



Synthesis Report

Work Package 4, Action 2

Providing a Sustainable Supply Mix of Aggregates:
State-of-the-art in South-East Europe

Final Version

August 2011



DISCLAIMER

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Executive Summary

This report synthesises the results of the questionnaires distributed to selected SARMa partners in order to give insights on how SEE countries plan for a sustainable supply of a mix of aggregates, and their major divergences in the approach and application.

From the collected results emerges a widespread tendency towards the development of national/regional aggregate resources management plans that take in account for social, environmental and economical impacts. The recognised need for a more efficient and sustainable approach gets, however, heterogeneous answers. The cause for the lack of homogeneity can be recognised in the heterogeneity of national laws regulating land use and aggregate resources supply, and in the different approaches adopted. The development of communitarian guidelines, harmonised with existing EU legislation, is therefore highly desirable.

According to the best practices collected, to achieve excellence in sustainable aggregate resource plans it is necessary to develop long-term plans that account for aggregate demand, aggregate availability, and that forecast impacts during the whole life cycle of the products. The final goal is to achieve resource efficiency. From the results it has been recognised also that the actual social involvement in SEE is still inadequate, and should be increased.

The objective of this document, though, is not only to identify critical issues: the report offers a detailed analysis of plan development, highlighting best practices that may be useful to develop a communitarian approach to resource efficiency. The resulting report aims to be a step toward this goal.

Preface

This report aims to synthesise the efforts of SARMa Work Package 4, Action 2 to better understand opportunities, barriers, and best practices in planning for a Sustainable Supply of a Mix of aggregates resource (SSM). The need for a mixed supply of aggregates is essential in order to satisfy increasing demand in EU, ranging to more than 3 billion tons yearly (UEPG report, 2010). The future demand will be driven mainly by economic growth in South East Europe (SEE); thus a precise comprehension of the state-of-the-art in aggregates resource management and supply in the region is needed.

This report is the basis for the "SSM: Recommendations for land-user planners" document. It has been prepared from the data collected via an extensive questionnaire¹, from detailed reports on partners' procedures and data bases, and the best practices from selected project partners that are representative of ten countries (Table 1).

What defines a Sustainable Supply Mix?

A Sustainable Supply Mix uses multiple sources, including recycled wastes and industrial by-products (slag) that together maximize net benefits of aggregate supply across generations. Definition from SARMa Glossary (SARMa Glossary, 2011).

The structure of this report will reflect the double approach in data gathering. In the first part, a comparative synthesis of all the data collected with the questionnaires is presented, and in the second part details are given on best practices in each participating country.

¹ Raw data are available from the SARMa website (<http://www.sarmaproject.eu>)

Organisation name	Organisation acronym	Scope of the organisation	Country	Contributions
Montan University of Leoben and Styria Province	MUL & Styria	National/Local	Austria	SQ, PSR
Ministry of Economy Trade and Energy	METE	National	Albania	SQ, PSR
University of Belgrade, Faculty of Mining and Geology	RGF	National	Serbia	SQ
Regione Emilia-Romagna	ER	Regional	Italy	SQ, PSR
MBFH (Hungarian Office for Mining and Geology)	MBFH	National	Hungary	SQ
Parma Province	PARMA	Local	Italy	SQ
Geological Survey of Slovenia	GeoZS	National	Slovenia	SQ, PSR
Ministry of Economic Affairs of Herzegovinian Canton	MGK10	Regional	Bosnia Herzegovina	SQ
Geological Survey of Romania (IGR) and Bucharest University-Geology and Geophysics Faculty (FGG)	FGG & IGR	National	Romania	SQ, PSR
Former Pella Prefecture	Pella, IGME, TUC	National	Greece	SQ, PSR
Ministry of Economy, Labour and Entrepreneurship, Directorate of Mining	MINGORP	National	Croatia	SQ, PSR

Table 1 SARMa Partners involved into the preparation of this report. Please note that some partners provided information based on a single region legislation and experience i.e. some of the answers provided by Herzegovinian Canton, or by Emilia-Romagna Region can not be extended to the whole country they belong to. In the Synthesis Report the information has been reported referring to the answering region and only when applicable to the whole nation. For this reason in some chapters a partner can appear as representative of its nation and in other as representative only of a smaller area.

Methodology

The Questionnaire

The questionnaire was composed by more than one hundred questions and was designed to ease the comparison between countries by providing multiple answers. However, none of the questions was mandatory, and non-applicable questions could be skipped. This design structure was necessary since the involved partners participating to the SARMa project are heterogeneous (local to national public authorities, universities, geological surveys, private companies). Table 2 synthesizes this aspect, allowing a comparison of its role in SSM and the competences of each partner.

The WP 4.2 questionnaire has been distributed on a website with restricted access (see Figure 2), accessible upon invite. Participants had the opportunity to choose between filling an on-line form, or downloading editable documents to be compiled off-line. Approximately 70% of the participants preferred the on-line version of the questionnaire, while the remaining 30% were added to the database manually.



Figure 1 - Countries involved in the data gathering. Some countries gave increased detail inviting more than an authority to answer the questionnaire; other partners answered just referring to a specific region/province. Each Partner's contributions are detailed in Table 1.

Figure 2 -Web page of the SARMa Questionnaire for WP 4.2.

SARMa WP 4.2 (SSM & GIS) Questionnaire

If you feel uncertain about this questionnaire, or for any request, please contact [Sufano Purin](#) (REK consultant, Geotema S.r.l., Italy).



Web Questionnaire ENTER HERE

» this is our preferred method!

It allows us to collect data immediately into a database and it checks your answers while compiling. Furthermore, it adapts to your answers, showing only meaningful questions basing on previously collected data. You can suspend at any time and restore previous work when logging-in again. Please give it a try!



Editable Word Document DOWNLOAD IT

» this is a good alternative for early revisors

you'll be able to download the original .doc file (word 2000 compatible). The file contains all the questions presented into the web questionnaire and may became useful if you want to suggest revision to the questionnaire itself. It may be used also for sending us your answers in a more familiar way.



Printable PDF Document DOWNLOAD IT

» when everything else fails

you will not able to modify this file but you can print it, answer, then sent it back to us. It may be an alternative if you want to suggest modifications to the questionnaire itself but it is quite uncomfortable to be compiled.

The synthesis of data was performed using basic statistical methods. The results are grouped by common themes to give insights on how SEE countries plan for SSM, and the major divergences in the approach and application of best practices to assure an efficient SSM.

The Pilot Site Reports (PSRs)

Seven partners participated to this Action and submitted a detailed pilot site report. Regional/national approaches to implement SSM have been analysed through the PSR of seven case studies implemented at two different scales: regional (three partners involved: ER - Emilia-Romagna Region, Italy; Prefectural Authority of Pella, Greece; MUL- University of Leoben, Austria) and national (four partners involved: METE - Ministry of Economy, Trade and Energy, Albania; MINGORP - Ministry of Economy, Labour and Entrepreneurship, Directorate of Mining, Croatia; GeoZS - Geological Survey of Slovenia, Slovenia; FGG - University of Bucharest, Faculty of Geology and Geophysics, Romania).

In work package 4, bottom-up best practices for resource efficiency and top-down strategic plans for transnational harmonization of policies and legislation intersect. Relevant regional/national legislation, regulations, procedures and their bottlenecks have been studied. This kind of work lays the foundation for more effective management and implementation of legislation, inclusion of aggregates in land use planning, and harmonization of regulations.

The regional/national studies here synthesized consider nature conservation, water resources and transportation, as well as a GIS of supply-relevant data. Each partner has its own “point of view” and has deepened the main and well known topics inherent in their sectors of interest.

Part 1 Common practices in SSM

1.1 Legislation, planning and common management procedures

In every country, a set of laws exists to regulate extraction (*see also SARMa WP 4.1 Synthesis Report*) but not every country in SEE has adopted a national/regional minerals planning policy. The general tendency is to develop such a plan: more than two thirds of the investigated countries have already implemented a precise policy or at least a strategy document. Among the countries missing this kind of document are Romania and, partially, Bosnia-Herzegovina. The Herzegbosnian Canton at the moment has only a federal law for mining in effect, but soon expects to develop a strategy.

Not every country thus forecasts the future demand of aggregates. Where this is calculated, the countries consider many possible uses: industrial, private, building of infrastructure and landscape/environmental remediation. The aggregates demand is calculated on a national basis only in Slovenia and Albania, in all other countries the demand is estimated at regional level. Calculating the national demand is usually a good approach since it gives more space to optimization of resources production. In Austria, Greece and Croatia the demand is calculated at regional level, and in all other countries except Serbia and Hungary the demand is calculated on a local basis (county to municipality scale).

When considering the laws governing extraction, in many countries constraints to extraction are defined only by national/sub-national laws (see Table 3), with the noticeable exception of regulation of *Natura 2000* sites (EU Council Directive 92/43/EEC of 21 May 1992 on the *conservation of natural habitats and of wild fauna and flora* and subsequent emending acts). Laws may pose absolute constraints (forbid any type of extraction) or define special cases when extraction interferes with existing urban setting and environmental or landscape preservation, sometimes requiring harmonisation among different administrative levels.

Organisation acronym	Institution's competences and role in aggregates management									
	Legislative role in aggregates management	Planning role in aggregates management	Monitoring role	Data Management	Extraction management	Restoration management	Sustainability Verification			
MUL & Styria	●	●	●	●	●	●	●			
METE	●	●	○	○	○	○	○			
RGF	○	●	●	●	●	●	●			
ER	●	●	●	●	●	○	●			
MBFH	●	●	●	●	●	○	●			
PARMA	○	●	○	●	●	○	○			
GeoZS	●	●	○	●	○	○	○			
MGK10	●	●	○	○	○	○	○			
FGG & IGR	○	○	○	○	○	○	○			
IGME	●	●	●	●	●	●	●			
HGI/MINGORP	●	●	●	●	●	●	●			

Table 2 - Partner's role in aggregates management. Blue bullets indicate that the activity is an exclusive competence of the partner; green bullets indicate a precise involvement of the partner in the activity described; yellow bullets indicate an occasional involvement, whereas white bullets indicate no involvement at all.

Country	Scope and type of constraints imposed by law (A: absolute, R: relative/amendable)			
	Transnational (EU)	National	Regional	Local
Austria	*	A/R	A/R	**
Albania		R		R
Serbia		***		
Italy		A/R	A/R	A/R
Hungary		R		R
Romania		R	R	R
Slovenia	A	A/R	A	A
Herzegovinian Canton		R		R
Greece		A/R		A
Croatia		A	A	

*Table 3 - Type of constraints imposed by laws at various administrative levels. * = Natura 2000 areas result from trans-national (EU) law but where implemented in provincial laws. ** = In Austria just the national government and the provincial governments are in charge to adopt laws. *** = There are general constraints like: protected areas, state border areas, safety strips along roads, railroads, rivers, infrastructure.*

The major aspect emerging from the comparison of the data collected is the difference between countries when defining absolute/relative constraints. In Austria, Albania, Italy, and Slovenia the constraints are usually absolute, whereas in Serbia, Hungary, Romania and Herzegovinian Canton they are usually relative. This discrepancy can lead to significantly different extraction modalities even on adjacent areas, potentially creating “extraction paradises” (areas not subject to all the laws/rules/fees applying in the surrounds).

The aggregate planning policy should determine which authorities are in charge to develop a plan for future aggregates resources extraction and supply: depending on the rate of decentralisation of each country the planning role is in charge from national agencies to municipalities (see Table 4). According to the questionnaires, historical reasons and fitting to existing normative infrastructure are governing this choice more than size of the country, resource availability or the demand of aggregates. Several countries attribute various level of responsibilities (e.g. at national, regional and local level) in planning for aggregates, including Albania, Austria, and Emilia-Romagna (Italy). According to the results, countries with an area < 100.000 km² are more inclined to adopt a single national policy. Another aspect described in the mineral policy is the authority/board in charge to approve the plan: this depends on many aspects, but in general the approving board is at the same administrative level of the authority in charge of developing the plan (see Table 5).

Aggregates supply plans are effective for not less than 10 year (Emilia-Romagna, Slovenia), and up to 18 years (Austria), being updated every 3-5 years in almost all countries except Albania where no updates are expected, Croatia (no time limit) and Greece (where an authorisation to extract may expire or may change when new environmental constraints apply to designed excavated areas).

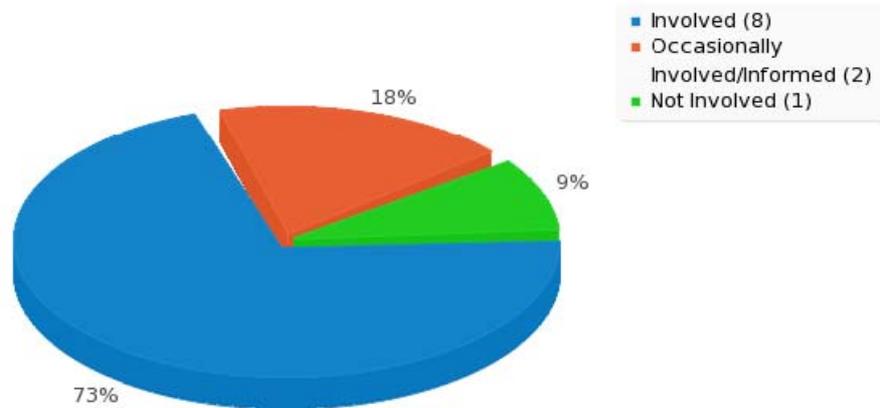


Figure 3 - The role of answering partners in planning for aggregates resources management

1.1.1 Role of sustainability when planning for aggregates supply mix (primary and secondary)

Planning to secure a supply of aggregates resource should take in account all possible sources and take in account a comparative sustainability assessment.

Possible sources of aggregates include both primary and secondary (recycled) resources (taken in account in ca. 55% of the countries), despite the fact that use of the latter source is usually only suggested, not prescribed by law. In Slovenia, as well as in Italy, some recycled resources are under the authority of different boards as outcomes of waste, reducing the possibilities to define an organic plan.

Existing aggregates resource supply plans are not evaluated against sustainability requirements except in Albania and Italy with a Strategic Environmental Assessment (SEA) document, according to EU Directive 2001/42/EC (in Italy SEA is required only since 2008). A Strategic Environmental Assessment document alone addresses only one aspect of the sustainability (the environmental one) where economic and social aspects are addressed into the aggregate resource supply plan. In many countries the plan must refer to a more general land management plan that may include a Sustainability Analysis.

Country	Board in charge of planning for future aggregates resource extraction and supply		
	national	← intermediate →	municipal/local
Austria		●	
Albania	●	●	●
Serbia	●		
Italy*		●	●
Hungary	●		
Romania			
Slovenia	●		
Herzegovinian Canton	○		
Greece		●	○
Croatia	●	●	

*Table 4 - Planning role and decentralisation for resources extraction and supply. Intermediate boards belongs to regions, counties, provinces. * Each region in Italy has its own regulations; the answers are representative of Emilia Romagna Region and Parma Province. ○: In Herzegovinian Canton the plan does not yet exist, but it is in development at the moment; according to the last revision of the draft document a national Board will be in charge to plan for future extractions. In Greece the designation of quarries takes place at prefectural level after a multi-member committee proposal.*

Country	Board in charge of approving the plan for aggregates resource supply		
	national	← intermediate →	municipal/local
Austria		●	
Albania	●		
Serbia	●	○	
Italy		●	●
Hungary	●		
Romania			
Slovenia	●		
Herzegovinian Canton	○		
Greece		●	
Croatia	●	●	

Table 5 - Boards in charge of approving the plan for aggregates resource supply. In Serbia the plan is approval by Ministry of Mining and Energy, except in Vojvodina autonomous Region where the role is demanded to the Secretariat for mineral resources and energy. In general the approving board is at the same administrative level of the authority in charge to develop the plan, with the exception e.g. of Bosnia Herzegovina where Federal Geologic Surveys will propose the plan, but it should be approved by the Government of the Federation of Bosnia and Herzegovina.

1.1.2 Authorisation to extract

In the areas where extraction is allowed, all extraction and processing activities related to aggregates require an authorisation. In Austria, Slovenia and Herzegovinian Canton the authorisation is provided by a national authority where in all other countries the authorisation is given locally. The evaluation of sustainability is provided by local authorities in all countries except Austria and Romania, where the evaluation is provided by a national authority.

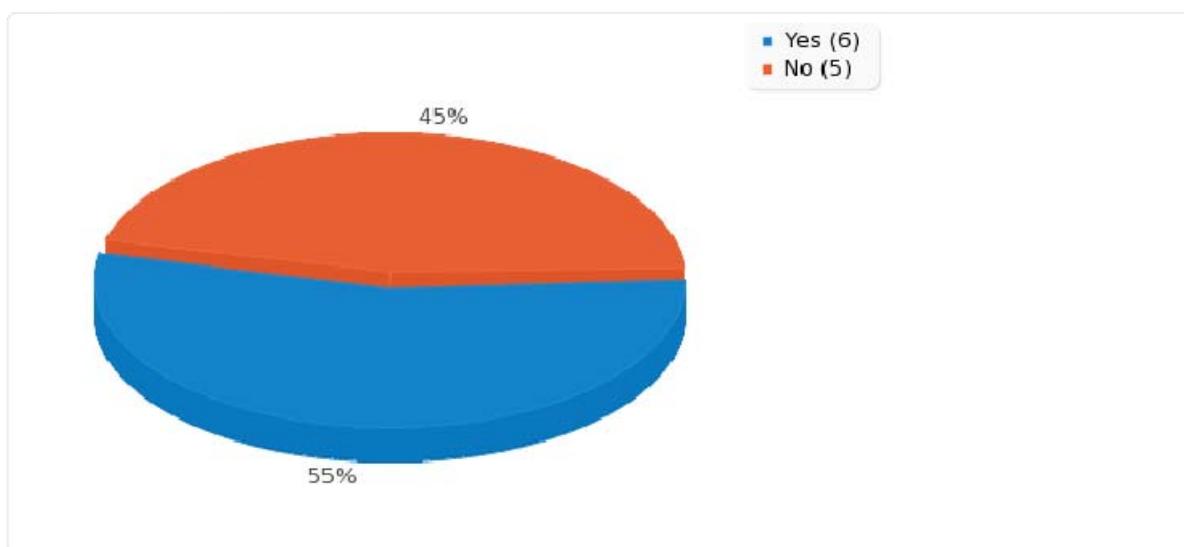


Figure 4 - Percentage of countries where a competition-based procurement is adopted.

The procedure to allocate future extractive areas, in Austria, Albania, Slovenia and Herzegbosnian Canton requires a competitive-based procurement system, whereas in the other countries the evaluations of candidatures are applied upon demand. In many countries authorisation requires the payment of a fee, but with extremely differentiated approaches. Many countries apply a constant fee to process the authorisation request, usually in the order of few hundreds euros, with only some exceptions (Romania, Slovenia and Herzegbosnian Canton) defining a fee according to the dimensions of the potential extraction area. Only in Emilia-Romagna Region (Italy) the authorization procedure does not impose additional fees. In almost every country some royalties are due if aggregates are extracted, with different prices, ranging from 2-20 €/m³ in Hungary to ca. 0.5 €/m³ in Emilia-Romagna region and Serbia (the latter define the fees in €/t).

The total amount of aggregates exploitable from an area is defined (and regulated) by different approaches (see Figure 5). Commonly the amount is undefined, or constrained only by technical limitations (like a maximum extraction depth, or the morphology of the area). The general approach seems thus to exploit an area to its maximum, in accordance to existing laws: social acceptability is only rarely taken in account.

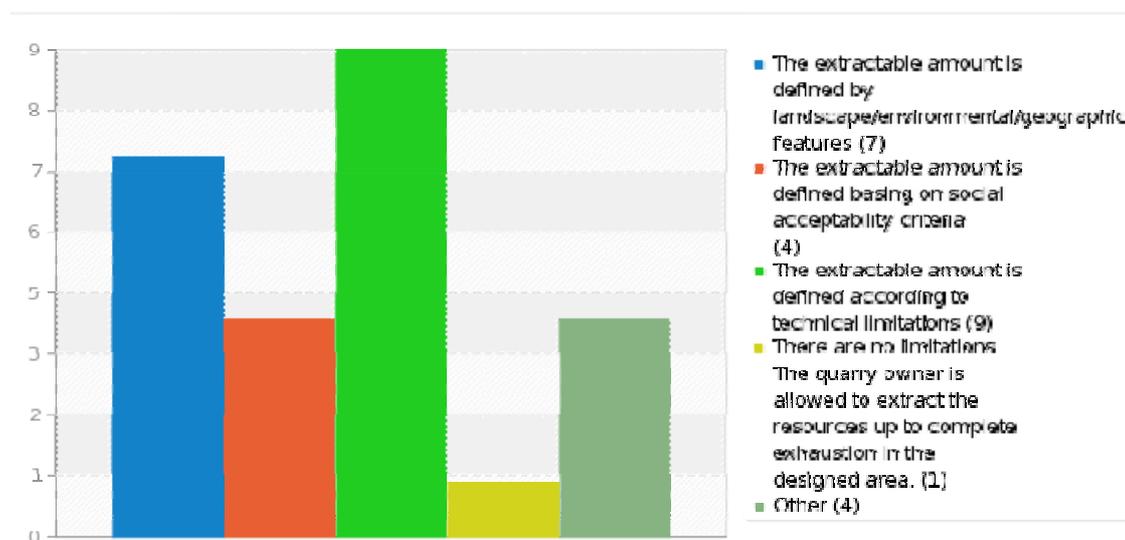


Figure 5 - How the extractable amount of aggregates are defined by extraction plans;

Collected fees are commonly used to mitigate impacts (see Figure 7) and sometimes to contribute to administrative expenditures, in order to process the authorisation documents, or future monitoring.

Country	Fees required during		
	authorisation	extraction	recycle
Austria	●	-	●
Albania	●	●	-
Serbia	●	●	●
Emilia-Romagna Region	-	●	●
Hungary	●	●	-
Romania	● / ●	●	-
Slovenia	●	●	●

Country	Fees required during		
	authorisation	extraction	recycle
Herzegbosnian Canton	●	●	●
Greece	●	●	● / ●
Croatia	●	●	●

Figure 6 - Fees due to produce aggregates. Authorisation: ● = proportional to aggregates production or area; ● = fee not proportional to the size of the site; Extraction: ● = upon payment of royalties; ● = upon payment of royalties but only for certain activities; Recycling: ● = fees are due to authorise recycling; ● = no fees are due to be authorised to recycle; ● = free if reduces pollution (e.g. soils) or subject to the same procedure of quarrying (e.g. rockwaste); ● = no recycling plant/no Cantonal laws so far. In Greece, fees are due only if the recycling plant is separate from the producing quarry.

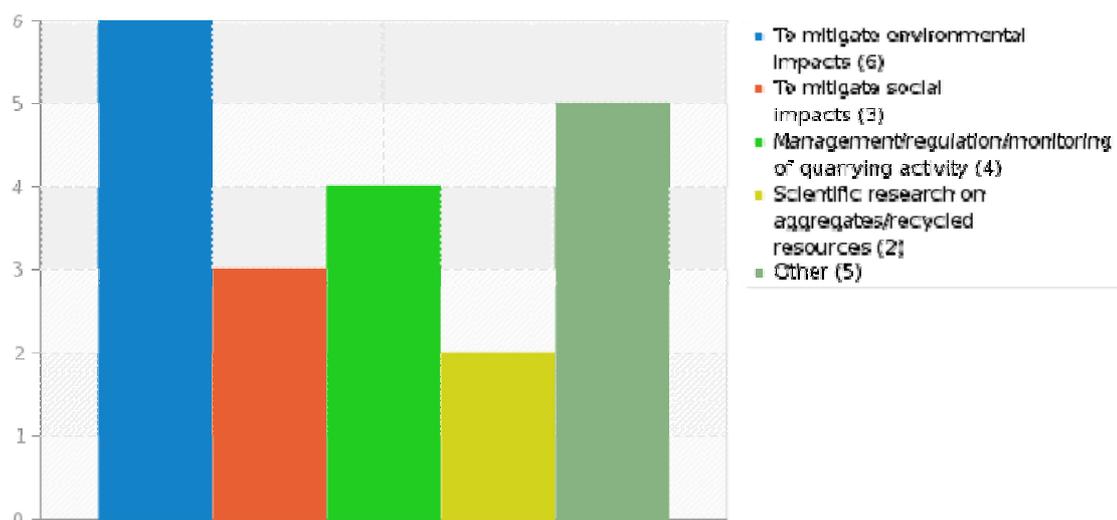


Figure 7 - Use of collected fees: the resources are commonly used to mitigate impacts, and only in some cases they compensate administrative expenditures (the “Other” case)

1.1.3 Extraction in rivers and river banks

River beds are owned by the state/community in every country investigated, but the activities allowed in river beds are different in each country: considering only activities generating aggregates, quarries are forbidden in Albania, Emilia-Romagna (Italy), Hungary, Greece, Croatia and Romania; activities related to land reclamation in river beds are forbidden in Albania, Emilia-Romagna, Romania, Greece, Croatia and Herzegbosnian Canton; hydraulic works and remediation are forbidden only in Albania and Herzegbosnian Canton; environmental arrangements are forbidden in Romania, Croatia and Herzegbosnian Canton. No strict limitations on the river beds activities are posed in Austria and Slovenia. Italian and Albanian legislation are the less permissive one, when considering the extraction in river-beds.

1.1.4 Monitoring competence for aggregates supply mix (primary and recycled)

Monitoring ensures the correct application of authorised extraction plans. The importance of monitoring is recognised in every country and discrepancies arise only on the modalities of verification (see Figure 8). For instance, technical inspections are routinely carried out in all countries except Croatia, administrative inspections are expected in each country except Romania, Herzegbosnian Canton and Croatia, whereas judicial inspections are less common and due only in Albania, Emilia-Romagna Region, Slovenia, Greece and Croatia.

Accordance with the extraction plans is verified everywhere by public servants (employees), sometimes assisted by external experts (like in Austria and Italy). Usually no fees are due to directly contribute to monitoring services, except in Austria and Hungary. It should be remembered, however, that in many countries the quarry owner is obliged to provide a yearly extraction report that may require external expertise (thus indirect expenditures) to be prepared.

The extraction report is usually checked against the national/local registry of authorised quarries in order to identify anomalies in the development of the extraction plan. If anomalies are found, the monitoring authority should investigate. GIS tools and remote sensing are considered a way to speed-up the monitoring phase, reducing costs and increasing efficiency. Ideally, these tools gather information on the authorised extraction practices and areas, and are queried every time a suspicious activity is noticed. In all countries except Hungary and Herzegbosnian Canton the authority is required to maintain a registry of authorised extractions, even if the documents are not stored everywhere in a digital format. Only a few countries store this registry on a GIS (see Slovenian Pilot Site Report for an example of extensive use of GIS in aggregates resource management). The registry collects information on authorised areas and volumes/weights. The lithological/mechanical characteristics of aggregates are not directly linked to this registry except in Emilia-Romagna Region, Slovenia and Romania, but even in these countries/regions the classification of aggregates resources broadly differs: in Emilia-Romagna Region they are classified by a mix of lithological and possible use of excavated materials, whereas in Romania EN classification is adopted.

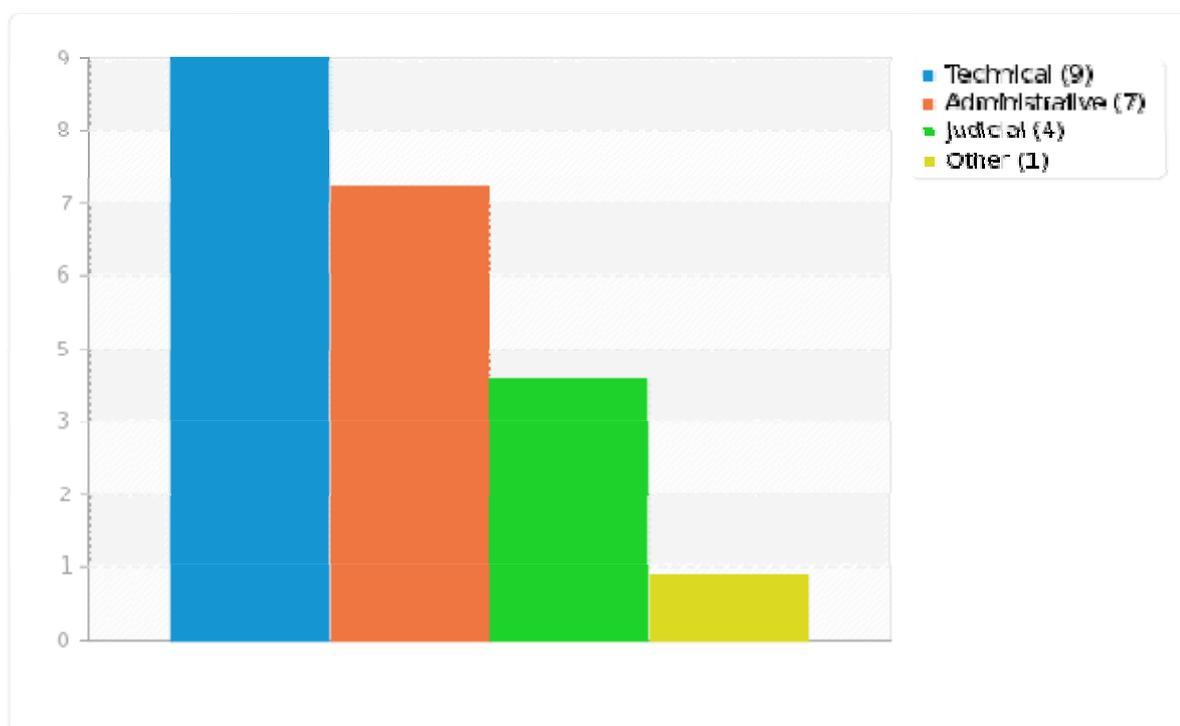


Figure 8 - Different kinds of inspection can be carried out on known quarries. Only technical inspections are ubiquitous, other inspections are carried out only in certain countries.

Monitoring authorised quarries is just a part of the activities required to reduce illegal practices (see also the Synthesis Report for Project Activity 3.2 and the WP3 manual for further information). Another requirement is to identify completely unauthorised quarries, a process that still requires to query a registry of authorised quarries, but that may also be aided by cross-checking extraction sites against maps of legal, environmental, etc. constraints/barriers. These maps are less commonly collected by monitoring agencies - even less transportation maps. More details are provided in the next chapter.

1.2 The Geographic and GIS infrastructure

It was previously stated that Geographic Information Systems (GIS) can contribute to improved efficiency of monitoring quarrying activities. This is also true when considering the optimization of logistics, the analysis of costs vs. benefits during the planning phase, and during sustainability evaluations. GIS also provides cheaper, informative and detailed mapping tools useful to generate thematic maps addressed to specific problems/areas.

The scanning and digitizing of documents and the adoption of GIS is still a work-in-progress in many countries, testified to also by the large amount of digitised, raster maps used as base maps during planning stage. Many of these maps should be converted to vectors in order to store more details, e.g. in geological/geomorphological maps. The transition is in progress, however it is valuable that the majority of the maps produced by mining plans are in vector formats.

Regarding which informative layers are routinely consulted when developing an aggregates management plan, the emerging scenario is quite homogeneous. In all countries, geological and geomorphological maps are collected to estimate resources, location and availability. In Emilia-Romagna Region the map of resources must be consulted at the scale of provincial plans, but not yet at regional/national scale. Geological maps are usually queried to identify the principal, outcropping lithologies, or the extension of sedimentary deposits. In Austria the lithological information is enriched by details on the quality of materials, and only in Greece and Serbia does the information provide details on the final uses of the aggregates resources.

When planning for future extractions it is commonly necessary to verify that the designed area can effectively host a quarry. This verification is achieved by two approaches: the first one is to check directly against legal constraints (like in Austria, Croatia, Emilia-Romagna Region, Romania, Serbia), the other is to refer to a more general land-use map (Slovenia) integrated by specific checks on archaeological, environmental and landscape protection requirements. Reference maps are usually detailed and available at a small scale (ranging from 1:10,000 to 1:50,000) with only few exceptions.

1.2.1 Coordinate Systems

National coordinate systems and different marine gauges for vertical coordinate reflect the different historical and administrative choices during the last two centuries. Only a few countries routinely adopt global or continental reference systems (ETRS89 or WGS84), but this is not a big issue if transformations are known. In any case the problem is evident only on small areas across international borders. The future pervasive adoption of GPS systems and EU initiatives like INSPIRE will potentially push more nations to refer to global coordinate systems.

1.2.2 GIS capabilities

Developers (full positions inside the boards or occasionally hired) and IT staff are routinely involved in defining solutions to help aggregates resources management. In all countries/regions, except Herzegbosnian Canton, the staff has additional knowledge in GIS and/or RDBMS (Relational Data Base Management Systems). This will favour a future coordination among offices, despite the fact that in many countries data are stored in a single computer, not allowing multiple access-concurrent data input or remote access to the data except via small intranets (shared folders).

A large number of countries (but not all) use a GIS software capable of complex spatial analysis tools. Only Herzegbosnian Canton has not adopted GIS solutions yet. Data integration with RDBMS is routinely carried out only in Austria, Emilia-Romagna Region and Slovenia. Remarkably, the same countries routinely provide metadata together with their datasets. Other countries rely on excel files or attributes into feature layers.

Almost all answering partners forecast that the management of spatial datasets will change only slightly in the near future, probably reflecting the expected evolution of GIS technology and funds availability.

1.3 The knowledge framework for a sustainable aggregate supply plan

One of the fields that more clearly reflects the heterogeneity of approaches is the sustainability evaluation. It is interesting to observe which data are considered when assessing environmental impacts, for instance. Only a few countries seem to have a common source of environmental information; all the others rely on small area studies or a multiplicity of sources. Among different environmental themes, the commonest is land-use, followed by vegetation and agro-vegetation maps. Habitats and faunal characteristics are neglected. This may be explained by the national role of many partners. Usually complete and detailed environmental information are available only at local scale, whereas land-use is more likely to be available at national scale.

1.3.1 Environmental, economic and social sustainability

Environmental sustainability studies define the adopted modalities of extraction in many countries to reduce impacts and in every country the quarry owner is obliged to restore/remediate the quarry area at the end of extraction. Only in Austria, Albania and Emilia-Romagna Region is the quarry owner obliged to maintain the area also for some years after the remediation, usually for 2-3 years.

The sustainability requirements also describe the modalities of restoration in many countries; sometimes they are described at the beginning of quarry development (before approval), in other cases at the end of the productive phase of the quarry.

1.3.2 Aggregates' alternatives and recycling

In almost every country the sustainability requirements take into account only for the resources to be extracted from the quarries, and do not include other sources of aggregates materials as possible alternatives. This is caused by a lack of normative regulating the inclusion of alternatives in plans or by difficulties in collecting information on the availability of the recycled aggregates. Sometimes these alternatives are even considered a threat to the producers, since they reduce the potential market for the primary aggregates.

1.3.3 Secure transportation

Marine transportation is considered only in the Greek plan. It is acknowledged, however, that marine transportation is adopted also to ensure trans-national commerce among seaside countries on the Adriatic Sea. This strengthens the point that trans-national trade is not part of management plans. Rail transportation is the more common alternative, and fluvial transportation should also be considered, even though that is not possible in many areas.

Country	Kinds of transportation routinely adopted			
	Road	Rail	Fluvial	Marine
Austria	75%	25%	0%	0%
Albania	100% *	0%	0%	0%
Serbia	90%	5%	5%	0%
Emilia-Romagna Region	90%	5%	5%	0%
Hungary	90%	5%	5%	0%
Parma	90%	0%	10%*	0%
Romania	80%	10%	10%	0%
Slovenia	90%	10%*	0%	0%
Herzegovinian Canton	100%	0%	0%	0%
Greece	90%	0%	0%	10%*
Croatia	90%	10%*	0%*	0%

Table 6 - Transportation modalities. * = transportation modalities promoted by local authorities.

Sustainability evaluations consider the transportation mode in many countries. Usually the evaluation is focused on impacts on urban areas crossed, impacts on the circulation of other vehicles (type of the roads), on habitats (noise/killings) and emissions into the atmosphere. When new infrastructures are required in order to permit aggregates production, they are usually included into the sustainability assessment.

1.3.4 Costs vs. Benefits analysis

In many countries Sustainability Analyses (SA) for mining plans benefit from Environmental Impact Assessment (EIA) studies of the authorised quarries. This means that sustainability analyses are carried out only when applying a mining plan, not during its development, and that the SA forecasts impacts only at local scale. Only in a few countries (Italy, Austria), is a Strategic Environmental Assessment for mining plans also required, meaning that a SA is carried out during the development of the plan itself. When SEAs are available, SA may benefit also of these evaluations.

Economic effects are investigated in all countries, but only half of the countries try to precisely quantify/estimate them. For social effects the scenario is similar, but quantification of effects seems to be even more difficult. Environmental effects are taken in account similarly to economic effects, commonly by a tentative quantification.

1.4 Dissemination of aggregates management plans

Only in a few countries are maps of resources, barriers to extraction, and the registry of authorised quarries actively divulged. In many circumstances the documents are freely available upon request, but they are not placed on a website or other public dissemination media. This has a double effect on illegal quarrying: on one side it makes it more difficult to establish new (illegal) extractions on areas with relevant mineral resources, but on the other side it reduces the possibility for citizens to check if an area is authorised or not, and this favours illegal quarrying.

Sustainability evaluations are taken into account as suggestions and/or prescriptions when developing a mining plan in Austria, Italy, Serbia and Slovenia. In almost all countries, the SA results are simultaneously presented to inhabitants, environmentalists, industrialists and businessmen, as a draft document or eventually at the end of the evaluation process. Stakeholders can participate in the development of management plans in all countries where such plan exists, but only in a few countries can they impose changes. In Austria, Slovenia, and in some Italian provinces like Parma, stakeholders are informed about the actuation of the management plan, and in the majority of countries they can access the plan anytime (usually upon request). Web publication and presentation seminars are not routinely adopted as communication approaches.

Part 2 The SSM experience in SEE

The main objective of the project is to develop a common approach to sustainable aggregates resource management (SARM) and sustainable supply mix (SSM) planning, at three scales (local, regional and national), to ensure efficient and secure supply in SEE. Specific objectives include capacity building, development of information, infrastructure, and planning for a Regional Centre on SARM and SSM.

Work package 4, which includes this kind of activity, is the central thematic WP, where bottom-up best practices for resource efficiency and top-down strategic plans for transnational harmonization of policies and legislation intersect. Relevant regional/national legislation, regulations, procedures and bottlenecks have been studied. This kind of work lays the foundation for more effective management and implementation of legislation, inclusion of aggregates in land use planning, and harmonization of regulations.

Local, site-level activities have been developed to focus on environmentally friendly extraction through best practices, reducing illegal quarrying and recycling, and to decrease the use of primary aggregates. Regional and national activities shall *create* a SARM framework for effective management, and *define* SSM, as well as recommend how to integrate SSM into planning and legislation.

With this aim in mind 7 case studies were implemented at two different scales: regional (3 partners involved: SPRF - Emilia-Romagna Region, *Italy*; Prefectural Authority of Pella, *Greece*; MUL- University of Leoben, *Austria*) and national (4 partners involved: METE - Ministry of Economy, Trade and Energy, *Albania*; MINGORP - Ministry of Economy, Labour and Entrepreneurship, Directorate of Mining, *Croatia*; GeoZS - Geological Survey of Slovenia, *Slovenia*; ERDF:FGG - University of Bucharest, Faculty of Geology and Geophysics, *Romania*).

The regional/national studies synthesized here consider nature conservation, water resources and transportation, as well as a GIS of supply-relevant data. Each partner highlighted one or more of the sections described, based on their specific knowledge and sectors of interest (see Table 7).

Partner	Spatial framework	Geological settings and resources	Biological framework	Operational and market characteristics	Administrative and legal framework	Environment impact assessment	Best practices approach
ERR - SPRF	●	●	●	●	●	●	●
PELLA	●	●	●	●	●	●	●
MUL	●	●	●	●	●	●	●
METE	●	●	●	●	●	●	●
MINGORP	●	●	●	●	●	●	●
ERDF- FGG	●	●	●	●	●	●	●
GEOSZ	●	●	●	●	●	●	●

Table 7 - Review table of the contents of all the PSRs (Pilot Site Reports), built to help the readers in the selection of the best pilot site concerning their specific interests. The meaning of colours is given in Table 8.

Classification	Data collection	Maps and geographical dataset detail	Insights
● Complete	In-depth	Detailed	Detailed
● Deepened	In-depth	Well documented	Yes
● Good	Well documented	Absent or some notes	No
● Light	Some notes	Absent	No
● Unavailable	Not available	Absent	No

Table 8 - Classification approach adopted in Table 7

Generally speaking, all the case studies provided a complete and deepened spatial and geological framework, with good to excellent geographical details (relationships between quarry areas, infrastructures, protected areas and Nature 2000 sites; Corine Land Cover main frames). Substantially the same level of detail (from the good to the complete one) was reached regarding the administrative and legal issues and the operational and market characteristics.

Relationship analysis between quarry activities and nature conservation (species and habitats) seems still to be the framework most in need of improvement in the European context. Gaps can be found in both the biological frame analysis and in the best practices approach, which rarely lead to concrete and well-structured purposes. A very good example of “how-to-work” in the field of the relationships between environmental conservation and quarry activities is the work of MINGORP (Croatia), which provides single species-directed solutions for the reduction of quarry impacts.

The analysis offered by MUL is excellent, with very deepened and very well documented insights in all fields and in particular in the operational and market analysis; in the method of dealing with case-studies and in the land use planning for aggregates analysis with a specific insight about methods for integration of SSM in land use planning.

2.1 Best practices

Sustainable Aggregates Management faces the challenging dual-target of providing economic growth without excessive environmental and social impacts.

The main negative factors influencing aggregates extraction is the negative perception of the public (which does not differentiate between legal operator and illegal ones), time consuming processes of licensing, and conflicting regulations.

Furthermore, media coverage of the sector is targeted towards negative practices while positive examples are mainly ignored. In general, this happens despite the fact that many companies contribute more to the local communities than they are legally obliged to do, such as co-financing of sports, cultural activities and similar efforts, as well as maintaining good local community relationships. Another widespread, good practice is to do the extraction in the way that waste is kept to a minimum.

It should be highlighted, however, that most concessioners are reluctant to implement best practice codes when that reduces their profit. This is due to the fact that most companies do not have management vision and do not consult modern management practices. This is reflected also in a lack of investment towards better machinery, and reduction of noise/dust emissions, despite the fact that this is mandatory to avoid financial penalties, issued by the Mining inspectors. In Croatia, Slovenia, and also in many other countries, most producers are ignorant of sustainable practices and environmental conscience: for this reason areas of environmental protection are usually seen as barriers.

2.1.1 Forecast future demand of aggregates

In some countries aggregates management plans forecast future demand of aggregates and secure aggregates supply. Good examples of such plans are provided by Leibnitz, Deutschlandsberg and Graz areas in Austria, and by Parma Province in Italy. Regarding future demand for aggregates in the concerned regions, it would be important to establish short, medium and long-term aggregates demand and supply (i.e. forecasting) scenarios taking into account future supply potential including primary and secondary resources. Based on such demand and supply scenarios, aggregates land use supply concepts could be developed (including material flow analyses for different needed application).

2.1.2 Assure competitiveness of the aggregates industry

Investment security for the operator is crucial. When granting permissions for hard rock quarries a 50-year timescale (i.e. approved aggregates reserves) should typically be considered. No permissions should be less than 15 years; otherwise the major capital investment cannot be justified. Even in such cases, renewals for similar periods should be anticipated from the outset. For sand & gravel pits, the permission timescale should be 15-50 years depending on the scale of the deposit, with further renewals anticipated, also proportionate to the scale of the deposit. When granting permissions, the duration of these should always be in line with the lifetime of the deposit: sustainability requires the extraction of the total deposit.

In that regard, some concern may arise particularly in terms of non lithified deposits, like sand and gravel extraction.

In Emilia Romagna Region, as well as in Leibnitz Region approved reserves only last for about 10 years; furthermore, the potential conflict with water supply resources, the landscape preservation practices, the environmental impacts reduction practices and good restoration practices require that only a part of the deposit can be extracted.

2.1.3 SSM polices in land-use planning and management

The step of regional planning is especially important for the regulation of the raw materials affairs. With the help of precise statements, regional plans (based on wider development programs, like national and super-regional ones) determine the regional goals of land use planning for the development of single districts. A regional land use plan designed for the extraction and protection of mineral resources has to contain a precise planning depiction and a textual statement. The textual statement included in the plan has to define the term “*aggregates resource priority zones*” so that these should be guaranteed, while carefully considering the medium and long term mineral resource demands, and the limited availability of mineral resource deposits.

Methodically speaking, two different approaches in land planning could be used. The first approach is to limit the planning by excluding certain usages for a specific area. This method has a disadvantage, because a sustainable aggregates supply, i.e. a systematic and formalized securing of aggregates resource areas with priority, is not possible. In the second, alternative approach, the fields of other usage priorities reduce deposits that are worth extracting and the remaining fields become aggregates resource areas with priority. The advantage of this method is the fact that the authorities can go in for a concrete aggregates resource policy, despite the fact that land speculation can occur.

The determination of “*aggregates resource priority zones*” itself is an encroachment in the basic property right (and thus needs a clarification with the concerned ground owner). It is justified if there is the need of public interest, which is true in the case of aggregates supply/extraction as required for economic development. However it should be clear what quantity and quality and for which application the resource will be needed in the mid-and long term. To justify the designation of an area as “*aggregates resource priority zone*” requires an analysis of aggregates market structure, and a material flow analysis.

Besides that, and based on Austrian experience, it must be mentioned that aggregates extraction also may be permitted outside raw materials priority zones, i.e. in the agriculture zones - if the municipality *agrees*. That will certainly depend on the quality of conflict management between the operator and the municipality (and concerned citizens). However, this possibility is regarded as positive by the local operators; thus, the social component of SSM will be of importance (for instance providing a mediator etc. seems to be useful).

2.1.4 Social acceptance

To increase the social acceptance of sand and gravel pits and quarries a stronger involvement of the communities in the planning and management process should take place at the earliest stage as possible (and during the whole process) both in terms of land use and pit/quarry project management and the restoration plan definition.

Another best practice is to educate people to sustainable quarrying activities and provide the opportunity to discuss bringing together environmentalists, administrators, aggregates producers and cultural workers. A good example is provided by IGM Šljunčara Trsenik, a Croatian company. The company organizes visits of both local school children and pre-school children to familiarize them with quarrying, uses of aggregates and the benefits of these activities to society. The company therefore communicates both with the academia and also with professional associations of producers, but mostly it focuses on the local community. Also during the preparation of the Urban plan of the municipality of Rugvica the Urban plan for the closure of the quarry was also developed. This is a rare example in Croatia where both miners and urban planners shaped the final stage of the quarry with the public consent of the local community.

Quarry operators are usually aware that environmental and social attention during extraction is vital for the company's future. Companies today are trying, in general, to practice "Corporate Social Responsibility" on high level. Consequently, business would embrace responsibility for the impact of its activities on the environment, consumers, employees, communities and stakeholders.

In Greece (and also in other counties), companies does not invest too much to best available machinery, and usually reduce their noise and dust emissions just to satisfy the regulatory decrees and to avoid financial penalties, issued by the law.

2.1.5 Environmental sustainability

Processing yards can obtain environmental certifications (ISO 9000/ISO 14000) based on specific technical and environmental requirements. In Emilia-Romagna planning instruments (PIAE) yards compatibility evaluation is also determined by a set of indicators that includes environmental parameters, such as: distance from fluvial habitats and naturalistic defence strips; visual impacts; depuration processes; and distance from inhabited areas. With regard to fluvial ecosystems, the most relevant impediments to a better management are:

- lack of knowledge on the legislation related to Protected areas and *Natura 2000* sites, by the regional services in charge of issuing the licenses for State properties land use (State properties cover in general the most of the natural ecosystems along the river banks);
- lack of knowledge and/or deepened insights about species and habitat conservation and about rehabilitation and restoration management (Provincial services in Italy, Agencies, Costumer designers)
- lack of regular dissemination of information to particular stakeholder groups (environmental organizations, Universities..)
- lack of coordination between Agencies
- lack of monitoring.

The need to improve the relationship between protected areas and other land uses has also been raised in Romania.

2.1.6 SSM-issues with particular focus on secondary resources

Ensuring a well-mixed supply of primary and secondary aggregates resources is a real challenge for the future. In terms of sustainability, each policy and legislation possibility should be realized in order to use secondary resources as much as possible. It should be noted that this is also a matter of recycling market structure and prices. This not only reduces the need for primary resources (i.e. prolongs the availability of natural resources for future generations), but it also reduces landfilling of industrial waste. Therefore, each aggregates supply concept based on land use planning and management should include *appropriate tools, instruments* to increase the use of secondary resources.

2.1.7 Legal and administrative framework

Permitting procedures should be efficient and effective. All departments involved should be well connected and united in one department if possible (one-stop-shop approach). Also it is assumed that permitting procedures will be based on land use planning and management at least in terms of the selected aggregates resource priority zones.

Some aspects, relevant for SARM and SSM should be part of National/Regional Mining Law, including:

- Resource efficiency, i.e. avoiding waste
- Use of best technical environmental standards
- Transport according to municipality traffic principles
- Guaranteeing funding for restoration
- Consideration of land use planning in permitting procedures
- Aggregates security at a broader level must be considered

2.1.8 Coordination between permitting authorities and land-use planning management

It is useful to improve the coordination between permitting procedures/authorities and land use planning management. A coherent aggregates planning policy must be based on relevant data and information. The geological knowledge, i.e., knowledge of location, quantity and quality of mineral deposits in general, is well known (a good example is provided by Croatian County mining-geology studies). Land-use limitation and protected areas must then be taken into account to define the aggregates resource potential of an area.

However, lack of knowledge in terms of aggregates demand, incorrect information of produced aggregates amounts, lack of information on recycling rates at district level is indicated.

2.1.9 Remediation Plans

A remediation strategy, defined during the first phases of development of the planning phase for quarrying, avoids exhausted quarries to become uncontrolled waste disposal sites. To ensure that a restoration plan will be actuated it is necessary then to secure economic resources, e.g. by guarantees or deposits.

To achieve better results on rehabilitation and restoration final disposition, restoration types planned by national, local plans and quarry extraction plans should better fit the environmental context in which they will be realized (e.g. in the Trebbia River Case study - Emilia-Romagna Region.)

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