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Editorial

The Urban Mining concept

The transition from a linear to a circular approach has characterised waste management strategies over recent decades.

The traditional linear approach is based on the extraction of raw materials, production, use, wasting and landfilling (Fig. 1, dotted line). In other words, there are no options for the raw materials except to be used and then discarded. However, with the constantly expanding populations, there is a shortage of raw materials to continue to support this linear path. The circular approach primarily arises from this increasing need for raw materials. Attention is currently 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 (Stallone, 2011).

Urban Mining activities are undertaken in this context, comprising actions and technologies designed for the recovery of materials and energy from products of the urban catabolism (Baccini and Brunner, 2012). Therefore, Urban Mining provides a systematic management of anthropogenic resources stocks and waste (products and buildings), 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 on a continual increase. Given that gold concentration in electric and electronic scraps could be considerably higher than the amount of gold in gold mines, recovery of gold from WEEE may potentially result in a more ecologically compatible mining activity.

However, these concepts are not limited to WEEE as they can be applied to several of the traditional fractions of MSW, which are usually considered in source segregation programmes (plastics, paper, cardboard, glass containers, cans, putrescibles, etc.). These and other waste materials can be considered as Urban Mining resources. Among these we may include: End of life vehicles, scraped tires, construction and demolition waste, combustion residues, food waste, road sweeping waste, water treatment sludges, exhausted oils, old landfilled waste, residues from food industries, incineration slags, as well as other industrial wastes. These materials can alternatively be used for obtaining different kind of products, such as secondary raw materials, building materials, fuel and biofuel, composites and soil fertilisers.

To provide a better understanding of its role and potential the Urban Mining principle, for a better understanding of his role and potential, should be considered in the framework of the general material cycle, including emission control strategies and final materials sink, as described by Fig. 1.

A mass balance can then be written:

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

where E is the extracted raw material, ΔR is the recycled and reused material (secondary raw materials), ΔL is the recovered material from landfill mining (secondary raw materials), d_i is the diffuse mass emissions/loss associated to the specific steps and processes, and I is the immobilised material.

The diffuse emissions should be carefully controlled and minimised being the cause underlying the progressive deterioration of the global environmental quality.

The path to achieve this (control and minimisation) can be better analysed by rearranging the Eq. (1):

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

In view of controlling emissions, it is thus clear that it is necessary to minimise raw material extraction and to maximise recovery, recycling and reuse of secondary raw materials through

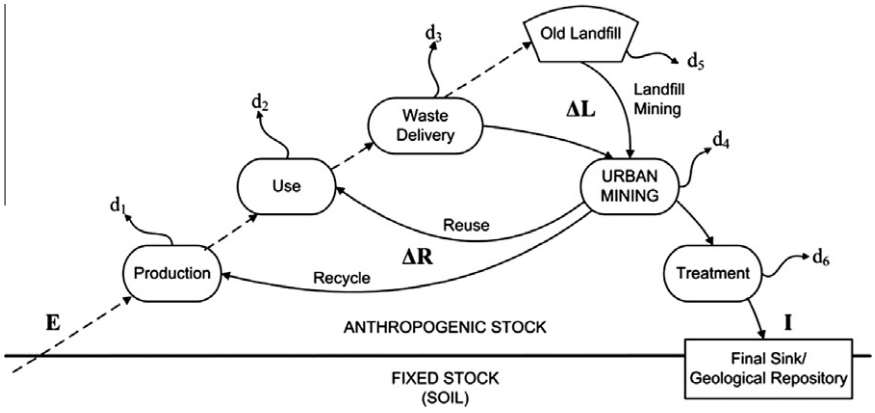

Fig. 1. Role of Urban Mining in materials life cycle (Cossu et al., 2012).

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Urban Mining processes and mining of old landfills, and to increase the immobilisation of materials in final sinks/geological repositories (Cossu, 2012).

Consequently, any material recovery, reuse and mining activity should be planned with due attention to life cycle analysis (LCA) options for emissions minimization, while avoiding any demagogical or ideological issues related to the need of treatment and final disposal of the unavoidable waste.

Likewise to promote the economic sustainability of the Urban Mining system and to focus greater attention on the quality of goods in the production phase, increased technical and economic responsibility should be transferred from the Consumer (as is often the case today) to the Producer. Reuse and minimisation should be maximised by stimulating and incentivizing the related markets and by adopting the most appropriate regulations and actions.

Acknowledgments

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References

Baccini, P., Brunner, P.H., 2012. Metabolism of the Anthroposphere – Analysis, Evaluation, Design 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 32, 243–244.

Cossu, R., Salieri, V., Bisinella, V. (Eds.), 2012. Urban Mining – A Global Cycle Approach to Resource Recovery from Solid Waste. CISA Publisher, ISBN 9-788862-650014.

Stallone, R., 2011. What is Urban Mining? <http://jessestallone.com/2011/04/20/what-is-urban-mining> (accessed April 2012).

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Note on this Special Issue

In order to promote the application of the Urban Mining concept and exchange experiences in the field, an International Symposium on Urban Mining (SUM) has been organised by IWWG-International Waste Working Group and GITISA , the Italian Association of Scholars of Environmental Engineering. The first edition of SUM was held in Bergamo (Italy) in May 2012 with the second one planned for May 2014.

The present special issue on Urban Mining was launched with a dedicated Call for papers. It includes regularly submitted manuscripts, selected papers from the above mentioned Symposium and contributions originating from the activity of the GITISA Group of Networking on Urban mining, chaired by the Editors of this Special issue.

Thirty-two manuscripts have been selected among 100 considered (submissions, proceedings, etc.). The selected contributions involve authors from 22 different countries (Canada, China, Greece, Hong Kong, Germany, The Netherlands, Italy, Malaysia, Iran, France, Japan, Brazil, Spain, Sweden, Romania, Pakistan, Turkey, Korea, UK, USA, Switzerland, Greece), showing how hot the topic is worldwide. The Special Issue analyses preliminarily some Urban Mining concepts and discusses the separate collection outcomes for different collection units. Then individual Urban Mining sources among different waste flows are considered, such as biomass, waste paper, polymers, combustion residues, landfill mined waste, C&D, scrap tyres, spent batteries, WEEE, kitchen waste and food waste. A huge variety of materials for a huge variety of useful products! We hope the readers will appreciate our efforts!

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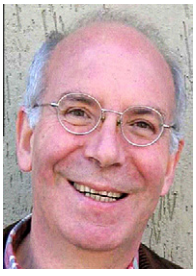
Giuseppe Bonifazi, Full Professor of Raw Material Beneficiation at the University of Rome "La Sapienza", Italy, addressed his main scientific activity to the mineral sector and secondary raw materials (e.g. products and/or materials at the end of their life cycle). His field of investigation involves: the study and set up of methodologies for the characterisation of primary and secondary raw materials and the modelling of their textural and structural attributes to optimize processing and recovery; the analysis and the application of mathematical-numerical methodologies to study and model industrial processes; the utilization of innovative optical-electronic techniques to perform a full control of the characteristics and quality attributes of the different products fed to a material processing plant or resulting from beneficiation actions; the study and set up of procedures for the morphological and the morphometrical characterisation of particulate solids and fine particles.



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