



PRE - Feasibility Study for Regional Centre on SARMA and SSM

- FINAL VERSION -

Project: SARMa, SEE AF/A/151/2.4/X-SARMA

Authors: dr. Gorazd Žibret
Geological Survey of Slovenia

dr. Mitja Ruzzier
PROjektIN d.o.o., Slovenia

Date: November, 2011

DELIVERABLE SUMMARY	
PROJECT INFORMATION	
Project acronym:	SARMa
Project title:	Sustainable Aggregates Resource Management
Contract number:	SEE AF/A/151/2.4/X – SARMA
Starting date:	1. 5. 2009
Ending date:	31. 10. 2011
Project website address:	www.sarmaproject.eu
Lead partner organisation:	Geological Survey of Slovenia
Address:	Dimičeva ulica 14, SI-1000 Ljubljana
Project manager:	Slavko V. Šolar
E-mail:	Slavko-Vekoslav.Solar@geo-zs.si
DELIVERABLE INFORMATION	
Title of the deliverable:	feasibility study and action plan on regional centre
WP/activity related to the deliverable:	WP5 / Activity 5.4
Type (internal restricted or public):	Public
Location (if relevant):	-
WP leader:	MUL
Activity leader:	GeoZS
Participating partner(s):	
Author:	Gorazd Žibret (GeoZS), Mitja Ruzzier (subcontractor PROjektIN)
E-mail:	gorazd.zibret@geo-zs.si

CONTENTS

CONTENTS	3
SUMMARY	4
1. INTRODUCTION	6
2. AGGREGATES RESOURCE MANAGEMENT	10
3. REGIONAL CENTER ON SARM AND SSM	16
4. MAIN OBJECTIVES AND VISION OF THE CENTER	18
4.1 Main objectives	18
4.2 Vision of the Centre	19
5. MAIN ACTIVITIES OF CENTER	20
5.1 Collecting the data	21
5.2 Analysing the data	23
5.3 Providing the data	23
5.4 Awareness rising activities, best practices, awards and other activities	24
6. ACTION PLAN AND MANAGEMENT OF THE CENTER	25
6.1 Action plan	25
6.2 Management and organization of the Centre	25
6.3 Stakeholders involved	26
7. FUNDING OF THE CENTER	28

SUMMARY

The **pre-feasibility study for the Regional Centre on Sustainable Aggregates Resource Management (SARM) and Sustainable Supply Mix (SSM)** is a deliverable, under activity 5.4, of the SARMa project, funded by South East Europe programme, contract No. SEE Eol/A/151/2.4/x. The **main purpose of the document**, as stated also in the description of work of the SARMa project, is to undertake a pre-feasibility study. This document is not a detailed feasibility study, with the usual structure (including the technological feasibility, cost-benefit analyses, economic analyses, analyses of risks, cost structure, etc). The action plan is a vital part of this feasibility study and should be read in conjunction with this document.

Key issues recognised within the current state of aggregate supply, which indicate the need for the Regional Centre on SARM and SSM are: low transparency of the aggregate market, problems related to the sufficient supply of aggregates in some areas and for specific companies, illegal quarrying, difficult and time consuming processes for obtaining mining permits, complicated and disharmonious legislation through south European countries, no planning for aggregates extraction (no land reserved for mining of aggregates in spatial plans), low rate of recycling, almost no use of secondary aggregates, almost no information regarding availability, trends and bottlenecks in aggregates supply.

The **basic concept of SARM and SSM** is to develop a common approach to sustainable aggregates resource management with the aim of ensuring efficient supply. This is to be done on three scales. Local site-level activities will focus on environmentally friendly extraction practices, recycling, and stakeholder involvement. Regional / national activities will focus on sustainable management and supply policies, considering EU guidelines and directives. Transnational activities will involve the creation of a structure for South East Europe, or possibly European-wide, aggregates information transfer and the promotion of harmonised policies and management.

The proposed Regional Centre would deliver **added value** on different scales; local, regional, national and transnational. **On the local scale** the added value of the centre would be: cheaper construction projects, higher quality of constructions, new business opportunities, less environmental and social impact of quarrying, decreased operational costs for many construction companies, less costs and negative impacts due to shorter transportation routes, higher social acceptability for quarrying. **At regional, national and transnational scale**, the added value of the centre is foreseen to be higher competition among aggregate producers, more stable price of aggregates, better security for planned projects and their funding schemes, higher rate of recycling, less corruption in the civil engineering sector due to higher transparency of aggregates market, optimisation of transport of aggregates, increased crossborder cooperation, lower CO₂ emissions and lower pollution, reduced chance for bottlenecks in supply and more stable construction sector, more stable aggregates market, harmonised policies and long-term planning for aggregates supply.

The vision of the centre is that in four years after its establishment, the Regional Centre for SARM and SSM will be recognised in European Countries as the leading institution for aggregate resources management with the widest database about the supply of aggregates (quantity, price, location, means of transportation, quality etc...), including more than 80% of aggregate producers in EU countries. With such a database the Centre will represent the meeting point of demand and supply of aggregate resources, an educational and informative entity in support of regional, national and transnational spatial planning. It will also provide support for investors and policy makers, and will be a research and development centre where scientists may share their experience about natural resources and their management. It will have also a promotional role for the recycling of aggregates, the use of secondary aggregates, the sustainable use of natural resources and the care of the environment. Most of the activities (especially in initial years) will be carried out on line, with the internet platform representing its core meeting point.

Main activities of the centre will be: (1) **collecting data** (aggregates demand/supply, available resources, high-quality aggregate areas, policies etc.), (2) **analysing data** (supply opportunities, transportation patterns, aggregate zones, bottlenecks, trends etc.), (3) **providing data** (to interested companies, policy makers, spatial planning authorities and other interested public) and (4) **awareness rising** (awards, seminars, workshops and similar).

The Centre shall be controlled by a management body, which will ensure the highest quality in the Centre's services, budget and other legal issues. Each partner shall have a proportional influence on the management board, according to its role and financial participation.

Since the Centre will be organised as a **non-profit and non-governmental organization**, based on the **voluntary participation**, the stakeholders are very important for its functioning and development. Stakeholders for a Regional Centre on SARM and SSM can be divided into three groups, depending on their role and involvement: interested stakeholders (local communities, environmentalists, teachers & students, investors, journalists, statistical offices, decision makers, land owners and other interested public), active stakeholders (construction & demolition companies, aggregate producers, other industry) and responsible stakeholders (geological surveys, research organizations, EU commission, aggregates associations, non-governmental bodies and similar).

Funding schemes can be different, depending on the area, covered by a centre, which can be focused on SE Europe, or on the whole of Europe. The Regional centre is not expected to begin its operation until funding has been secured at the beginning. Funds will be used for promotion among all stakeholders, and for covering the purchase of equipment, payment for contractors and salary for employees. On a longer term, the Centre would need to be able to function by its own. In every case, the seed capital (can be a new project, partners financial contributions, governments, EU Commission or similar) is a vital for the establishment of the centre. In 3 to 5 years the centre should be independent. For the start-up period (3-5 years), at least a 2 million euro project would be required.

1. INTRODUCTION

The pre-feasibility study for the Regional Centre on Sustainable Aggregates Resource Management (SARM) and Sustainable Supply Mix (SSM) is made as a deliverable, under activity 5.4, of the SARMa project, funded by South East Europe programme, contract No. SEE Eol/A/151/2.4/x, under activity 5.4. The centre should be a follow-up phase of the SARMa project, therefore its activities will be based according to the findings of the aforementioned project from other workpackages.

The main purpose of this document, as stated also in the description of work of SARMa project, is to undertake a pre-feasibility study. This document is not a detailed feasibility study, with the usual structure (including the technological feasibility, cost-benefit analyses, economic analyses, analyses of risks, cost structure...). The document itself represents the clarification of the idea for a new Regional SARM Centre, with outcomes of the SARMa project as a foundation including the following perspectives (chapters):

- The problems and complexity of the aggregate resources management (state of the art)
- The necessity for more coordinated and planned regional/national and transnational actions that could be performed in such a Centre
- The potential impacts and added value, opportunities and threats of the new Regional SARM Centre
- The main objectives and vision of the Regional Centre
- The main activities of the Regional Centre that would be performed
- The management of the Centre
- The potential funding of the Centre (financial perspective)

The pre-feasibility study should be read together with the Action plan for the new Centre. Both documents represent the basic milestones in the development of the new Centre.

Aggregates are of vital importance for a modern society and are a core building material used by human society. Without them, we would have no roads as we know them today, no railroads and no airports. Roads would not have been paved with asphalt. Without aggregates, houses would be build solely with wood, glass or steel. We would have no tunnels, no shopping centres, no defence against flooding, and we would be without many other modern acquirements. According to the UEPG, Europe consumes 3 billion tonnes of aggregates annually with a direct turnover of 20 billion €. Every EU citizen needs 5.5 tons of aggregates per year. Almost half of this quantity is used to make concrete. However, because aggregates are so basic a material, they are not recognised by the general public and amongst decision makers as a vital part of almost every construction project.

Department of Mineral Resources and Petroleum Engineering, University of Leoben (2010) gives even higher estimates about EU aggregates sector. The demand for Aggregates in Europe in 2008

was 3.5 billion tonnes, produced mainly by Small and Medium-sized Enterprises on 22,000 sites across Europe. The EU average use of Aggregates in 2008 was 6.2 tonnes per capita. The Aggregates Industry is by far the largest in the minerals sector by tonnages produced and accounts for the largest numbers of production sites and numbers of people employed in Europe. Taking an EU average price of 7-8 € / tonne (Figure 1), the aggregates sector represents a turnover of around €20-25 billion.

Demand for aggregates in Europe will reach 4 billion tonnes in the medium term, driven mainly by economic growth in Central and South-Eastern Europe (Department of Mineral Resources, 2010). This might be one of the main reasons to provide such a regional centre, as in south east Europe and central Europe many supply issues are not well regulated from a state of the art discussion point and regulatory framework. Thus, the regional centre might not only be related to south east Europe but also to Europe as a whole. Particularly the central Europe has a huge infrastructural development potential. For instance, the so called Visegrád Group countries (V-4 countries Czech Republic, Hungary, Poland and Slovakia) are important. The countries of the Visegrád Group cover an area of about 533,000 km² with a population of more than 64 million (in 2010). Thus, the potentials for the increase of the demand of aggregates in this area are very high, as shown also from the past 10 years (Figure 2).

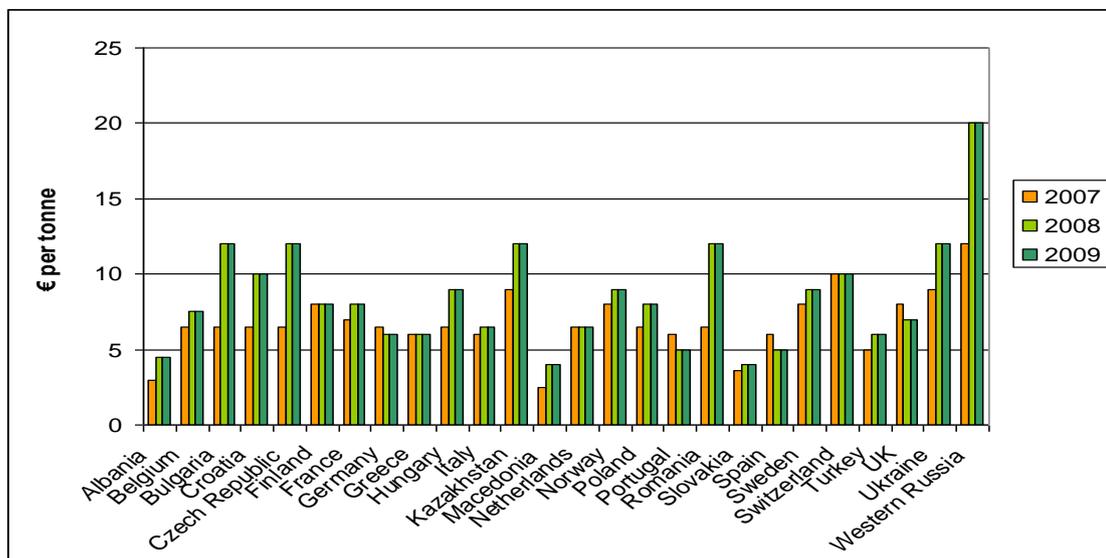


Figure 1. Aggregate prices in € per tonne in different countries of Europe, averaging around €7-8/tonne (Source: Aggregates Business Europe, 2010¹).

¹ Department for Mineral Resources and Petroleum Engineering, University of Leoben (2010): Planning Policies and Permitting Procedures to Ensure the Sustainable Supply of Aggregates in Europe, commissioned by UEPG.

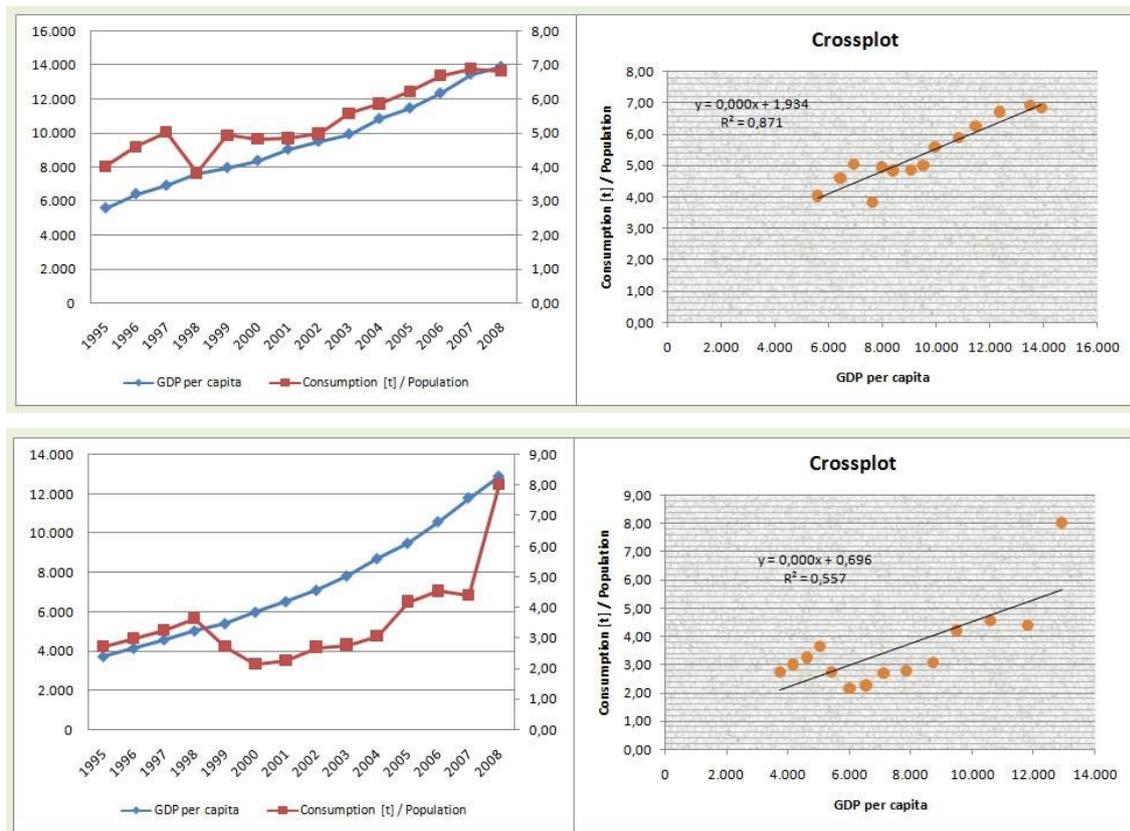


Figure 2. Aggregates consumption / GDP in Czech Republic (upper graph) and Slovakia (lower graph) (Department for Mineral Resources, 2010)

Several issues regarding aggregates supply have been recognized in the SARMa project. The most important issue recognised was a lack of information at all levels. At the production/consumption level, there is a lack of information regarding the aggregates market. Local consumers (mainly construction companies) are on their own when looking for an aggregate supplier, and this is why it is very common in SE Europe that construction companies need to develop their own quarry. This can be a serious limitation in the case of small civil engineering enterprises.

There is no transparent information about aggregates quality parameters in different deposits, which determine their usability for different purposes (for asphalt, for concrete, for special concrete, as an unbound material, as an armour stone, etc.). Several parameters are important, mainly in the respect of abrasiveness, shape, granulometrical composition, frost resistance, chemical composition, durability, hardness, etc. Many questions arise when someone is interested in buying aggregates without personal connections with producers: who produce them, who sells them, how much can be produced/purchased, where can aggregates be bought? Also, a price is a big enigma for everyone, and is very dependent on facts like: who is buying, how much, is an

aggregates producer interested to sell aggregates to third parties at all. At local level (supplier/consumer), there is a lack of transparency about aggregates market. And even less information is available when looking for an aggregate supplier outside a host country, which can result in prolonged transportation routes of aggregates, and this fact can drastically influence the price of a construction project near to international borders.

The lack of the information exists also at the regional level. Authorities might not be aware that aggregates supply is an important part for the functioning of the society, and commonly forget about future planning for appropriate aggregates supply. The consequence is that almost no or absolutely no land is reserved for aggregates extraction. Permitting procedures for mining rights are also subjected to time consuming procedures, and aggregate producers might face serious problems where aggregates are exhausted in their deposit.

This is why a new Regional Centre on SARMa is of vital importance. Its scope would be to provide all relevant and constantly updated information to interested parties. In the supplier/consumer level, supply and demand can meet in one specific place. On decision-level, it would provide the decision-makers and also investors with relevant information about supply gaps and investment opportunities. Summarizing all available data, the Regional Centre would issue aggregate indicators and temporal and spatial trends to interested members of the public. The Regional Centre on SARM and SSM is foreseen to be non-profit and non-governmental body, having the ideas of sustainable development as guidelines.

2. AGGREGATES RESOURCE MANAGEMENT

Construction aggregates are defined as naturally occurring matter or artificially produced matter (usually by crushing), used as an unbounded or bounded material (usually with cement and other additives) for construction purposes. The sources of aggregates are natural or artificial.

Natural sources can be divided into two groups. The first group are deposits of unconsolidated material, usually of alluvial deposition (sand and gravel pits) or from underwater extraction in rivers, sea or lakes. Because material is unconsolidated, crushing is not a vital part for aggregate production in this case. Production of aggregates goes from extraction with different heavy machinery, sieving through screens with different diameter, storage and finally loading to trucks or other means of transportation. 43% of aggregates are produced in such way in EU (EUPG data).

Second type of the deposit are hard base rocks (mainly igneous rocks, but also sedimentary rocks, like limestone and occasionally metamorphic rocks). Aggregates in this case are produced by crushing rocks. Base rocks are extracted with different means, depending on the hardness of base rock. Hard geological formations are extracted with blasting, while softer types can be extracted using heavy machinery (pneumatic hammer). The material is subjected to further to crushing, followed by screening, storage and loading to the trucks. The majority of aggregates (49%) are produced by crushing rocks.

A third type of aggregates can be produced from secondary sources, like recycling of waste, reuse of different by-products or by manufacturing processes. Construction and demolition waste, excavated soil/rock from civil works, different inert industrial waste or different waste from the extractive industry can be used as a raw material for aggregate production. These types of aggregates are currently unimportant for aggregate supply (especially in the south east Europe area), but they are expected to increase in the future. Approximately 8% of aggregates come from such sources in EU, but in areas of south east Europe, this source is still an insignificant one.

Aggregates can be used (percentage data from EUPG):

a) as an unbound material for the preparation of foundations, material for embankments (dams, flood protection banks, etc.), or a material used as a weight to increase the pressure to the construction ground to increase a consolidation rate of poorly consolidated sediments before the construction can begin. In such cases aggregates are transported to the site of construction; approximately 40% of aggregates are used in this way;

b) for the production of asphalt for roads, playgrounds, airports, etc.; aggregates are transported to the asphalt plant and mixed with tar or bitumen; 10% of aggregates are used in his way;

c) in concrete production (45% of aggregates); aggregates are transported to the concrete plant, where different mixtures are prepared, or directly to the construction site, where a concrete is

prepared in-situ; small amount of aggregates are also used for the preparation of concrete for different architectural and ornamental products;

d) as railway ballast (2%), vital for all railway constructions where the aggregates are used to support the weight of a passing train, to distribute the load to avoid serious damage to the underlying ground or other structures and to hold sleepers and rails firmly in place; aggregates are transported directly to the place of railway construction in this case;

e) as armour stone (3%), used mainly for road embankments, dams, for river regulations or coastal flood defences, etc.

Aggregates are thus a vital part for almost every construction, for example (data from EUPG):

- residential buildings (houses, apartments, etc.), 25% of aggregates are used for this purpose;
- commercial buildings (offices, factories, etc.), 20%;
- social buildings (hospitals, schools, etc.), 20%;
- infrastructure (bridges, harbours, pipeline stabilizations, airports, etc.), 15%;
- roads, railways, runways, waterways, 20%.

Because aggregates are a key ingredient for every construction or infrastructure project, and are usually needed in huge quantities, proper planning for sufficient supply is a very important issue. It is interesting, that GDP is tightly connected to aggregate consumption. This is why the upcoming end of the economic crises, and development of less developed EU member states and other countries will certainly increase the aggregates demand in the south-eastern part of Europe in the near future.

As seen from the fact that aggregates can be produced from many different sources, they can have very different physical and chemical properties. Several of these properties can be very important to determine the usability of aggregates for different purposes:

As evident from the table 1, not every type of aggregates is useful for every application. The quality can vary drastically between different deposits, and this determines the usability and finally, the quality of the end-product (strength of the concrete, durability of asphalt, water permeability of road foundations, etc.).

Although aggregates are of vital importance for the modern society, their extraction is frequently not well welcomed. Two things are to be considered: environmental impacts, causing NIMBY syndrome², and time consuming permitting processes.

² NIMBY is an acronym for the Not In My Backyard syndrome.

Table 1. Important parameters which determine the usability and quality of aggregates.

particle density	the weight of the concrete depends heavily on this index, less is usually better, depending of application
water absorption	water absorption capacity, an important index in areas with subzero temperatures during winters;
particle size distribution	indicates the proportion of the particles of different sizes, because it can affect the strength, durability or flexibility of the final product;
resistance to fragmentation	this index tells how likely aggregates are crushed during loading, dumping or transporting; less likely they break apart, better they are;
resistance to wear and polished stone value	especially important in the case of aggregates, used for road construction, because this index measures the resistance of aggregates to a continuous abrasion
shape index	indicates how rounded are the particles; rounded aggregates are better than ellipsoidal or flat ones;
fineness modulus	determines the particle size distribution, an important index for some specific applications;
magnesium sulphate test	this is a measure of the resistance of the aggregate to freezing and thawing, and is particularly relevant where the aggregate will be exposed to sea water or de-icing salts;
impurity level	very important index especially for the preparation of concrete and reinforced concrete, because some specific minerals from aggregates can react with minerals in cement or with iron armature.

On the other hand, extraction of aggregates might produce some unwanted environmental impacts which can decrease the quality of life near to aggregates producing sites. There is commonly a NIMBY syndrome present at a spatial planning stage. Most common negative impacts, which can be limited with proper planning and control of operations, are:

- dust;
- noise;
- negative visual impact;
- heavy traffic (transportation of aggregates by trucks);
- vibrations (especially at blasting);
- influences to the wildlife and plants;
- water pollution (usually with fine clay particles).



Figure 3. *Typical aggregates extraction site (quarry).*

Permitting processes vary from country to country, but some common elements can be observed for all countries. First of all, an extraction site needs to be planned in the scope of a spatial planning process. The use of space is an intersection of many interests, from residential, recreational, commercial and industrial areas, transport, communication and energy transportation areas, farming interests, environmental and biodiversity conservation interests, different waste disposal areas etc... Among this list land use interests, quarrying is without exception the least favoured land use option, and is very commonly forgotten at spatial planning stage. The ideal quarry should be:

- far away from residential, commercial and high-tech industrial areas;
- close to the transportation network (railway, highway, waterway);
- placed in the way that it does not disturb wildlife (frogs, bats, birds, etc.) and far enough from sensitive biodiversity areas;
- does not destroy natural heritage areas, and it is not placed in nature conservation areas (parks);
- does not destroy farming land or a forest;

- does not interrupt with surface or underground water;
- close enough to the appropriate water source;
- close to the end-users (populated areas);
- geological settings are favourable for aggregates extraction (good quality material, enough resources, settings to allow safe extraction, etc.).

As seen from the list, many different spatial parameters of an ideal quarry are negating or at least opposing each other. There is almost no location which would satisfy all stakeholders in the decision process. Moreover, at the stage of the adoption of new spatial plans, aggregate extraction sites (mining areas) are frequently not the part of the official spatial plans. Later changes to these plans are close to impossible. This is why locating an extraction area and putting it to spatial plans is usually a very time consuming and painful process for the aggregate producing company. When a suitable location is found and it is officially placed in the spatial plans, further permitting process might be a quick one, compared to a previous stage.

But why is this story an important one? In some countries there is a lack of permits for legal quarrying, and this is a "very fertile land" for the growth of illegal quarrying, creating unfair competition for legal ones. Together with the NIMBY syndrome, it is clear, that companies with the mining right, located in the countries not managing their aggregates according to the SARM and SSM concepts, can be uninterested to sell aggregates, to preserve the resources for their own needs. This can create bottlenecks for a supply, which have different consequences, for example:

- no transparency on the market, prices change from a case to case, no knowledge about the quality of aggregates, every aggregate consumer, who does not own its own quarry, is at very high risk because of unstable aggregate supply, etc.;
- following the increase in price or even unavailability of aggregates in the market, aggregates are extracted illegally, which makes the legal extraction even more unattractive;
- there is a lack of aggregates on the local market, which means aggregates need to be transported from distant extraction sites, causing the increase of the price, and at the end, the increase of cost of almost every construction project;
- aggregates are extracted from low-quality deposits, which can have many high-cost side effects:
 - higher road accident rates due to slippery roads because of low quality aggregates used for asphalt;
 - faster decaying of concrete, higher costs for infrastructure maintenance;
 - lower quality of almost all construction products (houses, roads, bridges, etc).

Open issues exist also on a regional and transnational scale which need to be addressed in parallel. Because of a general lack of awareness regarding the importance of sufficient aggregate supply and issues related with it, there are more or less different large gaps towards managing the aggregates supply according to SARM and SSM concepts in south-east European countries. These may include policies and regulations affecting aggregates that:

- do not address resource and energy efficiency or EU guidelines;
- preclude the use of recycled materials and industrial by-products;
- fail to address aggregate consumption in long-term spatial planning;
- are influenced by a lack of capacity and/or a lack of coordination on aggregates production and transport.

Not all countries and regions are facing such problems, but there are still many countries which are having some or all aforementioned issues at their aggregates supply. Taking into account all aforementioned elements, a transparent market, or at least an information centre, which will function also as the aggregate supply bottleneck indicator, is almost a "must" for many areas.

3. REGIONAL CENTER ON SARM AND SSM

The basic concepts in the SARMa project are **sustainable aggregates resource management - SARM** (efficient, low socio-environmental impact quarrying and effective waste management) and **sustainable supply mix - SSM** (aggregate supply using multiple sources, including recycled wastes and industrial by-products (slag), that together maximise net benefits of aggregate supply across generations).

Based on the two main concepts of SARM and SSM and the problems described above regarding the management of aggregate resources, the establishment of the Regional Centre on SARM and SSM would contribute significantly to a solution. **We see the main OPPORTUNITIES** in the establishment of the Centre as:

- no such centre has been established in the EU yet (it would coordinate activities on different levels);
- high obscurity of the aggregates market currently acts in favour for a such centre;
- high interest for such centre from the different aggregate associations (like UEPG);
- high motivation of partners within partners of SARMa project for such centre and willingness to take part in it;
- very low rate of aggregate recycling and very low production of secondary aggregates;
- the formation and creation of an fully functional constantly updating demand and supply database;
- promotion of the recycling of aggregates and of the use of secondary aggregates;

The Centre would deliver added value on different scales; local, regional, national transnational. When the centre would be fully implemented and a long term vision being adopted, it can represent a multi-layered structure. Its potential added value can be roughly evaluated at different scales. At a **local scale**, the added value would be:

- transparency in the market;
- cheaper construction projects due to cheaper aggregates and shorter transportation routes;
- higher quality of constructions due to the use of higher quality aggregates and better knowledge about aggregate parameters, which might includes also:
 - fewer road accidents;
 - fewer casualties at earthquakes;
 - less property loss by floods;
 - higher durability of concrete, higher lifetime of buildings;
 - lower costs for infrastructure and building reparations;
 - less traffic jams due to fewer road reconstructions and reparations;
- higher added value due to construction and demolition waste recycling, new business opportunities;

- higher added value for companies which have waste products which are suitable for aggregates production;
- lower environmental and social impact of quarrying;
- decreased operational costs for many construction companies, which will be able to operate without their own small-scale quarrying;
- increased productivity.
- less accidents, noise, dust and pollution due to shorter transportation routes of heavy trucks, transporting aggregates;
- higher social acceptability for quarrying.

At **regional, national and transnational scale**, the added value of the centre is foreseen to be:

- higher competition among aggregate producers, resulting in higher quality products;
- more stable price of aggregates;
- according to the more stable price, better security for planned projects and their funding schemes;
- higher rate of recycling which decreases the production of primary aggregates and decreases the needs for a landfill capacities and costs related to them;
- less corruption in the civil engineering sector due to higher transparency of aggregates market;
- optimisation of transport of aggregates, increased cross border cooperation, and at the end, lower CO2 emissions;
- more transparency on the aggregates market, not only transparency on the price, but also transparency about quality, resources, availability, etc.;
- other positive effects (lower accident rate and death toll on the roads, lower maintenance costs, longer lifetime of constructions, etc.);
- reduced chance for bottlenecks in supply;
- more stable aggregates market;
- more harmonised policies;
- long-term planning for aggregates.

The establishment of such a new centre has also some threats. The **potential THREATS** of such Centre are:

- companies would not be interested in providing data;
- new economical crisis, decreasing the civil construction activities;
- not enough funding after start-up period, causing the Centre to decrease its activities or shut down completely;
- politicians and decision-makers ignore the recommendations of the centre;
- similar centres take a vital role in providing the data.

4. MAIN OBJECTIVES AND VISION OF THE CENTER

4.1 Main objectives

In the preparation of the pre feasibility study we have identified the objectives we believe that could be achieved by the Centre. These are described more fully in the action strategy, which includes also the activities that will enable them to be achieved. The main objectives of the Centre are:

- Collect and hold available information about the supply of aggregates (quantity, price, location, means of transportation, quality, etc) in one place, which includes the majority of the producers (target: >80% of aggregates producers voluntarily contribute data and update them regularly); anonymous report of illegal quarrying can also be an option;
- Motivate and inform aggregate consumers to ensure regular use of actual information (target: >80% of civil engineering projects use the data from the portal at planning stage / costs calculating stage);
- Regular use of the Regional Centre database by demolition and other companies with suitable by-products to identify the nearest producer of recycled aggregates to minimise the cost of investments;
- Awareness and supply of information to/from spatial planning officials and investors about:
 - the sufficient aggregate supply and potential bottlenecks in aggregates supply
 - the areas of favourable geological settings for aggregates production, which will allow more efficient planning;
 - future projects requiring higher aggregates supply;
- Support and inform investors for possible opportunities for investing into aggregates production in the sense of best regulatory framework, best quality material, future trends in aggregates demand, bottlenecks in supply, etc., which will encourage them to make the decision to invest into aggregates production;
- Educate and inform different stakeholders (local/regional/national governments) based on seminars and workshops about the importance of sufficient aggregates supply;
- Give support for long-term planning for aggregates production, reserved areas for aggregates extraction that are an integrated part of spatial plans;
- Coordinate the aggregate supply on different levels (regional/ national/ transnational)
- Establish and maintain partnerships within aggregate producers, consumers, decision-makers and other stakeholders in different projects and initiatives.

4.2 Vision of the Centre

From the objectives we have set, and from the objectives of the Sustainable Aggregates Resource Management paradigm, developed within SARMa project, we have developed a **vision of the Centre**, which is:



In 4 years after establishment the **Regional Centre for SARM and SSM** will be recognized in European Countries as the leading institution for aggregate resources management with the widest database about the supply of aggregates (quantity, price, location, means of transportation, quality etc), including more than 80% of aggregate producers in EU countries. With such a database it will represent the meeting point of demand and supply of aggregate resources, an educational and informative entity in support of regional, national and transnational spatial planning, a support for investors and policy makers, a research and development centre where scientists may share their experience about natural resources and their management. It will have also a promotional role for the recycling of aggregates, the use of secondary aggregates and the sustainable use of natural resources with the care of the environment. Most of the activities (especially in the initial years) will be carried out on line, with the internet platform representing its core meeting point. It will be a non-profit and nongovernmental institution, which will be managed by the voluntary participation of different stakeholders and few part-time workers.

5. MAIN ACTIVITIES OF CENTER

The main activities of the Regional Centre on SARM and SSM are, but not limited to, the following:

1. collecting data

collecting data relating to the:

- demand and supply of aggregates (natural, recycled and secondary aggregates),
- available resources and quality of aggregates from different deposits,
- areas containing high-quality material for aggregate production, aggregates regulations and spatial planning policies in different areas,
- areas reserved for aggregates production in the local/regional/national spatial plans, etc.;

2. analysing data

analysing the data to identify:

- aggregates transportation patterns,
- aggregates zones,
- policies,
- bottlenecks of supply,
- spatial and temporal trends, etc.;

3. providing data

- to interested parties via web pages,
- in reports,
- in other publications;

4. awareness raising

- activities, such as awards, best practices, workshops, courses etc.

The basic idea is that good quality data will allow good analysis and good quality of service, which will create more motivation to use the Centre as a useful tool when planning future construction activities and when calculating the price of the construction works (Figure 4). Furthermore, spatial planning authorities, politicians and investors will use the SARM and SSM Centre's products as important baseline for their decisions.

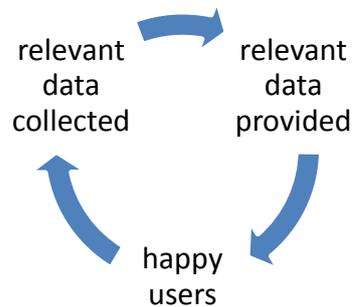


Figure 4: data cycle within Regional centre on SARM and SSM.

5.1 Collecting the data

This chapter is divided into different categories, depending on the level of data collection.

5.1.1 Collecting data on producer and consumer level (deposit, supply & demand level)

The foundation of the Centre is the collection of data, especially collection of data from the aggregate producers and creation of the aggregates database. This activity will be based on the voluntary participation of the stakeholders – aggregate producers. The main motivation for the stakeholders should be a strong and widely known existence of such database among aggregates consumers. This will ease the selling process and should increase the demand of the aggregates at stakeholder - aggregate producer. The data which can be collected are:

- location of the supplier;
- transportation possibilities;
- price of the aggregates (might be a sensitive information, also concerning the violation of the EU competition law);
- production capacity (might be a sensitive information for aggregate producers);
- available resources (short, medium and long-term);
- quality parameters;
- other information.

Data will be also provided from the aggregate consumers and from other sources, which will allow the SARM and SSM centre to be able to monitor the demand of aggregates. Short, medium and long-term demand of aggregates monitoring is foreseen. Such database (demand & supply) will be a basic building block for further activities – data & pattern analysis.

Moreover, additional motivation will be the activities of the Centre, which will ease the access to the aggregates by proposing aggregate zones and identifying supply bottlenecks to the decision makers and spatial planning authorities.

Final and ultimate goal of such activities will be the creation of the constantly updating aggregates supply and demand database. It is true that transportation distance limits the possibilities of the aggregate trade, but nevertheless, it is still possible for the consumer to decide among several producers in the area, and more transparent market will also contribute to the general positive stakeholder's opinion about such market.

A useful additional option of the web portal might be also the possibility to anonymously report the illegal quarrying.

5.1.2 Collecting geological data about areas containing high-quality material for aggregate production (regional level)

The main contributors for this activity will be the national Geological Surveys, which will act as the data provider about the areas with suitable geological conditions for aggregates extraction, and possibly also about tectonic regime and material quality parameters (on regional scale). Geological surveys are usually public bodies, funded by governments. According to the Aarhus convention, such geological data should be available to everybody. A good relationship among mineral resources experts is already established among SARMa project consortium, and moreover also among other European geological surveys. A useful supplement of a database developed by the Centre will also be aggregates restriction zones, like national parks, wetlands, nature protected areas, population areas, wildlife conservation areas, transportation routes etc, where extraction would not be permitted.

Created "**aggregates friendly areas database**", based on GIS environment, will ease the process of bottlenecks identification and will ease the process of the proposal of aggregate zones to governments and land use planning authorities.

5.1.3 Collecting data about aggregates regulations and spatial planning policies in different areas / countries and "aggregate areas" in spatial plans (state or province level)

The third activity regarding data collection will be the collection and analysis of the data of regulation (mining) and spatial planning policies among the areas of SE Europe, or on pan-European scale. Special attention will be placed to the permitting process and to the possible existence of "**aggregate production zones**" in the spatial plans. Such data will be collected with the help of the partner experts from different countries.

5.2 Analysing the data;

Based on the established databases, data will be analysed with the help of GIS, statistical and geospatial tools. SARM and SSM centre will provide the synthesis of the data to stakeholders, addressing different levels. At the producer/consumer level, analysis will be prepared via database query algorithms and web applications at the time of the demand. Provided information will include all available data or maybe only a selection of the available data. Data of interest among the private companies is mainly focused on:

- the data about the availability of aggregates (location, price, transportation options, quality parameters etc.);
- data about market conditions (transactions, quantity, price etc.),
- analysis of the spatial and temporal trends on aggregates market (supply & demand among countries, prognosis, price trends etc.) and
- permitting process among different countries/provinces and similar information about regulation.

But contrary, at the decision making process and policy making process, data of interest will be:

- spatial and temporal trends in aggregates supply/demand;
- legislative framework and permitting process among different countries;
- different aggregates indicators;
- possible current and future bottlenecks in aggregates supply;
- aggregates land zones proposal and other proposal of the solutions related to the aggregates issues;
- illegal quarrying.

Such data will not be prepared only with database queries or GIS tools and such reports can not be done automatically. This is why the mineral resource experts and a team of qualified data miners (mathematics, statistics, geographer, geologist etc.) are requested, which will be able to prepare all of the aforementioned indicators and syntheses.

5.3 Providing the data

This is almost the most important activity. The centre will be a fully operational only if it will be able to provide data with a user-friendly experience. Data according to the producer/consumer requests will be prepared on the time of the data demand with excellent database queries and maps prepared with GIS tools, and provided to the client via user-friendly web-based application. Powerful server with 24/7/356 uptime is requested. The team responsible for the application and hardware must be prepared to fix all possible problems within the shortest possible time.

The trends, policy indicators and other data will be prepared with the team of experts, which will also prepare electronic and printed materials, which can include:

- periodical electronic newsletters, published on the centre's web page or distributed via mailing lists;
- periodical reports on market trends;
- reports for the spatial planning authorities, decision makers and politicians when needed;
- warnings when future/current bottlenecks have been recognised;
- statistical tables;
- investment opportunities;
- annual bulletin.

A good access to the synthesis and reports, as well the accurate predictions and analysis will motivate stakeholders, to provide even more data (or maybe even funds), which will eventually close the circle and make the centre to be very alive and functional. Additional motivation for the voluntarily involvement of the industry might be the involvement of the centre in encouraging and assisting the governments and authorities in SEE to develop national and regional aggregates plans and efficient permitting systems, in order to supply the aggregates demands of the region needed for infrastructure, housing, etc.

5.4 Awareness rising activities, best practices, awards and other activities

Awareness rising is the last foreseen activity of the centre, which will contribute to the promotion of the centre objectives and activities. This will be done via many activities. Some awareness raising activities, which can be a core for the centre, are:

- best practice awards;
- seminars;
- workshops;
- attendance at conferences, lectures;
- communications with the authorities;
- publications, newspaper articles, expert and scientific magazine articles;
- commercials in the expert magazines and other media etc.

Additional activity might be the development of the technical testing and certification services for operators.

6. ACTION PLAN AND MANAGEMENT OF THE CENTER

6.1 Action plan

The detailed action plan can be found as a supplement to this document. Activities are focused on several main parts in the implementation and creation of such a Centre, including to:

- provide boosting funds;
- prepare and make a consortium agreement in case a consortium is taking a responsibility for the Centre, prepare a legal framework;
- find a location (head office) for the Centre;
- build the database structure, web portal and other required IT infrastructure;
- actively promote the Centre among stakeholders (conferences, meetings, etc.);
- print and disseminate material, prepared at SARMA project, as a teaser;
- prepare new promotional material;
- make first predictions, prepare market's indicators, recommendations for policy and decision makers, prepare first official issue of an annual almanac, give some outputs, etc.;
- at the end of a boosting funding period, think about future funding.

6.2 Management and organization of the Centre

At the initial stage of the Centre development there is no need to structure it in details since it will be mostly organised as a virtual network with the central portal being as a meeting point. In the second stage, the proposal of the organisation of the Centre is as follows, but can be adjusted depending on the needs.

The **organisation** of the Centre can consist of several departments, but such structure is not limited to the proposed one. Departments can be fused together or broken apart when needed. The proposed organization (Figure 5) of the Centre by departments is:

- technical department (web portal, desktop publishing, printing...);
- data collection department (legislation, spatial plans...);
- data mining department (preparation of analysis, predictions, trends...);
- promotional department (preparation of publications, seminars, advertising...);
- administration.

The Centre shall be controlled by a **management body**, which ensures the highest quality of the centre services, budget and other legal issues. Each partner shall have a proportional influence to the management board, according to its role and financial participation. The influence needs to be adjusted when the proportions of funding of each partner is changed. The head of the centre shall

have a limited mandate. Depending on the size of the Centre, each department might have its own head of the department in the future. Heads of the department are controlled by a director. Due to non-commercial role of the Centre, annual financial reports, awards, salaries and other related issues shall be controlled by a management body. Details need to be discussed at the beginning stages of the centre creation.

There is no need for a Centre to be in one place. It can function within a proposed framework also as a network of experts on a virtual basis, each of it being a part time employed by the Centre as an expert.

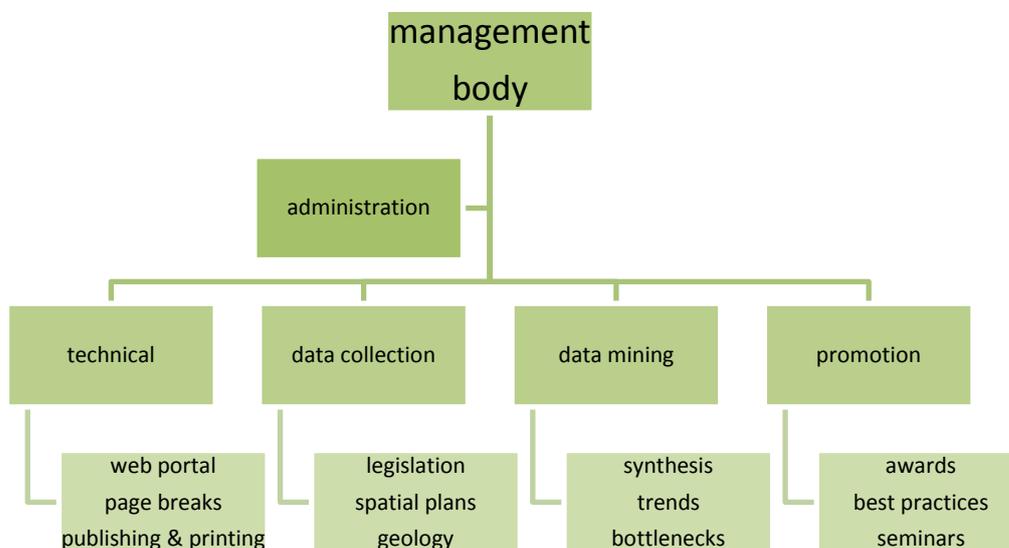


Figure 5: simplified organigram of the regional centre on SARM and SSM.

6.3 Stakeholders involved

Since the Centre will be organised as a non-profit and non-governmental organisation, the stakeholders are very important for its functioning and development. **Stakeholders for a Regional Centre on SARM and SSM** can be divided into three groups, depending on their role and involvement:

- Interested stakeholders;
- Active stakeholders;
- Responsible stakeholders.

Interested stakeholders are those which will get a positive benefit from such regional centre and might occasionally use information from a web portal, but will not play a vital role in it, they include:

- local communities, especially those which are facing some negative impact from aggregates producers (noise, traffic, dust, etc.)
- environmentalists;
- teachers, students;
- journalists;
- investors;
- statistical offices;
- different decision makers;
- land owners;
- other interested public.

Active stakeholders are stakeholders, which actively contribute or search from centre's database, or use services on regular basis. They can be private enterprises, policy makers and planning authorities (spatial planning, infrastructure and others). Among private enterprises, sectors to be mentioned are:

- construction companies;
- aggregate producers;
- other industry with secondary by-products, suitable for a secondary aggregates production (foundry, steel works, power plants, etc.);
- demolition companies;
- waste processing companies.

Responsible stakeholders are the stakeholders which are responsible for the Centre to work effectively. Responsibility can be placed on one, two or more responsible stakeholders. Some possible entities recognised are (but not limited to), listed according to the appropriateness for such task:

- a consortium of geological surveys, research organizations and industry;
- research organisation or a consortium of research organisations;
- government or governmental body;
- a consortium of governments from different countries;
- The European commission;
- different aggregates associations;
- non-governmental association;
- a specially formed group of interested companies or individuals, who run the Centre on volunteer basis or for income;
- a private investor, interested to earn money from such Centre.

7. FUNDING OF THE CENTER

Funding schemes can be different, depending on the area, covered by a centre, which can be focused on south east Europe, or on the whole of Europe. The Regional centre is not foreseen to begin its operation without the funding boosts at the beginning. Funds will be used for promotion among all stakeholders, and for covering the purchase of equipment, payment for contractors and salary for employees. On longer term, the Centre would need to be able to function by its own. Boost funds (at the beginning) can be, from best to worst option:

- funding in the scope of a new international project (SEE, Framework7);
- funding on the basis of the partner's consortium contribution (in this case, funding can be also based on the basis of working hours, office availability, etc.)
- funding in the scope of government contribution (every European government a specific lump-sum of money);
- funded by the European Commission by different available instruments;
- voluntary funding by stakeholders (aggregate producers/consumers);
- founded from the selling of commercials space at web portal (least likely).

At the **end of the start-up stage** (after 3-5 years), the Centre should have a widely developed database, covering a majority of the areas, a large number of daily users, significant promotional activities and its own recognisable logo. It needs to be able to collect funds by itself, on the basis of (from more to less likely):

- funding on the basis of a voluntarily contributions of companies;
- selling a commercial space for interested companies;
- "Google-type" of funding scheme, with sorting of the search hits according to the company financial contribution to the centre;
- funding on the basis of a membership fee.

The Regional Centre is foreseen to be a non-profit, non-governmental body. It is not foreseen that the Centre will make a profit, even if it gains a huge success. Details need to be discussed before the formation of a Centre.

According to the rough estimations of the costs, at least 2 million euro project would be required for the start-up period (3-5 years). After start-up period and according to the experiences about which activities would be a vital part of the centre, and which activities will be discarded, the Centre would need from about 50.000 € / year (web portal and database maintenance and data provision service) and up to 500.000 / year if experts would be needed in order to prepare all different analysis and publications.

SUPPLEMENTAL:

This feasibility study and action plan has been reviewed by 5 reviewers. According to their suggestions, following major changes have been implemented in the current version:

- the idea about "Aggregate exchange market" was removed due to the suggestions that such institution would easily violate the EU Competitive Regulations;
- more data and background information about the future demand of aggregates and the need of SARM centre is provided in the introduction area;
- the organigram about the possible structure of regional centre on SARM and SSM is provided;
- English language was revised and improved; some awkward phrases were rewritten;
- Table 1 was improved, including the use of correct terminology, harmonised with EU standards;
- lower price of the aggregates as a potential local scale impact has been removed.