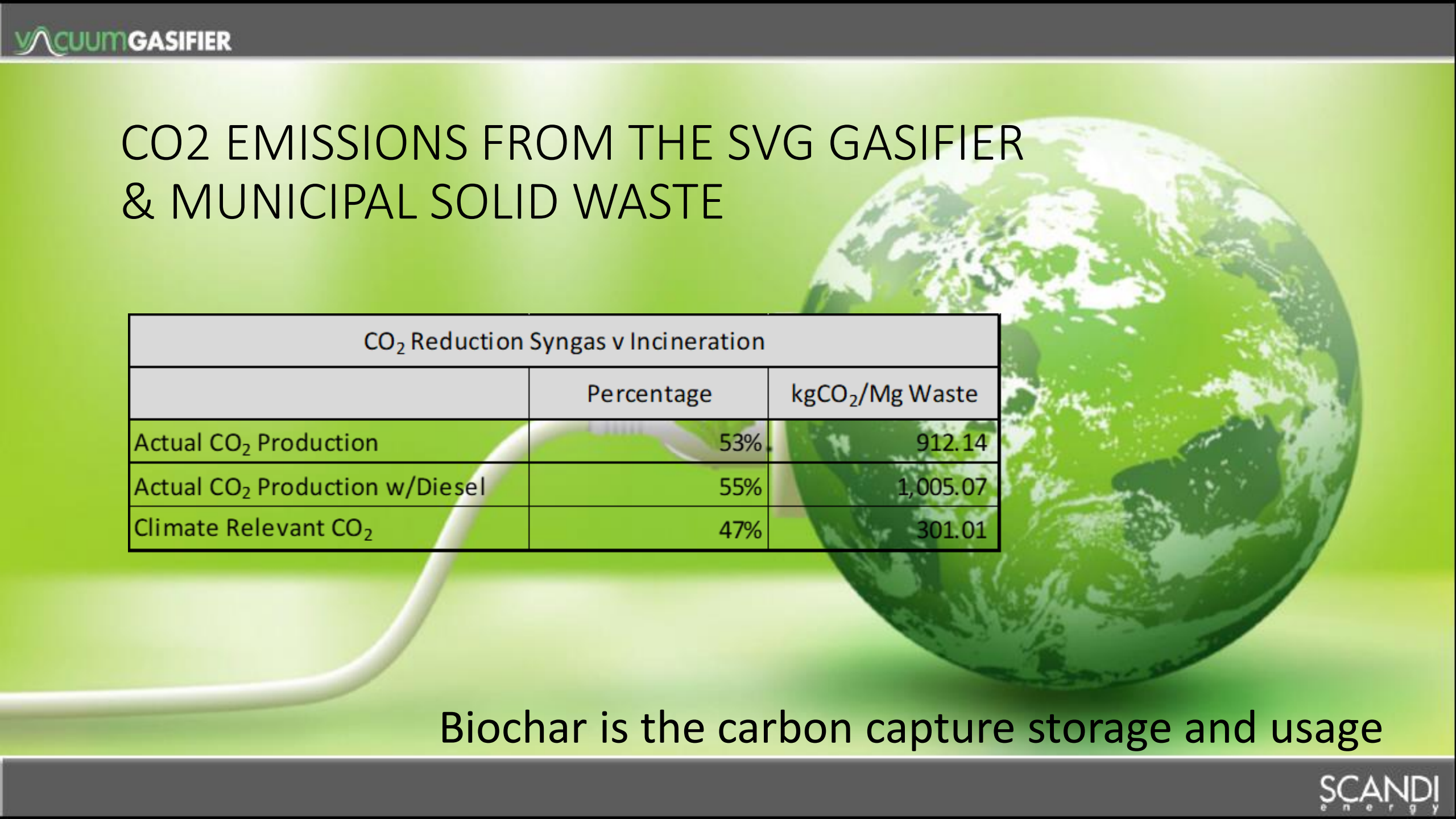
*Kriteriene i tabell: 85% tørrmasse med tetthet på 400 kg/m^3 og et energi innhold på 17 MJ/kg.

Energy yield versus biochar yield for different substrates



CO2 EMISSIONS FROM THE SVG GASIFIER & MUNICIPAL SOLID WASTE

CO_2 Reduction Syngas v Incineration		
	Percentage	$kgCO_2$/Mg Waste
Actual CO_2 Production	53%	912.14
Actual CO_2 Production w/Diesel	55%	1,005.07
Climate Relevant CO_2	47%	301.01



Biochar is the carbon capture storage and usage

Biochar compositon car fluff performed by Eurofins in Germany.

Parameter	Lab	Accr.	Method	LOQ	Unit	ar	db
Biochar properties							
Bulk density	FR	JE02	DIN 51705: 2001-06		kg/m³	647	-
Moisture	FR	JE02	DIN 51718: 2002-06	0.1	% (w/w)	1.6	-
Ash content (550°C)	FR	JE02	analog DIN 51719: 1997-07	0.1	% (w/w)	85.5	86.9
Hydrogen	FR	JE02	DIN 51732: 2014-07	0.1	% (w/w)	0.4	0.4
Carbon	FR	JE02	DIN 51732: 2014-07	0.2	% (w/w)	17.8	18.1
Total nitrogen	FR	JE02	DIN 51732: 2014-07	0.05	% (w/w)	0.37	0.37
Oxygen	FR	JE02	DIN 51733: 2016-04		% (w/w)	-6.9	-7.0
Total inorganic carbon (TIC)	FR	JE02	DIN 51726: 2004-06	0.1	% (w/w)	0.4	0.4
carbonate-CO2	FR	JE02	DIN 51726: 2004-06	0.4	% (w/w)	1.6	1.6
carbon (organic)	FR	JE02	berechnet		% (w/w)	17.4	17.7
H/C ratio (molar)	FR	JE02	berechnet			0.29	0.29
H/Corg ratio (molar)	FR	JE02	berechnet			0.29	0.30
O/C ratio (molar)	FR	JE02	berechnet			-0.291	-0.290
Sulphur (S), total	FR	JE02	DIN 51724-3: 2012-07	0.03	% (w/w)	0.35	0.36
pH in CaCl2	FR	JE02	DIN ISO 10390: 2005-12			10.5	-
Conductivity	FR		BGK III. C2: 2006-09	5	µS/cm	3410	-
salt content	FR		BGK III. C2: 2006-09	0.005	g/kg	18.4	18.7
salt content	FR		BGK III. C2: 2006-09	0.005	g/l	11.9	12.1
thermogravimetry TGA 950°C by N-Atm.	FR		TGA 701 D4C			see Annex	-

Biochar content after 550 Celcius. performed by Eurofins in Germany.

Elements from the micro wave pressure digestion acc. to DIN 22022-1							
Arsenic (As)	FR	JE02	DIN EN ISO 17294-2: 2005-02	0.8	mg/kg	-	22.8
Lead (Pb)	FR	JE02	DIN EN ISO 17294-2: 2005-02	2	mg/kg	-	1910
Cadmium (Cd)	FR	JE02	DIN EN ISO 17294-2: 2005-02	0.2	mg/kg	-	7.1
Copper (Cu)	FR	JE02	DIN EN ISO 17294-2: 2005-02	1	mg/kg	-	23600
Nickel (Ni)	FR	JE02	DIN EN ISO 17294-2: 2005-02	1	mg/kg	-	470
Mercury (Hg)	FR	JE02	DIN 22022-4: 2001-02	0.07	mg/kg	-	< 0.07
Zinc (Zn)	FR	JE02	DIN EN ISO 17294-2: 2005-02	1	mg/kg	-	20200
Chromium (Cr)	FR	JE02	DIN EN ISO 17294-2: 2005-02	1	mg/kg	-	627
Boron (B)	FR	JE02	DIN EN ISO 17294-2: 2005-02	1	mg/kg	-	1130
Manganese (Mn)	FR	JE02	DIN EN ISO 17294-2: 2005-02	1	mg/kg	-	1270
Elements fr. the borate digestion acc. to DIN 51729-1/-11 after inciner. (550°C)							
Phosphorus as P2O5	FR	JE02	DIN EN ISO 11885 (E22): 2009-09	0.1	% (w/w)	-	< 0.1
Magnesium as MgO	FR	JE02	DIN EN ISO 11885 (E22): 2009-09	0.1	% (w/w)	-	2.8
Calcium as Calciumoxid	FR	JE02	DIN EN ISO 11885 (E22): 2009-09	0.1	% (w/w)	-	7.0
Potassium as K20	FR	JE02	DIN EN ISO 11885 (E22): 2009-09	0.1	% (w/w)	-	0.8
Sodium as Na2O	FR	JE02	DIN EN ISO 11885 (E22): 2009-09	0.1	% (w/w)	-	12.4
Iron as Fe2O3	FR	JE02	DIN EN ISO 11885 (E22): 2009-09	0.1	% (w/w)	-	0.5
Silicon as SiO2	FR	JE02	DIN EN ISO 11885 (E22): 2009-09	0.1	% (w/w)	-	54.9
sulphur as SO3	FR	JE02	DIN EN ISO 11885 (E22): 2009-09	0.1	% (w/w)	-	0.4

Non contaminated organic waste	Use
	Fertilizer/soil conditioner
	Animal nutrition
	Enhancement to biogas process
	Soil cleaning
Contaminated waste	**Use**
	Asphalt
	Concrete
	Gypsum
	Heavy metal run offs from roads
	Metal production
	Water Retention
	Soil Cleaning

Biokull
i asfalt
8-10%
av bitumen.

Reduksjon i
lagt tykkelse
60%

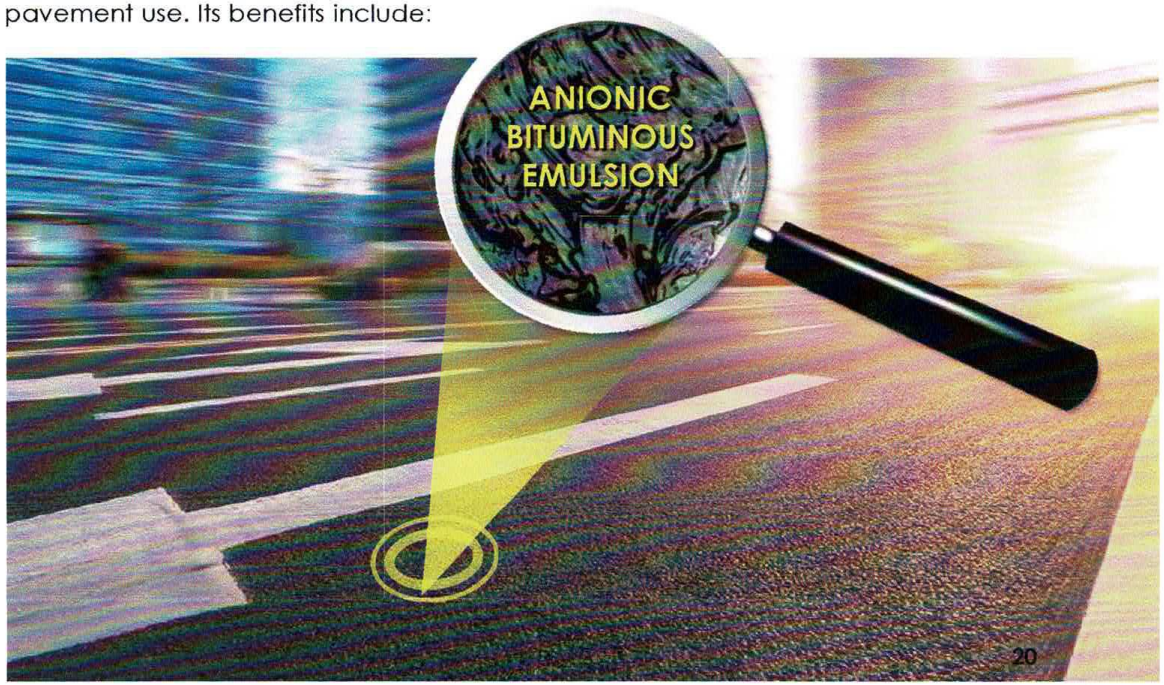
11 Cold Bio Mix Pavements THE PRODUCT

In addition to sequestrating Carbon

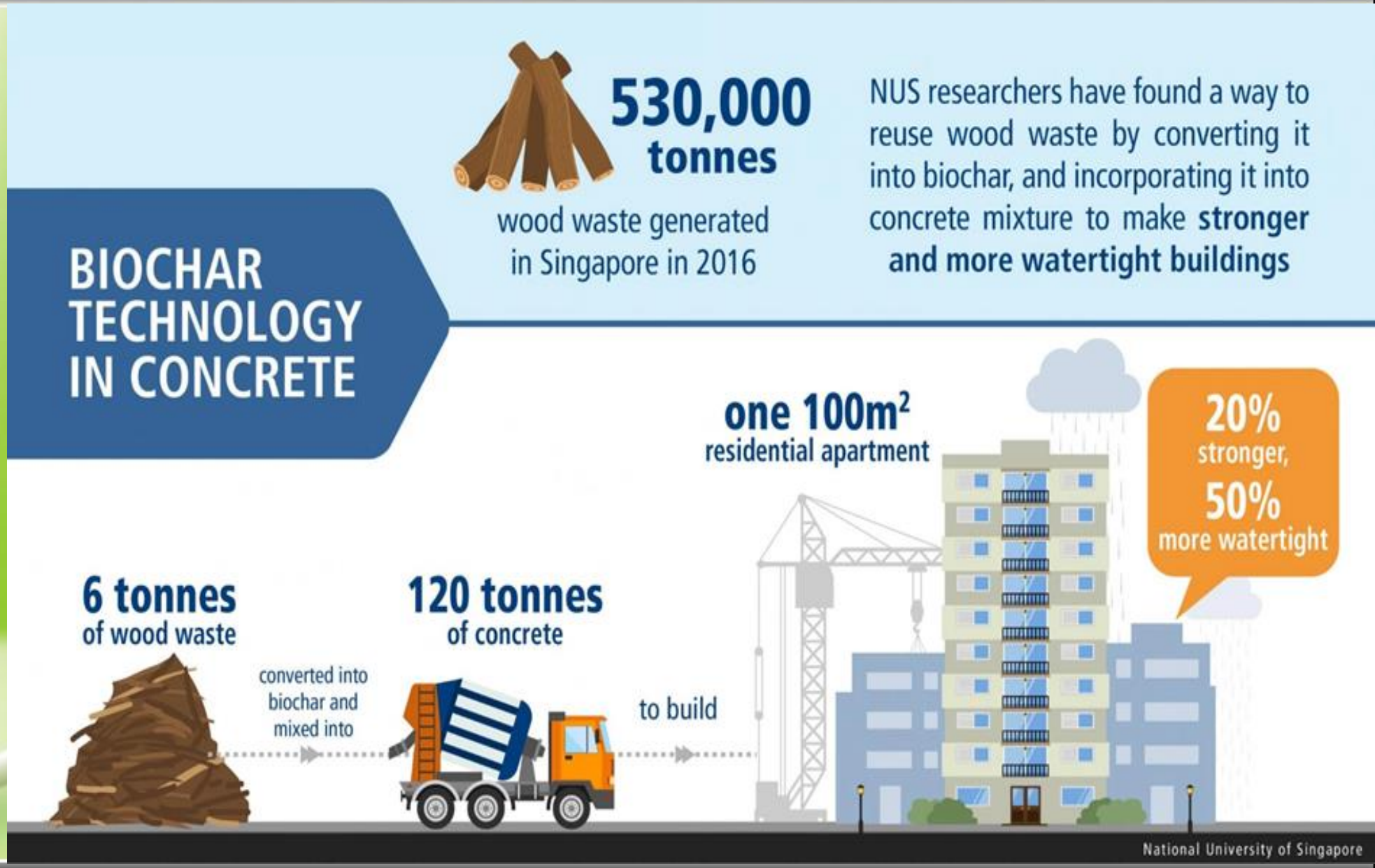
- No Cracking ✓
- No "Creeping" ✓
- No Heat ✓
- No Leaching ✓
- No Solvents ✓
- No Tack Coat ✓
- No Waste ✓

Cold Bio Mix Advantages in Summary

Uses local road aggregates, carbon-based materials and specifically formulated anionic bituminous emulsions to form a permanent solution for all pavement use. Its benefits include:



Biokull i sement



3 main obstacles for making money out of biochar

1. Immature markets, the customer need help to “get rid of” the biochar
2. High volume thresholds
3. Further need for R&D to open up for usage.