ECOBRICKS

Input materials	Pre-condition/Pre-treatment	Operation & maintenance	Objectives / Key features	Key technical parameters
Suitable plastic waste: – PET (container) – Plastic film: – LDPE (e.g. plastic bags) – PP (food packaging) – PS (food containers & packaging)	Waste segregation at source Clean and dry plastic film and PET bottle	No operation and maintenance required	Very simple way to fill PET bottles with plastic films and then use as construction material. Effective way to reduce waste littering and reduce concrete or cement volume in construction.	Optimal ecobrick density: > 0.37 g/ml; Normal density: 0.33 g/ml (e.g. 600ml PET bottle: 200g ; 1500 ml PET bottle, 500 g)
Outputs / products	**Technical complexity**	**Maturity level**	**Educational aspect**	
Filler for construction (e.g. benches, small walls, chairs, tables, etc.).	No infrastructure required No skills required to do ecobricks Medium-level skills required for constructing with ecobricks	Proven globally for small-scale application (e.g. schools, small community, etc.)	**Topics:** Plastic litter reduction, consumption **Practical exercises:** Produce ecobricks with students (school + home)	

Making ecobricks is a downcycling method consisting in packing PET bottles with clean and dry non-recyclable plastics. They are a great way to mitigate the amount of plastic sent to landfill and the environment and can be used as building blocks for non-structural constructions (e.g. benches, small walls).

Soft and hard non-recyclable plastics such as bags, packaging, food containers, among others, are tightly packed in PET bottle to reach a density of 0.33 g/ml for further use in construction. The ecobricks can be stored indoors, away from heat, sun, and humidity until they are used.

Applicability: Ecobricks are aimed toward small-scale application (e.g. at communities or neighborhoods level), when appropriate solid waste management service is lacking.

Design considerations: The ecobrick should meet minimum weight requirements of 0.33 x bottle volume (i.e 600ml bottle should weigh more than 200 grams, and 1500ml bottle more than 500 grams). Experienced ecobrickers consider a density of > 0.37 g/ml as optimal [1]. Bottle selection should align with local availability. For building modules (small constructions that can be moved once, such as benches or stools), bottles

should be of similar size and shape. For outdoor building projects, size and shape matter less than volume (e.g. small bottles make sturdier walls, large bottles make good benches).

Materials needed: To produce ecobricks, a stick is needed which is a smaller diameter then the bottle opening. An indoor storage space with low humidity and sun exposure is recommended. To construct small infrastructure with ecobricks, water and locally available earth/soil, clay and sand are needed. Once soil and clay are mixed together, they should achieve a non-crumbly texture referred to as "cob". Rice straw, coconut fiber or other organic source can be used as binder. Cement can also be used as construction material and binder.

Technical operation & maintenance: It is important to clean and dry the plastic used as bottle filling, as dirty plastic and moisture inside an ecobrick lead to microbiological growth and methane formation. Pushing of the plastic filling into the bottle must be done carefully in order to not break bottle walls. For efficient packing, the bottle is filled halfway and the filling pressed using the stick. The same is repeated for the second half of the bottle. A 1-2 cm between the plastic filling and the cap should be left to avoid overpressure. The bottle then needs to be closed with the cap.

It is recommended to protect ecobricks with a cloth or tarp during storage as PET attracts dust and chemicals. Horizontal stacking slightly above floor level with ends pointed outwards enables efficient brick categorization and prevents rats from chewing the ecobricks.

It is recommended to not leave the ecobrick caps exposed on walls facing the outdoors as the HDPE plastic of the cap degrades quickly with even small amounts of sun exposure. When filling around the ecobricks with cob, it can be helpful to lay small stones between the bottles to take up space and minimize the use of cob.

Health and Safety: The ecobricks should always meet the minimum density/weight requirements; if not, they are a potential fire hazard.

Costs: As ecobricks can be made out of plastic waste and construction with locally available material, the cost associated with it is very low.

Social, legal, and environmental considerations: Ecobricks should be closed correctly as their plastic filling can leach chemicals when exposed to sunlight, which can cause immediate damage to the soil and ultimately leach into water bodies [2].

Strengths and weaknesses:

- ⊕ Inexpensive
- ⊕ Effective way of mitigating release of macro and microplastics into the environment
- ⊕ Low technical know-how needed
- ⊕ Use locally available resources
- ⊕ Easy to get students and households involved in making ecobricks
- ⊕ Easy to link with education purposes
- ⊖ Downcycling option (no further recycling possible)

> References and further reading

1. Alliance, G.E., 10 step guide to making eco-bricks. 2020.
2. Duarte, L. and C. Barajas, Is the use of filled PET bottles as a building blocks a safe practice. Journal of Solid Waste Technology and Management, 2016. 42: p. 930-934.

Wasteaid, Making Waste Work: A toolkit – How to turn mixed plastic waste and bottles into ecobricks. 2017

www.ecobrickexchange.org

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