

INTRODUCTION TO THE CONCEPT OF URBAN MINING

The passage from a linear to a circular approach characterises waste management strategies in last decades.

The linear traditional approach is based on the extraction of raw materials, production, use, wasting and landfilling (Figure 1, Dotted line).

The circular approach primarily arises from the increasing need for primary raw material, as a consequence of the global economic development. Attention is currently then moving from the limited and fixed stocks of raw materials to the increasing anthropogenic stocks of materials. This creates the base for the development of the Urban Mining concept.

Urban Mining activities operate in this context, representing actions and technologies finalized towards the recovery of secondary raw materials and energy from products of the urban catabolism (Baccini, Brunner, 2012). Urban Mining therefore provides a systematic management of anthropogenic resources stocks (products and buildings) and waste, in the view of long term environmental protection, resource conservation and economic benefits.

An illustrative example is given by Waste from Electrical and Electronic Equipment (WEEE). Due to their short economic life, the amount of this waste stream is continuously increasing. Currently, their growth can be estimated as being three times faster than the average growth of municipal solid waste. Given that gold concentration in electric and electronic scraps is considerably higher than the amount of gold in gold mines, recovery of gold from WEEE may potentially become result in a more ecologically compatible mining activity.

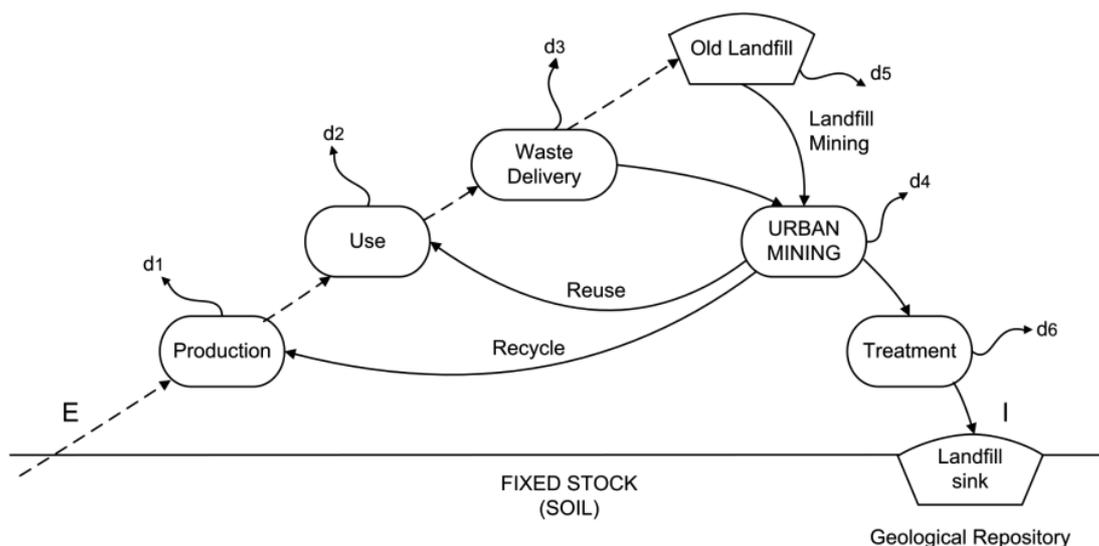


Figure 1. Role of Urban Mining in materials life cycle

Table 1 summarises, according to different experiences, a far from exhaustive list of urban resources which has been considered so far been considered for recovering recovering secondary raw materials.

The Urban Mining principle, for a better understanding of his role and potential, should be considered in the framework of the general matter cycle, including emission control strategies and final materials sink, as described by the scheme in Figure 1.

A mass balance can then be written:

$$E = \Delta R + \Delta L + \Sigma d_i + I \quad (1)$$

where:

E: extracted raw material;

ΔR : recycled and reused material (secondary raw materials);

ΔL : recovered material from landfill mining (secondary raw materials);

d_i : diffuse mass emissions/loss associated to the specific steps and processes;

I: immobilized material.

The diffuse emissions should be carefully controlled and minimised as they are the cause for the progressive deterioration of the global environmental quality.

How to achieve this (control and minimisation) can be better analysed by rearranging equation (1):

$$\Sigma d_i = E - \Delta R - \Delta L - I \quad (2)$$

In view of controlling emissions, it is thus clear that it is necessary to minimize raw material extraction and to maximize recovery, recycling and reuse of secondary raw materials through urban mining processes and mining of old landfills and to increase the immobilisation of materials in final sinks/geological repositories (Cossu, 2012).

Consequently, recovery, reuse and any material mining activity should be increasingly planned and accomplished with due care and attention to alternative LCA options for emissions minimization, avoiding any demagogical or ideological issues related to the need of treatment and final disposal of the unavoidable waste.

In view of controlling the economic sustainability of the Urban Mining system and to promote greater attention to the quality of goods in the production phase, increased technical and economic responsibility should be transferred from the Consumer (as is the case of today) to the Producer, according to the scheme described in Figure 2. Reuse and minimisation should be maximised stimulating and promoting with incentives the related markets, by adopting the most appropriate regulations and actions.

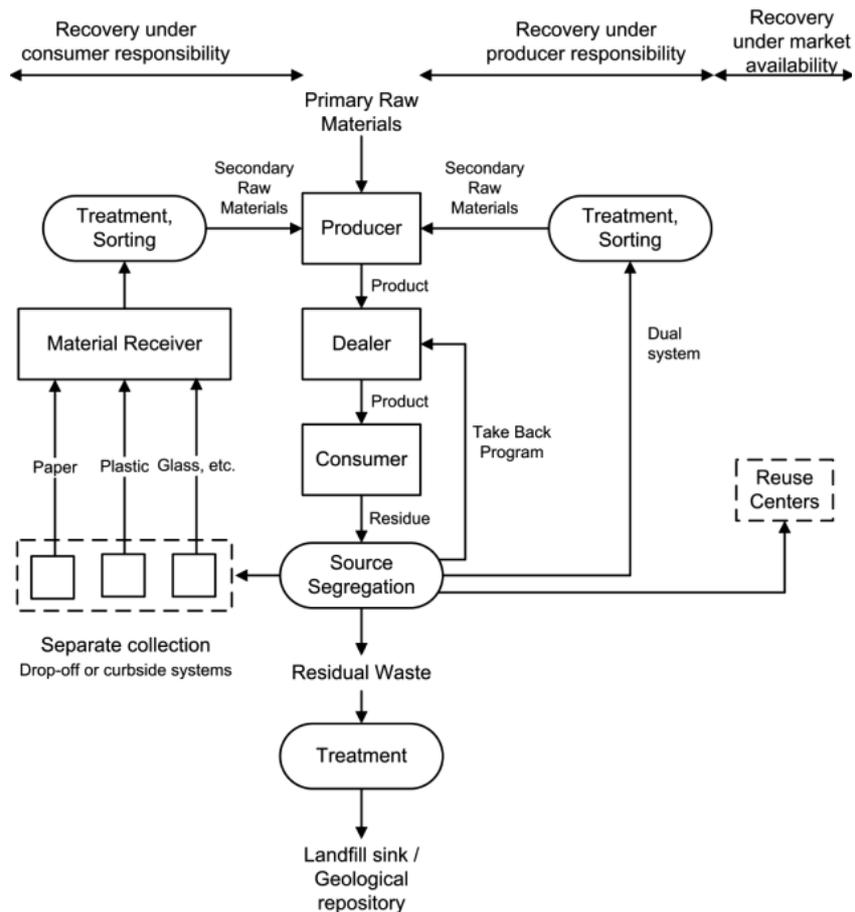


Figure 2. Different scheme for the management of resources in the urban material flow

The aim of the monograph is to offer a selection of the most significant papers on the topic presented during the events organized or promoted by IWWG (Sardinia, Venice, Crete, ICLRS Symposia), in particular the Symposium on Urban Mining (SUM), organised jointly with the Regional Government of the Lombardia Region, in Bergamo, Italy.

The focus is placed on the recovery of materials rather than on energy production from waste and biomass.

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REFERENCES

- Baccini P., P.H. Brunner (2012) *Metabolism of the Anthroposphere - Analysis, Evaluation, Design*. The MIT Press, Massachusetts Institute of Technology, Cambridge ISBN 978-0-262-01665-0
- Cossu R. (2012) *The environmentally sustainable geological repository: The modern role of landfilling*. *Waste Management*, vol.32, 243–244