Opinion of the European Economic and Social Committee on ‘The processing and exploitation, for economic and environmental purposes, of industrial and mining waste deposits in the European Union’ (own-initiative opinion)
(2012/C 24/03)

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On 20 January 2011 the European Economic and Social Committee, acting under Article 29(2) of its Rules of Procedure, decided to draw up an own-initiative opinion on

The processing and exploitation, for economic and environmental purposes, of industrial and mining waste deposits in the European Union.

The Consultative Commission on Industrial Change, which was responsible for preparing the Committee’s work on the subject, adopted its opinion on 27 September 2011.

At its 475th plenary session, held on 26 and 27 October 2011 (meeting of 26 October), the European Economic and Social Committee adopted the following opinion by 61 votes in favour with 5 abstentions.

1. Conclusions and recommendations

1.1 The main aim of processing industrial and mining waste is to avoid disposal. Challenges such as environmental pollution, health hazards and land aesthetics must be addressed responsibly and as a matter of urgency. Today, no country can afford not to take into consideration the recycling potential of waste produced after the use of primary raw materials. Simply abandoning these wastes without additional treatment because it is cheaper is no longer an option, when we are aware of the cost to the environment, human health and society.

1.2 Processing these types of waste for economic purposes can improve the environment, landscape, employment and the social conditions for the communities concerned. By eliminating the risk of pollution for people and the environment, living conditions in these regions would improve, resulting in win-win situations. This is the reason why the beneficial use of these wastes should be considered part of a sustainable development strategy and as a compensatory measure for the affected local communities.

1.3 The role of civil society, the social partners, professionals involved in the mining, metallurgical and energy industries, academia, equipment manufacturers, transportation and trade associations, is crucial to better inform the public and raise awareness about the environmental, economic and social advantages of processing the huge quantities of waste, which were or are produced by the mining and metallurgical industry and from coal-fired power plants.

1.4 Local authorities can play a key role in this issue by encouraging open civic dialogue at regional level, to identify solutions for environmental protection, waste processing and for rebuilding a base for sustainable industrial development. For this purpose is necessary to set up a network of public, private or Public Private Partnership projects, to share the responsibility for future investments, infrastructure and environmental protection.

1.5 The European Union and the Member States should develop innovative tools and policies for approaching the issue of industrial and mining waste in the most efficient and sustainable way, based on research, statistics and scientific facts. Also, it is important to reach a better understanding, through an appropriate consultation process with the relevant stakeholders, of the existing legal, political, administrative and social obstacles to processing these wastes.

1.6 Therefore the EESC points to the need to develop effective policies in the area of industrial and mining waste deposits in the framework of Europe 2020, which in an overall approach explicitly links sustainable industrial policy with innovative processes, resource efficiency and improved access to raw materials.

1.7 Any new extractive waste treatment process should be accompanied by information about the physical and chemical characteristics of the waste in order to make sufficient data available to authorities and companies who are to start potential reprocessing activities or environmental protection programmes.

1.8 Current political initiatives for ensuring the security of supply of raw materials should increase the financial support of EU and Member States for the research and development of technologies which process mining and industrial waste and recover valuable minerals and metals. One of the priorities should be the development of technologies which enable the recovery of critical materials and of those that may be damaging to human health and the environment.
1.9 In the context of the Europe 2020 Strategy, organised civil society considers it time to assess the results achieved by the Directive 2006/21/EC and is ready to put forward comments and suggestions for the improvement of its implementation and to promote initiatives for the beneficial use of the mining waste.

1.10 The proposal to improve recycling and reduce waste produced by the rock mining, quarrying and metallurgical industries can be summarised as follows:

— Modifying the legal status of the by-product as a co-product with the same properties as the primary product.

— Explicitly permitting the processing of by-products with specific treatment performed in the primary facility or in dedicated systems designed to give the co-product the characteristics required for use.

— Promoting the marketing of the co-product by means of facilitating transport and utilisation.

— Tax incentives for consumers who use the co-products.

1.11 EU-related institutions should provide increased information on the impact of thermal power plant wastes on the environment and human health and also on the beneficial uses of coal combustion products (CCPs). R&D is needed to improve applications in which the CCPs might be used, as well as for emerging technologies and general ash management and disposal.

1.12 The EU should set up and finance projects for the beneficial reuse of coal combustion by-products, thereby contributing to sustainable development by recycling these wastes and keeping them out of landfills, thus reducing the need to extract new raw materials, and conserving energy and water resources.

1.13 A survey should be set up at European level to garner more information about fly ash, bottom ash, boiler slag, flue gas desulphurisation (FGD) gypsum, FGD wet and dry scrubber materials as well as fluidised bed combustion (FBC) ash. EU coal-fired power plants should be invited to volunteer data for the survey. An inventory of existing products and the potential applications of CCPs must also be set up and constantly updated.

2. Overview

2.1 The Thematic Strategy on Waste Prevention and Recycling adopted in 2005 in the context of the implementation of the 6th Environmental Action Programme, now followed by a new Commission Communication (COM 2011(13)) assessing to what extent the objectives of the Strategy were met or not, proposes new actions to reinforce the strategy’s implementation.

2.2 The industrial and mining waste issue is of major concern to European citizens and organised civil society. The industrial future of Europe will depend, to a degree, on how we tackle this. Currently, a significant number of industrial projects run the risk of remaining deadlocked due to opposition from local communities and civil society organisations worried about the impact of industrial and mining activities on public health and the environment.

2.3 Unfortunately, in many cases, civil society’s concerns result from a lack of information and transparency and it is therefore necessary to ensure a full and correct implementation of the Environmental Impact Assessment in order to ensure a correct information and the participation of the civil society.

2.4 Industrial and mining waste still represents a challenge for a great number of Member States where industrial plants and mining facilities were, or still are, in place. These waste deposits can be a threat or an opportunity for local communities. They become a threat when simply abandoned and where measures are not taken to reduce the risk to the environment, but in some cases they can also present an opportunity, when the waste dumped could give rise to activities involving the recovery of metal or other useful secondary raw materials.

2.5 In some cases, the metal concentration in mining waste can be equal to or even greater than the concentration of metal in ore. The same applies to metallurgical industry waste: recovery technologies have evolved and there is now an opportunity to reassess the potential of waste resulting from old industrial activities and to make this domain environmentally sound.

2.6 In many cases, the local authorities have to deal with the industrial and mining waste issue due to the fact that the tailings or waste dump areas are located in their jurisdiction. Therefore, solutions can be found at this level for transforming the ‘challenge’ into an opportunity by encouraging private initiative, public-private and administrative partnerships to set up Industrial Parks for complete use of the waste, by combining horizontal and vertical approaches in the processing industry, construction and infrastructure.

2.7 In this opinion, we will focus on three categories of waste that can be found in considerable quantities in Europe (billions of cubic meters) and in which European Union and Member States legislators have expressed a special interest:

— Mining waste (or ‘extractive waste’ as defined in Directive 2006/21/EC resulting from the exploration, extraction and processing activities for coal or non-energy minerals – hundreds of millions of tonnes from existing or former mining areas have been or are still stored without treatment,
in varying proximity to local communities. (*) Closed and abandoned mining waste facilities can become a serious danger for the environment and local communities.

— **Metallurgical industry waste**, mainly consisting of slag, sludge and dust. The waste from non-ferrous metallurgy for instance can have a high heavy metal content that can have a potentially negative impact on the environment if it is not properly treated.

— **Wastes from thermal power plants**. Slag and ash from power plants represent a large proportion of wastes especially in countries where the thermal power industry uses large quantities of low quality coal.

2.8 In all these cases, the waste storing areas, if not properly managed, can make the local communities' surroundings very unpleasant and render unserviceable large tracts of land that could otherwise bring economic, social and environmental benefits to those communities.

3. **Policy and legal framework for promoting the processing of the industrial and mining waste deposits**

3.1 The EU 2020 Strategy, EU’s industrial policy (2), EU’s strategy for resource efficiency (3), EU’s strategy on raw materials (4), the Thematic Strategy on Waste Prevention and Recycling (5), and the EU’s strategy on innovation (6) promote:

— the sustainable growth of Europe through an economy that is resource-efficient, greener and more competitive;

— technologies and production methods that reduce the use of natural resources, and increase investments in the EU’s existing natural assets;

— the full application of the waste hierarchy based on prevention first followed by preparation for re-use and recycling, then energy recovery and in last resort waste disposal;

— the review of regulations to support the transition of service and manufacturing sectors to greater resource efficiency, including more effective recycling and promoting the commercialisation and take-up of key enabling technologies;

— the investment in extractive industries by setting up land-use planning policies for minerals that comprise a digital geological data base and a transparent methodology for identifying mineral resources, while also encouraging recycling and waste reduction;

— a European Innovation Partnership to accelerate research, development and market deployment of innovations.

3.2 The First European Directive on waste management has been in force since the 1970s. In 1991 the European Waste Catalogue (EWC) was established by Directive 91/156/EC which was followed by Directive 91/689/EC on hazardous waste. In 2008 Directive 2008/98/EC was issued which is particularly relevant to our opinion because its Article 4.1 introduced a more precise definition of the waste management hierarchy: (a) prevention; (b) preparing for re-use; (c) recycling; (d) other recovery, e.g. energy recovery; and (e) disposal. (*)

3.3 Directive 2006/12/EC and Decision No 1600/2002/EC set out that:

— For wastes that are still generated, the level of their hazardousness should be reduced to the lowest possible degree of risk.

— Preference should be given to waste prevention and to recycling.

— The quantity of waste for disposal should be minimised and be safely disposed of.

— The waste intended for disposal should be treated as closely as possible to the place of its generation in so far as this does not lead to a decrease in the efficiency of waste treatment operations.


— Intends to prevent adverse possible effects of the mining waste from existing and new mines on public health and the environment.

— Includes an obligation for the operator to draw up a waste management plan which must be in accordance with the waste hierarchy – knowledge first, then prevention followed by re-use, then recycling and finally disposal.

— Includes the obligation for Member States to establish an inventory of the closed and abandoned mining waste facilities which causes or could cause damages to the environment and public health by 2012 (8).

(*) As for example, according to the Ministry of Economy, Trade and the Business Environment, in Romania there are 77 mine tailings with a volume of 340 million cubic meters, covering a surface of 1 700 ha, and 675 mine waste dumps with a volume of 3,1 billion cubic meters, covering 9 300 ha.

(3) COM(2011) 25.
(4) Last report COM(2011) 13

(7) There is no provision, however, regarding the need ‘to reduce the harmfulness in the waste’ once it has been accepted or is already in the landfill.

(8) A guidance document on the establishment of the inventories has recently been published to support the Member States in this task.
4. **Mining waste treatment**

4.1 Legislative proposals to date have called upon Member States to establish by May 2012 an inventory of closed and abandoned extractive waste facilities sites having a potential impact on human health or on the environment and to make this inventory public.

4.2 In 2004, the EU's Pecomines study (9) and its case study report on using remote sensing (10) established a preliminary assessment of a number of sites in the wake of the accession of the first Eastern European countries. However, the study did not conduct any analysis of the physical or chemical stability of the sites.

4.3 No Europe-wide database exists to date on the location and the physical and chemical characteristics of mine waste and other industrial deposits. Member States, such as Spain, for example, have already developed national plans for managing waste from extractive industries on the basis of relevant statistical data about the number and volume of registered abandoned and existing waste dumps, dams and ponds (11).

4.4 Some Member States have developed and applied methods to assess the safety of old tailings dams and waste dumps and have established the priority actions required to prevent major pollution (e.g. the Slovakian Environment Ministry). However, no comprehensive assessment has been carried out with regard to the assessment of the current economic viability of reprocessing mining waste. Whether or not the reprocessing is economically viable depends largely on the market price of the minerals being targeted. Such assessments should be carried out by the Member States to identify possible win-win situations.

4.5 Access to these waste deposits and tailings would be a question of national mineral planning policies and land-use planning policies, all of which fall under the subsidiarity principle and have to be handled by each Member State individually but respecting EU legislation on Impact Assessment, Mining Waste and Water Framework.

4.6 The EU's raw materials strategy proposes a long-term analysis of mineral demand which could provide a basis for the economic prioritisation of the reprocessing of old tailings and waste facilities.

4.7 Redeveloping waste facilities and tailings with or without an economic incentive can provide: employment, an improved environment, and better social and living conditions for the communities concerned; in particular improved landscapes and an eliminated pollution risk.

4.8 The treatment of closed and abandoned mining waste facilities should be governed by a number of considerations:

- The treatment of closed and abandoned mining waste facilities representing a risk for safety, health or which may pollute the environment or represent an economic value in the current economic climate should be prioritised with regard to speedy and careful issuing of permits; liability issues arising from previous operators should be resolved in order to encourage investment (12).

- The treatment of closed and abandoned mining waste facilities representing a risk for safety, health or which may pollute the environment and which does not have any economic value may require public funding (13).

- The reprocessing of closed and abandoned mining waste facilities which does not present a risk to safety, health and which does not pollute the environment, but has an economic value should be made available and liability issues arising from previous operators should be resolved in order to encourage investment.

4.9 **Technology** for reworking and rehabilitating old over-burdened waste repositories is partly available, but would require some new research. The European Innovation Partnership on Raw Materials could provide a vehicle to stimulate research in this area and possibly provide funding for a pilot project. This expertise could become world class and be used in Europe and worldwide (e.g. technologies applied in eastern Germany after reunification). Research into further technologies and techniques could potentially be a field in which the European industry excels.

4.10 The BAT (Best Available Techniques) document on the management of waste from the mining industry refers only very briefly to using BAT for waste segregation to allow for better future reprocessing of tailings and other wastes.

4.11 **The European Structural Funds** play a critical role and already provide substantial investments in research and innovation. Some EUR 86 bn has been programmed for the current financing period (2007-13). Much of these funds is still unspent and should be used more effectively for innovation and achieving the Europe 2020 objectives.
4.12 EU Structural Funds have already been used in the past in occasional cases where the development of new regional infrastructure could be combined with the clean-up and redevelopment of old industrial and mining regions. The most successful initiatives combine the reprocessing of old tailings and waste dumps with a new mine which - in most cases - improves economic viability due to economies of scale.

4.13 Until now, only a small amount of EU funding has been spent on the processing and exploitation, for economic and environmental purposes, of mining waste deposits in the EU. However, some European initiatives and projects as the European Technology Platform on Sustainable Mineral Resources, the EU ProMine Project and EuroGeoSource, have the financial support of the European Commission and it is expected that these projects will provide contributions on innovative technologies, mineral intelligence and mining waste data base.


5.1 The concept of industrial discharges has not substantially evolved over time, in the sense that the philosophy of ‘what is not a product is a waste’ remained unchanged. However, driven by recent environmental (‘Zero Waste’) policies and economic issues related to shortages of raw materials, the concept of the ‘product’ of an industrial activity might need to be revised substantially.

5.2 Today, complex industrial activities are aiming at obtaining many ‘co-products’ rather than generating a single product (14). For example blast furnace slag in cement production is now used as an important component of many mixes for cement (15).

5.3 The European legislation currently in force requires that a process must have, in addition to the product, only by-products and not co-products. This means that a by-product, if it is not processed in the main cycle, is considered as a reject that may be reused and is subject to all regulations on waste.

5.4 In reality this is not a problem of definition of the term (by-product or co-product can be considered equivalent). The problem is related to the limitations that the law now requires for the by-product. Under Article 5 of Directive 2008/98/EC, a by-product has to meet four requirements: (a) further use of the substance or object is certain; (b) the substance or object can be used directly without any further processing other than normal industrial practice; (c) the substance or object is produced as an integral part of production process; and (d) further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

5.5 The metallurgical industry waste disposed of in landfill may carry a variety of harmful substances such as heavy metals, including in the form of compounds, which were of no use in achieving the ‘product’. Also, these substances (16), if disposed of in landfill, often require preliminary treatment on the basis of Directive 2006/12/EC.

5.6 The challenge of considering a secondary product as a co-product allows treatment and/or processing to be carried out in the main plant itself (as now) or in dedicated systems designed to transform the co-product into a new product to be launched on the market with no restrictions other than to declare the co-product. Currently this is only possible for companies and facilities authorised to process waste on the basis of Directive 2006/12/EC.

5.7 The primary benefit for the environment is a reduction in damage to the soil and landscape. For example, it might be estimated that every one million tonnes of steel slag (the slag from carbon steel can be inertised) requires a bulk landfill volume of about 900 000 m$^3$ and it would save the same volume of inert excavation for aggregates (17). A second benefit, after inertisation for reuse, concerns the reduction of emissions (dust and metal leaching) into the environment.

5.8 From a social and economic point of view, the activities related to the treatment and recycling of metallurgical industry waste are innovative activities that require, in addition to direct labour, R & D activities to minimise the environmental impact and reduce costs. In this field an interesting study was performed in the UK in 2010, in which the employer skills needed for the collection, management and treatment of municipal and industrial waste were identified (18).

6. Wastes from thermal power plants. Beneficial use of Coal Combustion Products

6.1 Coal is an important resource which nature provides in large amounts. In 2008, total global hard coal production was 579 Mt and total global brown coal production was 965 Mt (19). Coal provides 27 % of global primary energy needs and generates 41 % of the world’s electricity. The importance of coal to electricity production worldwide is set to continue.

(14) In fact, this concept is nothing new. It transfers to the industrial sector a concept common in agriculture in which organic waste is redistributed in the soil as fertiliser or used as fuel.

(15) The European cement standard EN 197-1 in fact contains nine types of cement in the list of components. ‘Blast furnace slag’ is used in quantities of between 6 % and 93 % by weight.

(16) E.g. EAF dusts (EU 27 estimate from carbon steel production of over 1.2 Mt) contain iron (10-40 %) but also zinc (21-40 %), lead (up to 10 %), and cadmium + copper (up to 0.7 %). Slag (EU 27 estimate from carbon steel production - BOF and EAF - 27 Mt) can contain steel droplets (up to 10 %) as well as oxides of iron (10-30 %), manganese (3-9 %) and chromium (1-5 %).

(17) It is estimated that the 27 Mt of waste produced in EU 27 must correspond in volume to a 20 m high pile occupying an area twice the size of Milan every year.

(18) http://www.viridor.co.uk/news/recycling-waste-industry-labour-market-investigation-published/

with coal fuelling 44% of global electricity in 2030. At current production levels, proven coal reserves are estimated to last 119 years (20).

6.2 After burning coal for producing electricity and heat, huge quantities of waste remain which present a great concern and a challenge for the communities in the EU and globally where these types of wastes are produced and disposed of. Companies and research institutions from countries such as the US, Germany and the UK, have, since 1945, been identifying beneficial uses for these wastes which have been classified as Coal Combustion Products (CCPs). The main CCPs are: Fly Ash, Bottom Ash, Boiler Slag, Fluidised Bed Combustion (FBC) Ash, Semi Dry Absorption Product, Flue Gas Desulphurisation (FGD) Gypsum.

6.3 The American Coal Ash Association (ACAA) was established in 1968 in the US as a trade organisation aiming to reuse waste from coal-fired power plants. This association’s task was to advance the management and use of coal combustion products in ways which are environmentally responsible, technically sound, commercially competitive and supportive of the global community (21).

6.4 The ACAA calculated that in the US the production of CCPs rose from around 25 Mt in 1966 to about 135 Mt in 2008, and the beneficial use of CCPs over the same period rose from 5 Mt to about 55 Mt.

6.5 In 2007, the European Coal Combustion Products Association (ECOBA) (22) estimated total production of Coal Combustion Products in the EU to be more than 100 million tonnes annually in the EU 27 and 61 million tonnes in the EU 15 of which 68.3% was fly ash, 17.7% FGD gypsum, 9.4% bottom ash, 2.4% boiler slag, 1.5% FBC ash and 0.7% SDA products.

6.6 Worldwide but also in Europe, the potential users of CCP based products are not properly informed about the properties and advantages of using these new materials and products. Until now, the US industry has been the biggest producer and consumer of CCPs followed by a few European countries such as Germany and the UK. This situation is changing and nations such as China and India will become leaders in the production and consumption of CCPs (23).

6.7 Environmental benefits resulting from the beneficial use of coal-fired power plant wastes:

— Improved quality of the environment around coal-fired plants

— Saving of natural resources

— Reduced energy demand and greenhouse gas emissions

— Saving on disposal space.

6.8 Existing applications for Coal Combustion Products:

— Cement and concrete production. Fly ash is a binder in concrete (24)

— Solidification and stabilisation of hazardous wastes

— Use of bottom ash in asphalt mixtures for road construction

— Use of FGD Gypsum in agriculture

— Extraction of cenospheres or metals. Cenospheres can be used for lightweight concrete, structural materials, the synthesis of ultra-light composite materials. Applications in the automobile industry, aviation, tyres, paints and coatings, flooring, cabling, piping, construction and domestic appliances

— Protection of soil and reclamation of abandoned mines

— Bottom ash is used in the production of bricks and Clay Face Brick. Fly ash bricks do not require kilning and can incorporate a high percentage of recycled materials

— Recovery of Germanium from the coal fly ash

— Developing new paints and other environmental applications. The paints produced by using CCPs are resistant to water, acid and organic solvents

— Timber substitute products

— The use of fly ash in wastewater treatment, for heavy metals as Cd or Ni

— Research for turning toxic fly ash into automotive metal foams.

(20) World Coal Association.

(21) According to the ACAA’s website, the association also produces research, reports, surveys, industry documents and expertise in recycling coal ash, boiler slag or flue gas desulphurisation materials. Japan also has a relevant organisation: the Centre for Coal Ash Utilisation.

(22) ECOBA was founded in 1990 and today represents over 86% of CCP production in the EU 27.

(23) E.g. in India, it is expected that the country’s energy demand will be around 260 000 MW in 2020 of which around 70% will be generated from coal. 273 Mt of CCPs will be produced by coal-fired power plants.

(24) According to the ACAA, more than half of the concrete produced in the US is blended with fly ash.
6.9 Large volumes of fly ash in Europe go to landfill or are used for low-value applications with some exceptions (e.g. the Netherlands and Germany). This is due to ash quality in the EU which is not always suitable for high-value applications but also due to a lack of information and promotion of the beneficial use of CCPs in various applications. In future, the quality of fly ash is expected to improve due to the environmental requirements with which coal-fired power plants must comply and the efforts of the industry to burn coal efficiently and in an environmentally friendly manner.

6.10 More studies and research are needed to understand the factors which influence the utilisation of CCPs. The smart use of these products should be a goal and to this end innovative economic, management and logistic solutions are needed in addition to a performance-based fly ash classification system and R&D programs to improve the process of transformation of CCPs into new innovative materials and for enhancing existing knowledge on the fly ash cenospheres’ composition, morphology and structure.

6.11 The legal definition of CCPs as waste causes obstacles which discourage the beneficial use of the coal-fired plant wastes. The existing classification is a harmonised list of wastes which can be reviewed on the basis of new knowledge and research results. CCPs which are not subject to waste legislation can then be subject to the REACH regulation.

Brussels, 26 October 2011.

The President
of the European Economic and Social Committee
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