



Environmental Impact Assessment: Armagh Miniature Street Art

Summary

Owing to the high durability factor of the sculpture work, the outcomes contain very low embodied energy throughout their life cycle over a long lifetime. Recycled bronze has been used together with moulds made from abundant local materials. Most waste materials were recycled after being retrieved. This kept the total embodied energy input in the actual production process very low.

1. Distance to source of consumables	low
2. Abundance of consumable materials	high
3. Embodied Energy value (EE)	low
4. Recycled fraction of materials	high
5. Cyclicity	high
6. Production of emissions/waste	very low
7. Production of toxins in the process	very low
8. Recyclability of product/cyclicity	high/fully recyclable
9. End-of-life waste	zero if recycled
10. Total car transport	medium
11. Any other impact	none

Embodied Energy and CO₂ Emissions

The project used approximately 6,500MJ in processing and sourcing the materials. Spread over 22 sculptures, this averages 295MJ of embodied energy (EE) per item. The total CO₂ emission of the project amounts to 0.8 tons of CO₂, the majority of which accounts for travel and LPG.

Lifetime

The high permanence and life expectancy in excess of 100 years of the product material itself accounts for an excellent environmental impact/time ratio. Maintenance will not increase this ratio significantly.

Waste

More than 75% of all waste products of the process will be reused in future production. No toxic waste was produced.

Data sources

SERT, University of Bath (<http://people.bath.ac.uk/cj219/>)

Resurgence (<http://www.resurgence.org/education/carbon-calculator.html>)



HOLGER CHRISTIAN LÖNZE

SCULPTOR

Materials	Amount used	Amount retr'd	Amount Net	EE in MJ/Kg	Total in MJ	EC in kg/Kg	CO ₂ in Kg	Recycling fraction
Modelling Clay	50kg	48kg	2kg	0.50	1.00	0.023	0.05	96% recycling
Sand	50kg	45kg	5kg	0.10	0.50	0.005	0.03	90% recycling
Mould Clay (fired)	25kg	-	25kg	3.00	75.00	0.023	0.58	90% recycled as refractory
Refractory Molochite	10kg	10kg	-	5.50	0.00	0.51	0.00	100% recycled
Dung	15kg	-	15kg	0.10	1.50	0.00	0.00	Lost through burning
Wax	30kg	20kg	10kg	52.00	520.00	0.00	0.00	63% recycled
Copper	0.2kg	0.2kg	-	70.00	0.00	0.96	0.00	100% recycled
Bronze	95kg	40kg	55kg	32.68	1797.40	0.96	52.80	100% recycled source material
Water				0.20	0.00	0.00	0.00	80% rainwater
Silicon rubber	17.5kg	-	17.5kg	120.00	2100.00	4.02	70.35	moulds to be stored and reused
GPR resin	12kg	-	12kg	139.30	1671.60	5.91	70.92	moulds to be stored and reused
Hessian	3kg	1kg	2kg	33.50	67.00	1.70	3.40	Recycled source, 30% recycled again
Epoxy mortar	1.5kg	-	1.5kg	140.00	210.00	5.91	8.87	
Stainless steel fixings	1kg			56.70	0.00	6.15	0.00	
					0.00		0.00	
Total					6444.00		207.00	

Fuel/Energy	Amount used	CO ₂ in Kg	Comment
Propane LPG	55kg	82.50	1.95l/kg LPG; 1.5Kg CO ₂ /Kg of LPG
Butane LPG	4kg	6.00	1.74l/kg Butane; 1.5Kg CO ₂ /Kg of Butane
Methylated Sp.	6.5l	n/a	
Charcoal	1kg	n/a	
Electricity	120kWh	51.60	Units (kWh) x 0.43 = Kg CO ₂
Firewood	-	0.00	Units (Kg) x 1.779 = Kg CO ₂
Transport	Mileage	CO ₂ in Kg	
Diesel (MPV)	2,100mls	714.00	42 mls/gal; 0.34 Kg CO ₂ /mile
Diesel (Van)	-	0.00	0.34 Kg CO ₂ /mile
Dom. flights	-	0.00	0.56 Kg CO ₂ /mile
Total		854.10	

Toxic Material	Amount used	Comment
Copper Nitrate	100g	
Ferric Nitrate	50g	
Potas. Sulph.	0.11	

Material Values	EE in MJ/Kg	EC in kg of Co ₂ /Kg	Comment
Bronze, virgin	77.00	4.10	
Bronze, predominantly recycled	32.68	0.96	
Low grade clay or soil	0.45	0.023	
Silicon rubber	120.00	4.02	
Epoxy resin	139.30	5.91	
Flax/hessian	33.50	1.70	
Wax	52.00	n/a	
Water	0.20	-	
Molochite refractory	5.50	0.51	
Sand	0.10	0.005	
Copper from high grade scrap	17.5	0.96	
Plaster	1.80	0.12	
Clay, fired to 600°C	3.00	0.22	
Stainless steel	56.70	6.15	