IMPaCT
Integrated Modular Plant and Containerised Tools for Selective, Low-impact Mining of Small High-grade Deposits

Deliverable D5.2
Policy briefing document

Due date of deliverable: 29/02/2020
Actual submission date: 28/02/2020

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Summary
This policy brief synthesizes the messages and policy insights concerning social responsibility in small-scale mining, derived from the findings of the IMP@CT project. It presents the results of evaluations of potential social impacts based on case studies and consultations with experts.
Keywords: Mining, small-scale mining, social impacts, communities, social acceptance, SLO, sustainability.

Document Information

Lead participant: UEF University of Eastern Finland
Type: Report
Dissemination level: CO Public

Work packages

| 5 | Environmental and Social Sustainability |

Tasks:

| 5.3 | Policy and regulation advancement |

Revision history

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This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement nº. 730411

Start date: 01/12/2016  Duration: 42 Months
POLICY BRIEF

Policy agenda towards socially responsible small-scale mining in Europe

IMP@CT Policy Brief No.1
19/2/2020

This policy brief synthesizes the messages and policy insights concerning social responsibility in small-scale mining, derived from the findings of the IMP@CT project. It presents the results of evaluations of potential social impacts based on case studies and consultations with experts.

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About IMP@CT

The IMP@CT project aims to develop a new mining paradigm around mining of small-scale complex deposits. Today, the exploitation of small deposits could be economically viable in Europe but it requires new business and technology solutions. The IMP@CT project has studied whether these new developments can be technologically and socially viable using responsible mining practice. This policy brief considers whether small-scale mining can provide the means for minimizing the negative impacts of mining activities on the environment and the surrounding society. IMP@CT has tested small-scale mining and conducted social surveys in Bosnia and Herzegovina and in Serbia.

Context: The need for small-scale mining in Europe

The production and availability of minerals, especially the critical and strategic metals, has received increased attention from the European Union during the recent decade, with policies, supporting action programmes and stakeholder partnerships established. In 2011, the Commission first introduced the list of Critical Raw Materials (CRMs), which has twice been extended and updated. The 2017 list consists of 27 CRMs that are important for the EU economy and at risk of supply shortage. The Raw Materials Initiative, introduced in 2008, set a framework for a more reliable and secure access to raw materials, promoting effective policy dialogue with resource-rich countries and consideration of European mining activities. In this light, three main possibilities for increasing production of raw materials in Europe were identified: mining operations at greater depths, mining of non-conventional surface deposits and mining of small deposits (SIP, 2013).

Due to high exploration and infrastructure costs and lack of appropriate technologies, mining of small deposits in Europe was not generally perceived economically viable. However, the
smaller-scale deposits are included in exhaustive databases, such as ProMine¹ and Minerals4EU² and according to recent findings in IMP@CT (Bertrand 2019), there seems to be geological potential for small deposit mining in Europe. Figure 1 illustrates an extraction from the ProMine database using search criteria appropriate to high-grade, small tonnage ore deposits of zinc and lead-zinc in Europe, which could be amenable to small-scale mining.

Figure 1. Map of Europe showing the widespread occurrence of zinc and lead-zinc deposits that meet the geological criteria for small-scale mining; data from the Bureau de Recherches Géologiques et Minières (BRGM), a partner in IMP@CT (reproduced from IMP@CT deliverable D2.1).

The Horizon 2020 IMP@CT project sets out to investigate operational and technology models for small-scale mining in Europe. The development of social acceptance, i.e. social licence to operate (SLO), is paramount in the European context: unlocking the potential of small deposits

¹ http://promine.gtk.fi/
² http://minerals4eu.brgm-rec.fr/

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to develop small-scale mining requires critical consideration of environmental and social sustainability. Thus, there is a strong need to identify social impacts of small-scale mining and to consider responsible solutions for resilience in small-scale mining communities.

Redefining small-scale mining

The concept of small-scale mining (SSM) has started to enter policy discussions relating to the development of the European mining industry. However, the term “small-scale mining” (SSM) allows for some definitional ambiguities. A shared understanding of the concept SSM between industry actors and different stakeholders is important in the European context, but also more widely.

Traditionally, the term “small-scale mining” has been used to refer to “artisanal and small-scale mining” (ASM) activities, which predominantly occurs in developing countries. ASM is characterized by labour-intensiveness, small capital investments and use of less developed technologies. The new concept of small-scale mining (SSM) developed in the IMP@CT project differs significantly from ASM as well as conventional mining activities at larger scales.

In the IMP@CT project, modern small-scale mining is defined as mining operations with the following features:

Modern small-scale mining can be understood as low-impact, potentially short-term, small-footprint, regulated mining operations for extraction using technologies that are usually not labor-intensive. The approach is suitable for, but not limited to, small high-grade ore deposits.

- Exploration of, and extraction from, small but high-grade or complex deposits.
- Small-scale operations in larger deposits with small economic margins, where “SOSO” ("switch on – switch off") mining operations are active only when global market prices are favourable.

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- Shorter duration of mining due to the small mineral reserve or economic market conditions.
- Mainly underground operations, with selective mining and backfill options
- Adoption of small-scale modular technology, which has the flexibility to be rapidly deployed on different ore deposits.
- Use of advanced extraction and processing technologies.
- A good degree of automation and employment of small, but trained workforces.
- Significantly smaller infrastructure than large-scale mining.
- Depending on technology, the small-scale has the potential to be eco-efficient with minimal use of energy, land, water and chemicals for processing.
- Economic costs are moderate for starting and closing the production, minimizing the required investment.

**European responsibility and social acceptance agenda for small-scale mining**

Important concepts in the development of modern mining relate to sustainability, responsibility and social acceptance. Mining has a long history of causing negative environmental and social impacts, and problematic management of local community relations. These policy failures have impacted negatively on public acceptance of mining around the world.

It has often been argued that the future of mining in Europe is dependent on how the industry can respond to the requirements of ecological and social sustainability. The European Union has, in its “Strategic Implementation Plan (SIP) For the European Innovation Partnership on Raw Materials” (2013), recognized public awareness, acceptance and trust as one of the main action areas for improving the framework for regional production of raw materials. When considering the potential for development of small-scale mining in Europe, it is essential to explore the social and environmental impacts of SSM and the level of their management. Identification and
Effective management of social and environmental aspects are key to responsible and acceptable mining activities.

The extent and nature of the social and environmental impacts of mining varies from one mining project to another, depending on what is being mined, what technology is used for extraction and processing, the affected ecosystems and communities in the area.

Social impacts of mining can be categorized according to the following dimensions: employment, socio-economic welfare, housing, impacts and risks to living environment, health and security, land use changes, impacts for other livelihoods and business, changes in local identity, and changes in local governance. Based on the social surveys in Bosnia & Herzegovina and Serbia, the following SSM social impacts were identified.

**Employment:** Impacts on employment are one of the key positive social and economic impacts, which profoundly influences local acceptance of mining, especially in regions with limited sources of income. The IMP@CT project identified that SSM can offer less employment than traditional mining. This is both because of smaller sizes of mining projects and potential mobility of work forces, deployed with mining solutions into a mine site. These attributes can affect all the phases of mine activity from start-up to closure.

For regions with small population and high unemployment rates, the opportunities provided by SSM can be significant, even when the number of employees is modest. Possibilities for local employment also depend on the professional capacity of the community and prior experience of mining. Local employment can be strengthened through training and education of locals and by emphasizing local service procurement and sub-contracting when possible. It is likewise noteworthy that, if SSM mining operations are conducted as SOSO activities, local community members employed in mining face the challenges of unpredictable employment and unemployment periods according to whether mining is active or whether mines are under care and maintenance.
**Socio-economic welfare:** Importantly, mining will increase socio-economic welfare in the local area through salaries, possible local taxes, royalties or other revenues. IMP@CT case studies in Bosnia and Serbia suggest that, depending on the socio-economic situation of the mining community, SSM can provide attractive salaries in local communities. The challenge might arise that, while benefitting those employed in SSM, SSM can promote a widening socio-economic gap between population groups in low-income regions.

In addition to salaries, other key contributions of mining to local socio-economic development are through infrastructure development and corporate funding for community development. Large-scale operations frequently provide local communities with development of roads and, depending on the context and the needs of the mine, even housing and schools. With SSM, the scale of the impacts on local infrastructure development is likely to be more limited. In remote areas with a legacy of mining with associated community development, SSM activities may be unable to realize community expectations in terms of infrastructure and service provision.

SSM is unlikely to be the main contributor to the local economy due to the small size of operations. However, it has potential to act firstly as an additional industry for economic development in underdeveloped regions, thereby avoiding the challenges of reliance on a single industry. Secondly, SSM has the potential to act as a catalyst for the development and diversification of additional industries by shared use of infrastructure to mutual benefit.

**Housing:** Mining typically causes extensive changes in local demographics. The relatively small workforce of SSM may reduce many of the negative side-effects related to in-migration, including increased prices of housing and limited availability due to sudden increase in demand. However, SSM activities do require some specialist or non-specialist external workers for whom housing needs to be arranged. Particularly in small communities, availability of short-term housing can constitute a challenge. SSM can be also considered as an activity to prevent migration from the local area but, as a potentially short-term activity, it may not be able to meet this expectation as it is unable to provide long-term employment.
Impacts in ecology and living environment: Even with the most advanced technologies and smaller size of deposits, mining always entails environmental risks. Overall, the impacts of SSM on the environment are expected to be smaller than those of larger operations because of significantly smaller infrastructure and more limited use of water, chemicals and tailing ponds. Certainly, environmental impacts such as noise, vibration, dust and changes in local landscape are present to some extent in all operations. These may create greater tension for SSM, where the limited footprint of activities facilitates their location proximal to populated areas. Impacts on water and air are more case-specific. The context- and mine-specific features, such as what is being mined, location of the mine in relation to other livelihoods and methods of extraction and processing shape the impacts of SSM on the living environment. A significant caveat for SSM is that more aggressive chemical dosing may be used in operations that do not operate on the economies of scale, with large processing plants and extensive reprocessing options in process flowsheets. There is therefore some potential for point-source chemical contamination that is not in proportion to the scale of the mining operation. This would require careful environmental control, for which technologies exist.

Health, safety and security: Occupational health and safety culture is an important tool for mining, in order to reduce the risks of exposure to negative effects, and to prevent environmental and personal accidents. As SSM implies greater use of innovative technologies and efficiency in operations, H&S issues should be considered as part of socio-environmental impact management by the company. Health and safety cultures used to be most mature amongst well-established mining companies. Rapid start-up of SSM or SOSO mining activities require the rapid expansion or creation of a new workforce, however small, such that the development of health and safety culture must be immediately implemented and rapidly matured.

Land use changes: In terms of land use, the needs of SSM as underground operations with small-scale modular technology are modest compared to conventional large-scale mining. Therefore, SSM has the potential to limit tensions – depending on the environmental values of
the area - with other forms of land use. This is significant, since land use conflicts are a notable issue for the mining industry during operations and after closure, as mining can result in environmental degradation that makes the land unsuitable for other land use forms even after reclamation. Traditionally, mining has conflicted with tourism, agriculture and forestry but also fishing and hunting, having the most negative effect on local vulnerable groups engaged in small-scale activities. Thus, mining entails land use changes that can create impacts on local livelihoods and cultures.

Since SSM is particularly suitable for underground operations, the main changes in land use relate to the facilities needed to operate the mine. Compared with large-scale mining activities these changes are modest. Though SSM does not require extensive land, the removal of large areas of forests or displacement of people, the operations may still contribute to land use issues through pollution. These, together with poor communication, have been suggested as the greatest cause of land use conflicts. While the changes on land use caused by SSM in general remain modest, in the case of environmental accidents and unplanned impacts such as chemical pollution, the impacts of SSM on local land may be heightened and lead to conflict.

**Impacts for other livelihoods and business:** SSM will likely have more limited influence – both negative and positive – on other local businesses than conventional medium- or large-scale mining operations. On the one hand, SSM operations are unlikely to create a notable increase in the demand of local services or products but, on the other hand, they are unlikely to create significant challenges for other local livelihoods. Potentially, some local industries that are closely connected with the environment, such as tourism, recreation or organic agriculture, may experience negative impacts. However, SSM is unlikely to notably change the structure of the local economy. Therefore, issues that emerge with reliance on a single industry are less likely with SSM than with larger mining operations.

**Changes in local identity and culture:** Impacts of SSM to the local identity and culture are most likely modest. IMP@CT studies suggest that the first focus of SSM in Europe appears to be to utilize and reopen old mining sites in traditional mining areas. In these cases, the local
identity can be already linked with mining, whereby mining represents continuity rather than change for the local community identity and potentially does not create conflict. The case might be different in the former mining areas, where place is now considered as valued cultural and historical heritage by the ‘incomer’ post-mining populations and possible tourism industry. Tensions may particularly arise where place identity is strongly related to areas of outstanding natural beauty (AONB), sites of special scientific interest (SSIs), cultural landscapes, indigenous cultures, or nature-based livelihoods. SSM requires a relatively small number of workers. This means that the cultural and social impacts from a small number of workers arriving in the local community is quite modest.

**Changes in local governance:** Local governments have a role as representatives of local interests and as a provider of services, and they are often expected to act as the link between the local community and the mining company. They should further manage and mediate between the various stakeholders by facilitating open communication at the local level. The power-balance between SSM companies and local governments is case-specific. In small and remote areas, the resources and expertise of local governments to deal with mining may be limited. The control of state government on how mining is managed, supervised and regulated, may also be a strong influence at the local level. To minimize the challenges that SSM may cause for local governance, both state and local level governance actors need to acknowledge that similarly to larger scale activities, SSM places requirements on the expertise and capacities of governments. On the positive side, SSM will not place vast requirements on local governments in terms of local services and facilities.

Figure 2 summarizes the opportunities and challenges associated with the social impacts of SSM, as categorized in the sections above.
### Employment

**Opportunities:**
- Significant employment for regions with small population and high unemployment rates, even when the number of employees in SSM is modest.
- Skills training for local workforce.

**Challenges:**
- Short duration of SSM and SOSO activity results in short-term and uncertain employment.
- The extent to which SSM employs local populace or companies is case-specific.

### Socio-economic welfare

**Opportunities:**
- SSM can diversify industrial activity for economic development and reduce reliance on a single industry.
- SSM can potentially catalyze industrial diversity through some limited infrastructure or business development.

**Challenges:**
- SSM is unlikely to be a significant contributor to the local economy and infrastructure development.

### Ecology & Living environment

**Opportunities:**
- Possible smaller environmental and physical footprint facilitate inclusion of SSM in more populated regions and in integrated working landscapes.
- Smaller risks of environmental pollution and wastes, and harmful landscape changes.

**Challenges:**
- Environmental impacts and risks increase in proximity to community.
- Chemical impacts are limited by reduced volumes of rock and reduced use of chemical reagents, but as in any other operations there is a risk of unplanned negative impacts and accidents.

### Health and safety

**Opportunities:**
- Health and safety culture can be translated with mobile plant that are accompanied by a core deployment team and experts, who provide training.

**Challenges:**
- Maturity of health and safety culture is greatest in well-established mining operations and mechanisms are needed to accelerate the development of mature H&S cultures by new workforces in companies utilizing SSM approaches.
### Land use

**Opportunities:**
Land use conflicts are potentially less likely for SSM than for larger mining operations, due to the smaller need of land and limited footprint. SSM in former mining areas will not significantly change the landscape.

**Challenges:**
SSM might enable mining operations in new areas not previously affected by mining such as valued tourist or recreation areas. Unforeseen negative impacts of SSM to the local environment may limit the acceptability of SSM paradigm in other locations.

### Other livelihoods and business

**Opportunities:**
SSM is unlikely to notably compete with other industries and can help diversify industrial activities, leading to a greater economic resilience. To a limited extent, SSM can support local infrastructure that can support subsequent developments.

**Challenges:**
SSM will not notably increase the demand for local services and goods. To some extent, SSM can hamper the possibilities of businesses that are closely connected to the environment and/or image of the area, i.e. tourism or organic agriculture.

### Local identity and culture

**Opportunities:**
When SSM is located in traditional mining areas, mining represents continuity rather than change for the local identity. Local identity is preserved by a limited influx of external workforce and culture.

**Challenges:**
SSM may be resisted in cultures with no previous history of mining, and where mining is perceived as an environmental risk. The same may happen if a former mining area is valued as cultural and historical heritage site.

### Local governance

**Opportunities:**
SSM may generate policy level improvements for local development, revenue sharing and regional planning. Local actors in governance can easily mediate between mining company and stakeholders about arising local issues.

**Challenges:**
The local stakeholders and decision-makers may not have enough knowledge of SSM and impacts. Increased capacity/expertise may be needed in local government to manage or communicate external influences on mining regulation.
Management of SSM impacts

Cumulative impacts

IMP@CT studies suggest that there are areas in Europe that do not have large deposits but contain multiple small-scale mining deposits that can be integrated into a single business case using the SSM concept. This means that even though the impacts of one small-scale mining operation are rather modest, together several small-scale mining activities in the same area may induce a combination of different social and environmental impacts. Accordingly, special attention should be given to the evaluation of cumulative impacts which mining can generate in a region. These will depend on whether mining operations are run concurrently or sequentially, how long the positive and negative impacts last, and the level and duration of remediation that is required to mitigate negative impacts at each site.

Community development and impact management

Community development is an important policy concept in relation to any type of mining, including SSM. Community expectations for benefits from mining have increased. On a global scale, the mining industry has sought to respond to these demands and responsibilities through various types of community development activities. Typically, most of these take place at the operations stage, when mining activities are most stable. With SSM, the operations stage may be relatively short and the capacities of small companies to undertake community development activities more limited. If local communities expect SSM to make an extensive contribution to community development, tensions may emerge that could limit acceptance.

Promotion of social acceptance and social responsibilities of SSM requires awareness of the many specific features of SSM as well as understanding of the local contexts and stakeholders. The intensity of the impacts will most likely be more moderate than that of larger-scale mining projects, nevertheless, SSM must manage the same challenges as any mine. Developing management practices of social impacts in consultation with various local actors is beneficial.
for implementation of local CSR, social license to operate and increasing positive development influence. A particular social issue is the need to commence mine closure planning and management of social aspects related to loss of employment and economic development opportunities in the very early stages of mine development, since the lifecycle of these projects is relatively short. Overall, informing local communities and other stakeholders about the characteristics and likely impacts of SSM is essential. Moreover, since factors of acceptance are increasingly shaped by the local context, it is of great importance to acknowledge, manage and seek to respond to local expectations about responsible mining activities and promote participation in planning and decision-making around mining.

Policy recommendations

- **Develop common understanding of the term “small-scale mining” (SSM) among European policy and industry actors.**
  Currently SSM is interpreted in different ways and a common definition of SSM is needed to be able to use the concept. The examples of SSM application in different European regions and environments would be useful.

- **Potential governance and regulatory solutions for socially sustainable SSM need to be further developed**
  Regulatory and voluntary frameworks in European countries, with specific attention towards social and environmental aspects and participatory procedures, such as permitting, EIA and SIA, impact management plans, mining CSR, and stakeholder engagement need to be studied and developed to promote responsible SSM.

- **Paradigm shift in responsibility and acceptability of mining to fit the European context**
  The sustainability discourse around mining is significantly influenced by large-scale mining operations and operations held in other parts of the world. For European mining, there must be an important shift away from comprehending mining as a large-scale and
long-term activity. When re-formulating a responsibility and social acceptability agenda for mining in Europe, the focus should be on European local historical, socio-economic and policy context.

- **Policy and governance mechanisms to ensure local benefits from mining**

  Instead of extensive community development activities utilized in large-scale mining, SSM requires more targeted activities based on the context and the needs of the specific community, developed in close interaction with local actors.

**References**

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