

# SNOWMAN

## **WORKING TOGETHER IN RESEARCH AND DEVELOPMENT FOR SUSTAINABLE LANDMANAGEMENT IN EUROPE**

THE VISION OF SNOWMEN

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## 1. Introduction

The main goal of the SNOWMAN-project is to analyse the possibilities for improving co-operation in Europe between the national RTD programs in the field of soil and groundwater management under the pressure of contamination. WP-2 concentrates on the formulation of a vision to develop approaches to the achievement of co-operation and the subsequent success factors. In this paper Section 2 gives some background to the scope of SNOWMAN, relating to the research fields it addresses. In Section 3 a description is given of the RTD-process. In Section 4 the possible benefits of co-operation are highlighted and Section 5 discusses the way co-operation could be achieved. In Section 6 finally a description is given of a stepwise approach to realize European co-operation.

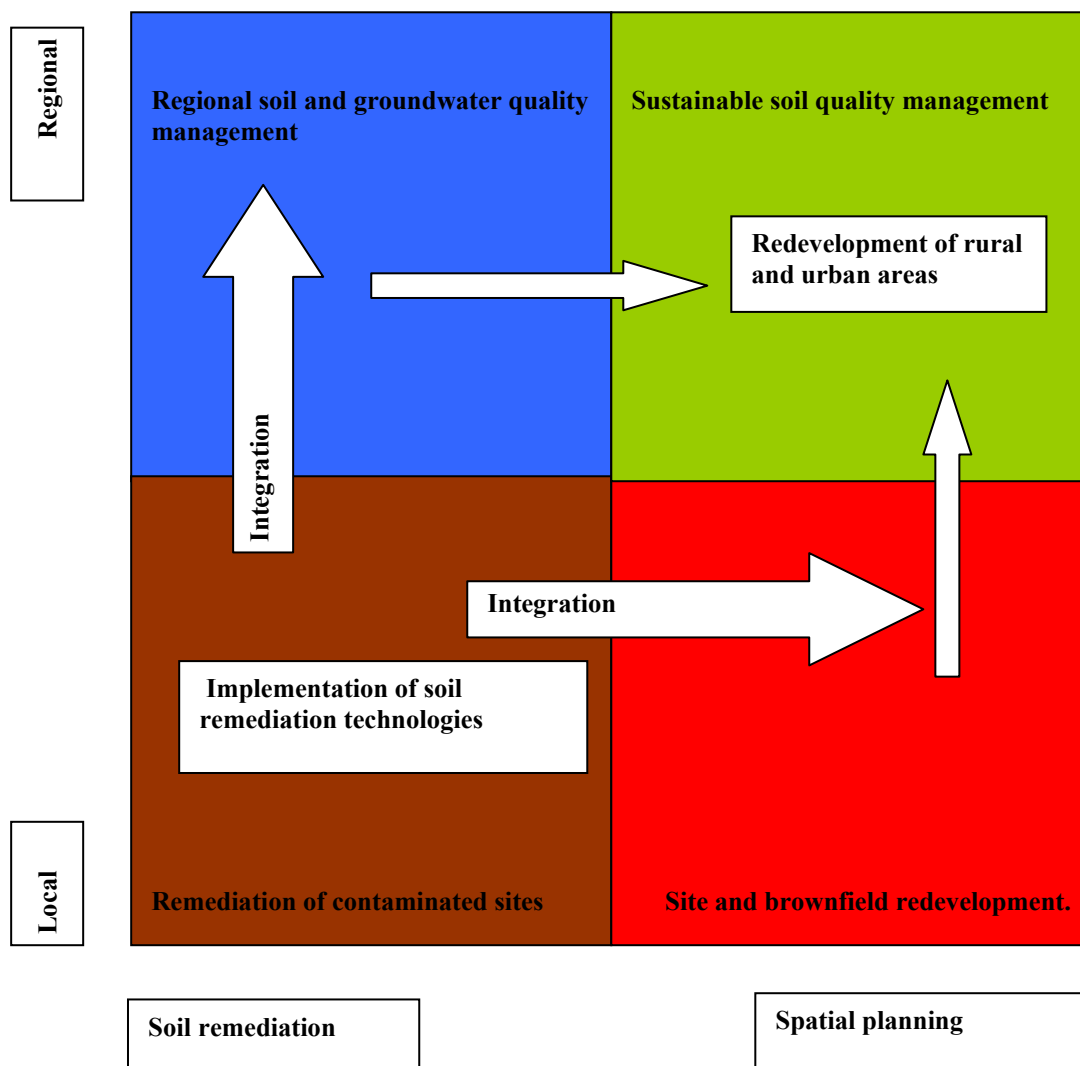
## 2. Scope of SNOWMAN: focus on research areas

*“when you know what you don’t know you know everything”*

The discussion about co-operation in R&D for soil quality management starts with the question: Co-operation about what? What type of research about what type of application is relevant for co-operation? In this paragraph a description is given about the development of the soil quality management process and the type of research that is relevant in the several stages of development. The phase of development will not be the same in all European countries. Therefore the conclusion can be made that the relevancy of R&D will vary in the different countries and co-operation between countries can have different focuses and different goals.

The different phases of development in soil quality management is illustrated in the next figure.

*Figure 1: Phases in the implementation of soil quality management*



### Remediation of contaminated sites

Much research in the last 10 to 15 years has been related to the remediation of contaminated sites. In this area implementation, demonstration and evaluation of developed technologies and approaches is the first priority.



Most of the formulated research needs in the former or existing European networks concerns the remediation of contaminated sites. A future development in this area is that, as remediation progresses, the attention to soil protection, to prevent new contamination, will increase. In the same time long term remediation processes like natural attenuation, will increase attention on soil monitoring and quality management. Soil quality management for site owners could be integrated into general site management or be a part of Health, Safety and Environment (HSE) -management. Applied research and implementation and dissemination of knowledge is the main issue in this field. Apart from natural sciences, social, economical and organizational sciences will be subject for studying the process of dissemination and implementation of knowledge and the integration into site management and HSE management.

### **Site and brownfield redevelopment**

Over the last 5 years the integration of soil remediation in site development and brownfield redevelopment has also been an area of research (CABERNET; [www.cabernet.org.uk](http://www.cabernet.org.uk)). The integration of soil remediation in urban planning is an important goal. Aspects such as organization, co-operation and co-financing are becoming as important as technology.

The integration of soil quality remediation into spatial planning, site and brownfield redevelopment means, that soil quality managers have to get familiar with spatial planning processes and the goals and interests of the stakeholders in this process. Soil quality managers have to think about the added value of soil quality management for this process and the importance of soil data and knowledge. This integration does not need much R&D. Process redesign, stakeholder analysis methods, methods to support changes in behavior and attitude of soil quality managers are relevant. Exchange of experiences between soil quality managers is more important than exchange of knowledge.

### **Regional soil and groundwater quality management**

The integration of soil and groundwater pollution into regional soil and water quality management is starting to happen in some countries. The implementation of the Water Framework Directive and Groundwater Daughter Directive will increase this integration during the next 5 to 10 years.

The integration of soil remediation into regional soil and groundwater quality management still needs more fundamental and strategic research. Sources of diffuse contamination, fate and behavior of contaminants in large areas and in a long term range have to be studied. The relation between soil quality, groundwater quality and soil use is also important. Apart from strategic research also concepts and systems for regional quality management have to be developed. Know how and experience with the implementation of these methods and concepts will be relevant after 5 to 10 years.

### **Sustainable soil quality management**

In the mid term and long term the focus of the research will be on soil quality management and sustainable soil use related to the (re)development of rural and urban areas. The research agenda of Professor Blum<sup>1</sup> follows that development. It is likely that the research agenda of FP7 on soil matters will also be focused on this issue.

The results of the integration into spatial planning and regional soil and groundwater management can be used in sustainable land management. Apart from contamination, other soil quality criteria are relevant for sustainable land management. The research agenda of professor Blum for soil quality formulates 8 threats for soil quality. Only one of them is soil contamination. That means that other fundamental, strategic and applied research is at the research agenda for sustainable soil management.

### **Different phases in soil quality management in Europe**

It has to be taken into consideration that the development of soil quality management is in different phases in the different European countries. West European countries are in the phase of integration and sustainable soil quality management will be on the agenda within 5 years. In the new member states site remediation has the highest priority. In some countries aspects of sustainable land management are already relevant at this moment. The co-operation between R&D on soil quality management depends of the phase of development of this process. Therefore co-operation in R&D may vary between the different member states.

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<sup>1</sup> Winfried E.H. Blum: European Union Soil thematic strategy, Working Group Research, March 2004.

### 3. Scope of SNOWMAN: focus on the RTD-process

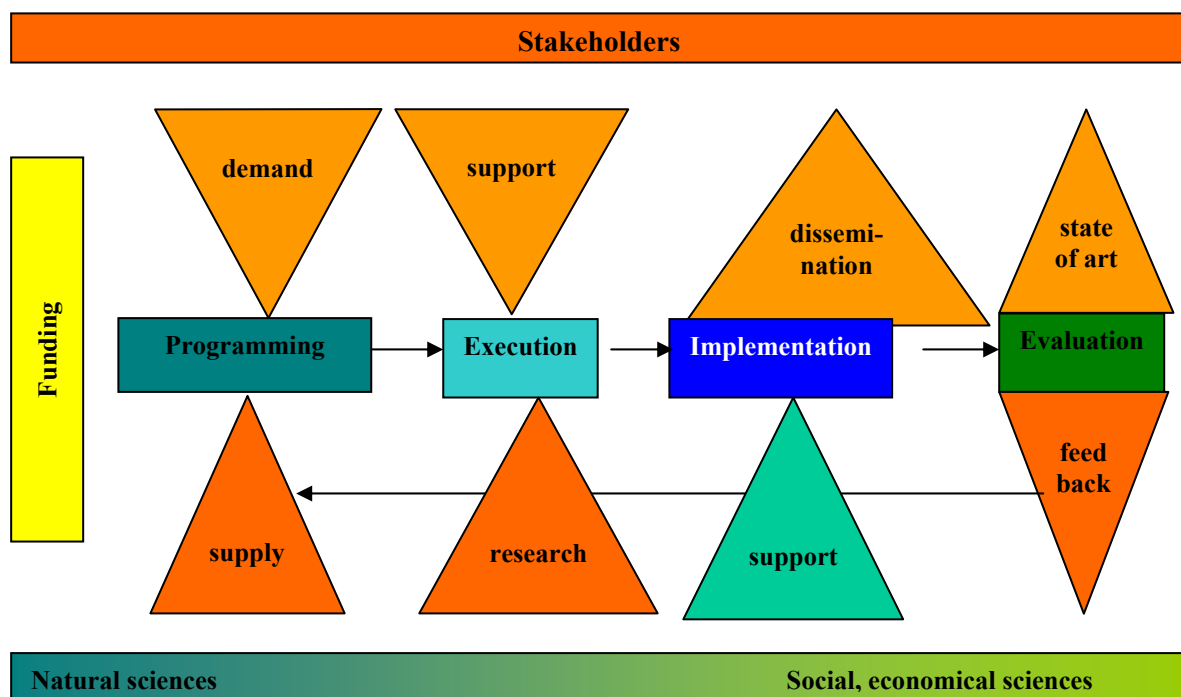
*“What is innovative today is normal tomorrow”*

Co-operation in R&D can also relate to the several stages in the R&D process. Starting with programming R&D, what are the research needs, with know how is lacking, up to implementation and evaluation in practice. The common final goal of R&D is the use of the results of research into practise. In all the participating countries within SNOWMAN, there is a need to increase the effectiveness of R&D, that means to improve the use of R&D results. But the context in which results have to be applied differs. The input of social and economical sciences can help to overcome the barriers with the implementation of the results of the R&D-process within the different contexts.

The focus of fundamental and strategic research is different than the focus of applied research. Also the stakeholders are not the same. This has to be taken into account in analysing the way of European co-operation.

In this paragraph a description of some of the aspects of the R&D process is given.

**Figure 2: The RTD-process**



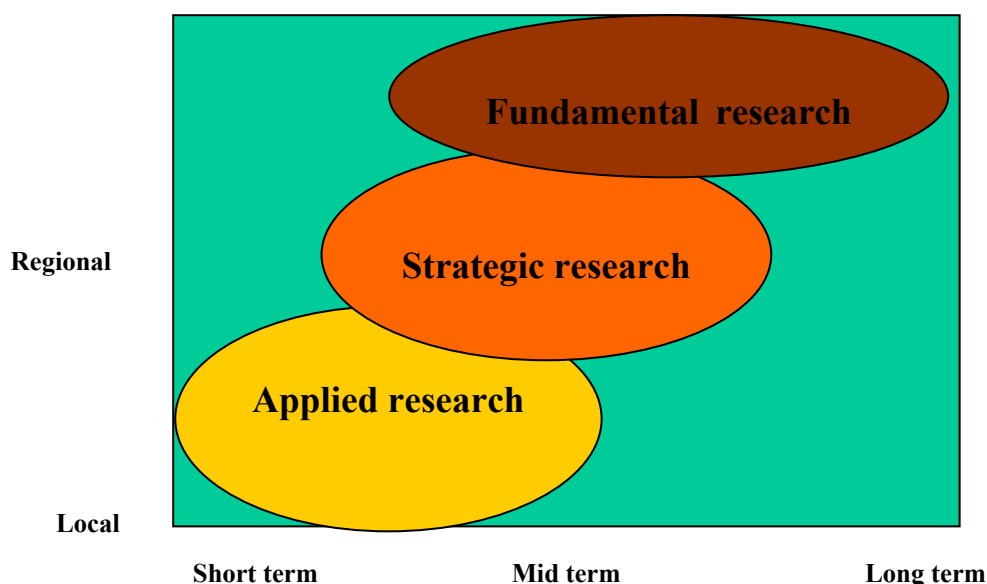
The complete cycle of research and development of know-how, the innovation process, starts with the formulation of research needs and ends in the practical evaluation of applied new technologies and feed back of the evaluation results to the end-user. In industrial research the number of organisations involved in this process is limited. An industry, or branch of industry, usually formulates the research needs themselves. One or more research groups or institutions can be contracted to execute the research. Implementation into the production process, marketing, evaluation of the product and feed back is also done by the industry itself.

With societal issues, for instance in relation to environment or soil quality, many stakeholders can be involved. Governmental departments, regional and local authorities, site owners, environmental groups and citizens act as stakeholders on the demand side. Questions are often multi disciplinary, so on the supply side research groups are also involved. Know how has to be transferred to consultants and contractors. Evaluation of innovations are not only technical (does it work), but also social (do we accept it) or economical (do we want to apply it). Therefore the R&D process, the communication between stakeholders, suppliers and researchers has to be organised and managed.

The importance of the steps in the RTD process depends on the type of research that is at stake. For fundamental research the steps to implementation and evaluation are far away. Stakeholders of this research can be scientists themselves or governmental departments. They mostly have a national or international orientation and a mid-term or long-term view. For strategic or applied research the stakeholders will be more regional or locally oriented and have short to mid-term views.

**Figure 3: Types of research, stakeholders perspective**

**(Inter)national**



These aspects have to be taken into account when talking about European co-operation in the RTD process. The funding of the different kinds of research is different in the SNOWMAN partner countries. The European networks that are existing are also working with different groups of stakeholders and types of research (e.g. NICOLE is a network of local problem owners interested in applied research). In the field of contaminated soil and soil remediation strong networks of scientists, research institutes, authorities, consultants and end-users already exist. Former projects like Clarinet, NATO/CCMS or recent projects like Cabernet, Eurodemo and new projects like AQUATERRA build up strong European and international networks. Because of this, co-operation between research programmes in this field can be potentially successful.

Much of the research is financed by central governments. National or regional authorities are important stakeholders, especially for research for policy development, delivery and implementation. So, organisations other than the primary funders are often the main users of the research results and this has to be taken into account when stakeholder involvement must be increased.

More attention must be paid to implementation and evaluation of know how to increase the effectiveness of R&D. Up to now only a little of attention has been paid to this subject. The idea is, that attractive concepts and technologies will be used after publication and dissemination of know how. This is often not the case. There are other constraints (uncertainty, avoiding risk, unwilling to changes) that prevent the use of new approaches and technologies. Innovators experience change as a challenge. Early adopters want to distinguish themselves from others. But the main challenge is to get new approaches and technologies accepted by the early majority and late majority (laggards) until new technologies become state of art. The role of the management of stakeholders can be important for this process.

## 4. Co-operation

### 4.1 Motivations

*“ There are thousand reasons to fail but no one excuse ”*

There seem to be many constraints in realising good co-operation between the individual RTD programmes. Nationalism, independency, different procedure, different responsibilities and mandates do not make it easy. So there must be a strong motivation to overcome them. Each individual country’s programme has to perceive a benefit to them from co-operation. The benefits the members of the SNOWMAN consortium see in this European co-operation can be summarised into 4 different groups:

- **Influence:** increasing influence on European soil policy and European R&D budgets for soil research. The priority of soil research on the European research agenda may also influence individual member states’ priorities. There is an expectation that, within several years, a European Research Council will be established. Good co-operation between national R&D programmes could increase the influence in the future Research Council. By acting together public confidence in research can be strengthened
- **Effectiveness:** Effectiveness is seen as the degree of application of research results into practice. It is a measure of the take-up of research results into practice and the contribution to soil quality management in practice. All national programmes see the increase of effectiveness of the research programmes as an important criterion for success. Dissemination of know-how and the economic and public added value of R&D results are important factors. The implementation of know-how in the new member states is another important criterion. Exchange of experience about methods for dissemination of know-how and improving added value is a strong reason for co-operation.
- **Efficiency:** Efficiency is the execution of R&D programmes for a minimum of costs. Through good co-operation overlaps between programmes of the individual countries can be avoided and thus cost-efficiency increased. The national programmes could focus on different (but complementary) research themes. Each programme could benefit from the results of other programmes and avoid “reinventing wheels”.
- **Finance and funding:** Co-operation creates the possibility of co-financing projects and increases the possibilities for research funding, whilst increasing flexibility.

The way of co-operation should contribute to one or more of these four groups of benefits.

### 4.2 Goals for co-operation

*“Learning is like rowing upstream. When you stop you fall back”*

The members of the SNOWMAN project have set goals for co-operation between the national research programmes. The goals can be divided into short-, mid- or long-term goals. These goals can also be related to the groups of benefits as mentioned before. The results of this classification are shown in the next table.

**Table 1 Goals for co-operation**

	<b>Influence</b>	<b>Effectiveness</b>	<b>Efficiency</b>	<b>Finance and funding</b>
<b>Short term</b>	<ul style="list-style-type: none"> <li>• Opening the information on national research programmes</li> <li>• Sharing a common R&amp;D agenda between the SNOWMAN partners</li> </ul>	<ul style="list-style-type: none"> <li>• Improve involvement of end users in R&amp;D.</li> <li>• Stimulate use of best practices.</li> <li>• Start up of common dissemination plans</li> </ul>	<ul style="list-style-type: none"> <li>• Sharing procedures of funders</li> <li>• Creating a data base of evaluators and reviewers</li> </ul>	<ul style="list-style-type: none"> <li>• Bundle, focusing national budgets</li> </ul>
<b>Mid term</b>	<ul style="list-style-type: none"> <li>• Coherence in European, national and regional R&amp;D programmes</li> <li>• Reaching a common</li> </ul>	<ul style="list-style-type: none"> <li>• Improving involvement of industry in R&amp;D</li> <li>• Integrate social and</li> </ul>	<ul style="list-style-type: none"> <li>• Decrease bureaucracy in national and international programmes</li> <li>• Avoid overlap of national</li> </ul>	<ul style="list-style-type: none"> <li>• Open more funding options for national researchers</li> </ul>

	vision on the research agenda on soil matters for FP7 and so on	economical sciences	programmes <ul style="list-style-type: none"> <li>• Improve exchange of know how between national programmes</li> <li>• Create a common forum for reviewing proposals</li> </ul>	
<b>Long term</b>	<ul style="list-style-type: none"> <li>• Becoming the main source of soil and groundwater quality knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing use of R&amp;D results</li> </ul>	<ul style="list-style-type: none"> <li>• Any national programme is open for international submission of proposals</li> <li>• One European address to submit proposals</li> <li>• Keep researchers in Europe</li> </ul>	<ul style="list-style-type: none"> <li>• More research funders</li> <li>• At least one specific contamination research fund per country</li> </ul>

The goals for co-operation can also be classified according the phases of the R&D-process.

**Table 2: Goals for co-operation related to the RTD-process**

	<b>Funding</b>	<b>Programming</b>	<b>Execution</b>	<b>Implementation</b>	<b>Evaluation</b>
<b>Short term</b>	<ul style="list-style-type: none"> <li>• Bundle, focusing national budgets</li> </ul>	<ul style="list-style-type: none"> <li>• Opening the information on national research programmes</li> <li>• Sharing a common R&amp;D agenda between the SNOWMAN partners</li> <li>• Improve involvement of end users in R&amp;D.</li> </ul>	<ul style="list-style-type: none"> <li>• Sharing procedures of funders</li> <li>• Creating a data base of evaluators and reviewers</li> </ul>	<ul style="list-style-type: none"> <li>• Start up of common dissemination plans</li> </ul>	<ul style="list-style-type: none"> <li>• Stimulate use of best practices</li> </ul>
<b>Mid term</b>	<ul style="list-style-type: none"> <li>• Open more funding options for national researchers</li> <li>• Sharing procedures of national funders</li> </ul>	<ul style="list-style-type: none"> <li>• Avoid overlap of national programmes</li> <li>• Improving involvement of industry in R&amp;D</li> <li>• Coherence in European, national and regional R&amp;D programmes</li> <li>• Integrate social and economical sciences</li> </ul>	<ul style="list-style-type: none"> <li>• Decrease bureaucracy in national and international programmes</li> <li>• Create a common forum for reviewing proposals</li> </ul>	<ul style="list-style-type: none"> <li>• Improve exchange of know how between national programmes</li> </ul>	
<b>Long term</b>	<ul style="list-style-type: none"> <li>• More research funders</li> <li>• At least one specific contamination research fund per country</li> <li>• Any national programme is open for international submission of proposals</li> <li>• One European address to submit proposals</li> </ul>	<ul style="list-style-type: none"> <li>• Reaching a common vision on the research agenda on soil matters for FP7 and so on</li> </ul>	<ul style="list-style-type: none"> <li>• Keep researchers in Europe</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing use of R&amp;D results</li> <li>• Becoming the main source of soil and groundwater quality knowledge</li> </ul>	

### 4.3 Possibilities for co-operation

*“When there is no alternative, there is no problem”*

In the database Report a brief description is given of the national funding of research and the selection processes of research projects and activities for dissemination. Although the organisation of the R&D in the several countries is diverse, some general remarks can be made:

1. There are only a few country specific soil contamination research programmes. Most R&D for contaminated soil is a part of research programmes related to sustainable land management, sustainable development, Brownfield regeneration or urban redevelopment.
2. There is a strong governmental and institutional involvement in the programming of fundamental and strategic research. In more applied research there are exceptions like LINK, CL:AIRE, FIRSTFARADAY.
3. In the funding of the programmes, there is a high governmental dominance. Stakeholder funding or stakeholder involvement in programming is limited.
4. There is little emphasis on knowledge dissemination and/or technology transfer. However, the attention to dissemination is growing.

These general aspects of R&D-programmes can be related to the type of research.

#### **Fundamental research**

Fundamental research, with a long term perspective and high national or international governmental involvement has little communication with practical solutions end users and solution suppliers. The interest of research institutions and researchers is high. Stakeholders involvement is limited. There can be attention for knowledge transfer or knowledge dissemination, but this will mostly be focussed on governmental authorities and policy makers and researchers or other representatives of the professional community.

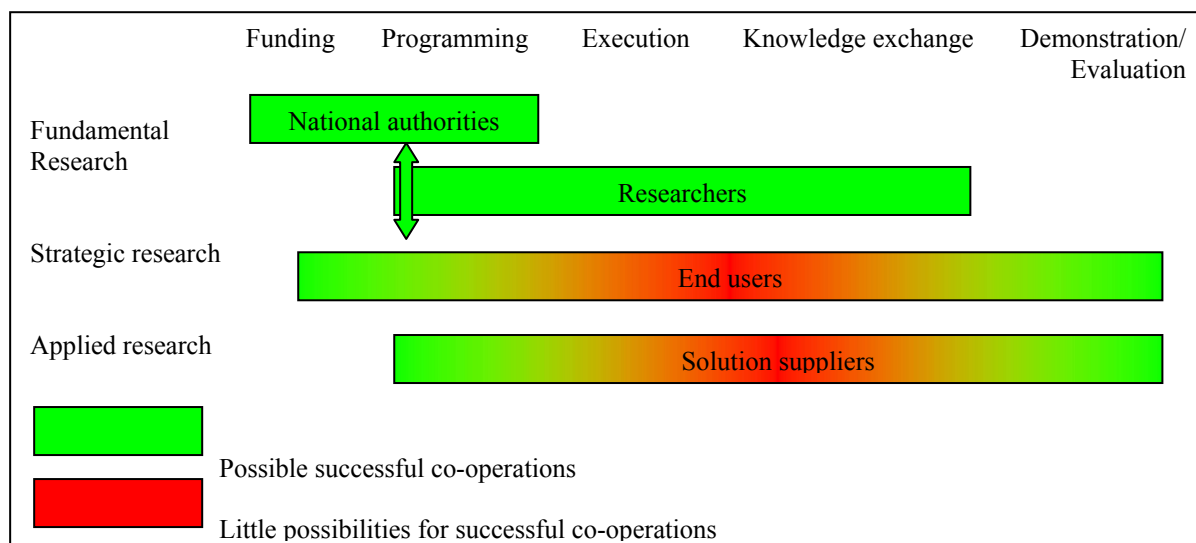
There are good possibilities for co-operation in the programming and execution of this type of research. As national soil policies are more and more harmonised by European soil policy, co-operation in R&D becomes more realistic. Authorities and researchers have to be involved in the programming of the R&D. Co-operation between universities and institutions in the execution of the projects and exchange of know how can be strengthened. Because of these circumstances there is a possibility to co-operate in international governmental funding.

#### **Applied research**

For applied research the interest of end-users or solution suppliers is greater. This market driven demand and supply process is less dominated by national interests, although the application of knowledge and technologies can depend on the context in which the know how has to be applied. Co-operation of end-users in the programming phase has good possibilities as well as co-operation in evaluation of new technologies in practice. The supply side of know how in this process, although operating internationally, has little interest in exchange of know how. National funding of technology development often has the aim of improving the competitiveness of national industry and service providers. International co-operation in funding applied research is more difficult. Most interest of co-operation is between the end-users having interest in application and evaluation of new technologies. Also solution suppliers can have an interest in evaluation of technologies to strengthen the competitiveness of these technologies and also national agencies can be interested in co-financing evaluation of new technologies or demonstration.

Policy development and policy implementation create the practical bottle necks for the future. So the results of fundamental and strategic research that form the basis of future policy development, is also the bases for the demand of end users in applied research for the future. Involvement of end-users in the results of fundamental research and policy making is important or the other way around: involvement of policymakers and researchers in the programming of demand driven applied research.

**Figure 4: Possibilities for co-operation in research**



Because there is a lag time between policy development and policy implementation and development of solutions and technologies, there is a difference in the focus of fundamental and applied research. Fundamental research is heading sustainable land management while applied research is still focussing on site remediation and brown field redevelopment. For this reason it is not likely, that co-operation in fundamental research and applied research can be combined in the same process and same structures.

The results of this ideas can be represented in the next table.

**Table 3: Characteristics of research types**

Type of research	Orientation	Stakeholders	Co-operation
<b>Fundamental/strategic</b>	Long term Regional or international scale Policy making	National (and regional) authorities Policy makers Research institutes Researchers Professional community	Funding Programming Execution Knowledge Exchange
<b>Applied</b>	Short term Local scale National Solution providing Cost savings	End users Solution suppliers National or regional authorities	Funding (by end-users) Programming (with policy makers and researchers) Application and Evaluation

## 5. Co-operation: overall-strategy and final goal

*“A plan is a dream with a deadline”*

### 5.1 Results of the Clarinet project

In the Clarinet project an analysis was made of the European RTD-programmes related to contaminated soil<sup>2</sup>. Some major findings of this analysis were:

- Budget of national RTD programmes are low (about 0.03% of contamination problem or about 1% of annual remediation expenses);
- Very little coordination between RTD programmes;
- Existing national RTD programmes are mainly not open for other countries;
- Dissemination of findings is very modest;
- No coordinated focusing of RTD programmes.

Recommendations of this analysis were:

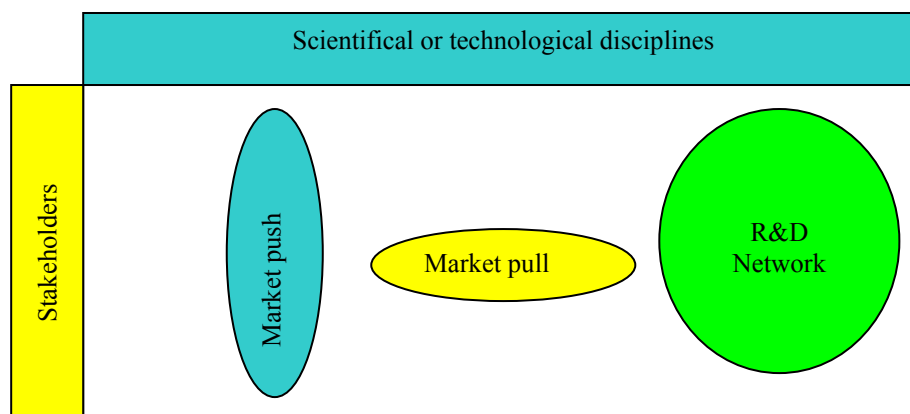
1. Providing a platform for research programme managers
2. More integration of European research activities by strengthening networks of European research institutes and stakeholders;
3. Promotion of European collaboration by EU research funds;
4. Joint approach in financing large research projects;
5. Networking of existing centers of excellence;
6. Increase mobility of researchers;
7. Coordinated research agenda and trans national RTD projects and peer review programmes;
8. Stimulation of trans disciplinary research and stakeholder involvement;
9. More attention to knowledge dissemination.

After the finalization of the Clarinet project no further actions were taken to implement the recommendations of the Clarinet project. The SNOWMAN project is the first action to improve the co-operation between the national RTD programmes in the field of contaminated soils. This is the fulfillment of the first recommendation. The SNOWMAN project can also address recommendations 2, 3, 4, 5, 7, 8 and 9. Recommendation number 6 is also a wish of the SNOWMAN partners, but it is doubtful that SNOWMAN can improve this mobility.

### 5.2 Overall strategy

The overall goal for R&D management is to overcome the gap between the demand and supply of knowledge and know how and to determine the need for R&D. Closing this gap is an absolute requirement for the application of the results of R&D in practice. There are several strategies to overcome this gap:

**Figure 5: Demand and Technology driven R&D**



<sup>2</sup> Clarinet: An analysis of national and EU RTD programmes related to sustainable land and groundwater management. December 2002, [www.clarinet.at](http://www.clarinet.at)



- Market pull: the power of the scientists or technology developers is high. They are developing knowledge and know how for services and products and are creating their own market for it. They have their own R&D strategy and budgets and marketing strategy. This is the case with the ICT-industry, the audio-visual and communication industry;
- Market push: the power of the stakeholder(s) is high. They can formulate their research demands themselves. They have influence on the researchers by financing research and have research contracts with research institutes. The results of R&D are implemented in their own organizations and activities. Examples are the oil and gas industry, pharmaceutical industry etc.;
- R&D network: there are no strong professional stakeholders who can formulate and finance their own R&D demands, nor strong suppliers that have their own R&D and marketing strategy. There are different groups of stakeholders and different scientific disciplines involved. The demand for R&D has to be formulated in a communication process between stakeholders and researchers. The implementation of the results also depends on the acceptance by the stakeholders. This acceptance is influenced by several interest groups, among them policy makers, authorities and public. This is the case in spatial planning, environmental management like water management and soil quality management.

For the R&D process in soil quality management the formation of an R&D network is essential. This means the combination of networks of stakeholders and researchers or technology developers. For societal problems with a lot of (small) stakeholders often governmental institutions or departments are acting as funders for R&D who also have to be involved in the R&D network. With the implementation of R&D results representatives of public stakeholders have also to be involved. This can be, for instance, environmental stakeholder groups or representatives of local authorities.

The overall strategy for European co-operation in the R&D process for sustainable land management is the use or formation of the relevant networks and involve them in the R&D process. Members of these networks have to gain benefits for this involvement because it takes time, money and energy. Building up networks for this reason an integrated part in the strategy to realize co-operation in the field of soil research in Europe.

### **5.3 The long term goal: the salmon on the moon**

The final goal for co-operation between research funding organizations within the SNOWMAN-project is formulated as a dream: a salmon on the moon. This means that the final goal to reach must be ambitious, motivating and exciting. A plan is more realistic. It has requirements for results, costs and a time-schedule. The long term goal of the SNOWMAN-project is formulated in this paragraph. This has to be a description of the desired situation within a period of 5 to 10 years from now. The main elements of this long term goal are related to the aspects of the R&D-process; programming, execution, implementation and evaluation, as described before. Next to that, the funding of programmes is an important item and also the development of networks. These elements of the final goal in European co-operation are described in the next paragraphs.

The scope of the co-operation is defined as “sustainable land management approaches under the pressure of contamination”. This field covers all the four squares of Figure 1 in chapter 1 with the restriction of the presence of pressure caused by contamination. However, sustainable soil quality management covers more than contamination. Sustainable land management is also a part of agriculture, forestry, preservation of natural areas, urban and rural development, water management, communication with local people. The focus of SNOWMAN is the soil sediment-groundwater system and compounds from outside that put a pressure on this system or compounds which are producing an emission from the soil and groundwater system to other systems. That means that other fields of research in the Blum-agenda, like erosion, compaction, flooding, landslides and sealing are not incorporated in the scope of SNOWMAN. Decline in organic matter, biodiversity and salination are included because these are important issues for the functioning of the soil-groundwater system. The advantage of the focus of SNOWMAN is that the community of soil system research is well known, it has a clear identity and existing co-operation activities.

#### **5.3.1 Funding**

On the long term national research funding organizations are also funding a coordinated European programme in which projects are funded out of a common pot. Participating countries can carry out projects and national researches can be financed by the participating countries out of a common pot. There is no relation any longer between the nationality of the researcher and the nationality of the euro's. This situation implies, apart from the

organization of the calls and evaluation of proposals, accepted procedures for financial accounting and control of the coordinated call and the projects.

National research programmes are open for international submission of proposals. Each country has at least one fund for research on contamination.

End-users and other stakeholders are co-operating on a European level for specific applied research programmes and projects.

### **5.3.2 Programming**

The long term goal for the co-operation in the programming of research is to realize coherence in European, national and regional R&D-programmes. A common vision on the research agenda on soil matters for FP7 and the next Framework Programmes will be the bases for this coherence. This common vision has to be revised regularly, for instance every two years. Policy makers and stakeholders are involved in this programming process.

Based on this common vision, an analyse can be made of the national research programmes of the participating countries to see if these programmes fit to and cover the common agenda and if there is overlap between the national programmes. This process has to result in an adaptation of national programmes. Final decisions about national programmes should therefore be based on the results of this analysis. This process leads to a better focus of national programmes, more efficiency because of less overlap, more synergy or sharing costs and a better link between national programmes and European R&D-programmes and budgets.

### **5.3.3 Execution**

The long term goal in the execution of research is the creation of an open European environment for fundamental and strategic research that attracts excellent researchers who can work together with a variety of Centers of excellence in Europe in European research projects. Procedures for submitting and evaluation of proposals are harmonized. There is little bureaucracy in procedures.

### **5.3.4 Implementation**

As stated in paragraph 4.3 exchange of knowledge from fundamental/strategic results and implementation and evaluation of applied research are potentially successful areas of co-operation. Dissemination of fundamental or strategic research is less dependent on the context of application and international dissemination activities can be successful. Final goal is, that exchange of know how from this research is freely communicated between European stakeholders, policy makers and researchers. There will be free exchange of knowledge between the programmes and research institutes. There are European conferences about the R&D programmes, symposia on specific topics and all relevant information and results are available on free accessible web-sites. Because stakeholders and policy makers are involved in the programming of the research and informed about the progress and results the application of results in applied research and practice is improved.

For all participating countries dissemination is an important issue to improve the effectiveness of the use of results from research. Learning to learn is a special field of research and know how itself. Modern systems of learning, like interactive social learning, action learning, single stage or multiple stage learning are applicable in sustainable land management. Implementation of innovations results in innovation of processes, changes in roles, responsibilities and power of stakeholders, negotiations and conflict handling. This know how of learning and implementation could be a separate field of research and exchange of know how.

### **5.3.5 Evaluation**

Results from applied research are more dependent of the context of application. Translation of results to different contexts is necessary. Participating countries have to organize this translation and dissemination by themselves. Nevertheless it is possible to formulate more general "state of art" information, especial for technologies or tools for sustainable land management. For end users European state of art information for techniques, instruments, models, applicable under specified circumstances, can be very important. Also for solution suppliers more general European acceptance of tools and solutions will contribute to their potential market. There will be free exchange of results from evaluation of technologies and tools between end-users and stakeholders. Final goal is that exchange of evaluation results takes place between stakeholders in the European countries and that results of evaluations are freely accessible.

### **5.3.6 Networking**

To realize the co-operation in the way described European networks are essential to support the processes necessary for co-operation. Therefore the most important results of SNOWMAN is to build strong European



networks of stakeholders and researchers in the process of sustainable land management. These networks will consist of:

- A network of national research programme funders, especially fundamental and strategic research, participating in coordinated programmes and calls or proposals and in dissemination activities on a European level;
- A network of stakeholders, like policymakers, governmental departments are involved in the process of programming and exchange of knowledge.
- A network of research institutions, centers of excellence, contributing to the national and European programmes. National networks are interlinked on a European level and have a coordinated communication with the European research councils. They participate in European exchange of knowledge in their professional fields of research.
- National and international networks of local and regional stakeholders from the participating countries who are participating in the process of programming of applied research. These networks, together with networks of service and solution suppliers, are involved in exchange of information about evaluation of results, formulation of state-of-art of solutions. They also contribute to the acceptance of solutions and tools by policy makers and public organizations.

For fundamental and strategic research there is a good communication between the networks of funders, stakeholders and researchers in order to realize demand-driven research programmes.

For applied research there is a good communication between the networks of local and regional stakeholders and the network of policy makers.

These networks should also have connections with other networks that are relevant for sustainable land management, such as agricultural networks, urban and rural planning networks and European networks for sustainable water management.

## 6. A stepwise approach towards co-operation

*“Lighting does not bring you on the right path, but it helps to see the directions”*

### 6.1 Introduction

To reach the final goal of co-operation and to manage and control the development of co-operation, a stepwise approach seems to be appropriate. Because the phase of development of co-operation and the speed depends on the type of research a distinction has been made between fundamental and strategic research on one hand and applied research on the other hand.

The first step of development starts with the existing networks and to involve them in the relevant steps of the R&D-process. The intensity of co-operation can be increased in steps. There has been chosen for a development in 3 steps: short term, mid-term and long-term. As the co-operation increases, the development of the networks will increase too. This development of networks is not a activity in itself, but a result of the improvement of the R&D process. Therefore this development is described in the three steps for each phase in the R&D process.

### 6.2 Funding

Three models have been identified that can be applied in the co-operation of funding programmes for fundamental and strategic research. The increase in co-operation in funding programmes can follow these three models:

- a **Step 1: National contributions.** Each country funds their own national contributions to the projects of a coordinated call or programme. Special arrangements have to be made between the country who is responsible for the management of the project (leading partner) and the countries that are responsible for the financial control. A difference can be made between the funding of the general activities of the co-ordinated call of programme and the research projects themselves. General activities such as preparation of the call, selection and dissemination, can be funded out of a common pot or by an additional funding organisation such as the EC. Funding national contributions is probably the most realistic model for the short term because national procedures are applicable and no money is transferred to researchers from other countries.
- b **Step 2: Adaptation of projects.** Each participating country adopts (a) selected project(s) that fit best to their national programmes. The country that adopts the project is responsible for the financial control of that project(s). One of the participating countries has to be responsible for the management and financial control of general activities of the coordinated call which can be funded separately as mentioned under a).
- c **Step 3: Common pot.** Each participating country contributes to a common pot. Projects are financed out of the common pot. Financial control of the projects and the programme is carried out by one of the participating countries or an independent third party. All participating countries have to agree on the procedures of the financial control and have trust in the controlling organisation. The balance between the contribution to and expenditures per participating country out of the common pot can be taken into account. The responsibility of the financial control of the coordinated call is a shared common responsibility.

This process will increase the co-operation between national R&D funders for scientific and strategic research. This will be governmental departments or organisations (such as research councils). They belong to the SNOWMAN network that has to be expanded in the several steps of development.

For funding of applied research the co-operation of funding between end-users has to be improved. This co-operation can start based on the NICOLE-network. This network, now existing of the larger industrial owners of contaminated sites, has to be enlarged to project and site developers and public end-users.

Each different funding model has its pros and cons. The different aspects of the funding models are listed in the next table and also is indicated which problems have to be overcome to get to the next step of co-operation.

**Table 4: Problems to overcome in funding programmes**

Model	Advantage	Problems to overcome
<b>National contributions</b>	National procedures apply for national contributions Only funding of national researchers	Mixed responsibilities for project management and financial control has to be solved
<b>Mixed funding of projects and general activities</b>	Flexibility Different models for project funding are possible More chance of additional funding	Mixed responsibilities for project management and financial control has to be solved
<b>Adaptation of projects</b>	Clear responsibilities National procedures apply for adopted projects	Funding of researchers of other countries must be allowed
<b>Common pot</b>	Flexibility More chance for additional funding Common financial responsibility	Funding of researchers of other countries must be allowed. Acceptance of common procedures for financial control

## 6.3 Programming

The goals in increasing the European co-operation in the programming process are formulated as follows:

- Reaching a common vision on the research agenda on soil matters for FP7 and so on
- Coherence in European, national and regional R&D programmes
- Involvement of policy makers and stakeholders in the programming process

To reach these goals it is possible to increase co-operation by executing co-ordinated R&D programmes in three stages:

- Execution of a programme of a limited number of pilot-projects of a small scale and short duration
- Execution of a co-ordinated R&D programme funded by the participating countries
- Execution of an European R&D programme on Sustainable land management in relation with FP7

The execution of these programmes forces the participating countries to increase co-operation among three main aspects:

- The common vision about the research agenda and coherence with national or regional R&D programmes
- The organization of the programming process and involvement of policy makers and stakeholders in this process
- The organization of the selection process and involving of stakeholders and scientists in this process.

These steps are related mainly to the fundamental and strategic research. In the SNOWMAN project also a lot of effort has been invested for the common vision about the research agenda. Based on the results of the analyses of European R&D programmes on contaminated soil, summarized in the database report, the relation between the national programmes and the research agenda can be established.

For applied research separate actions have to be taken among the same lines. Only the research agenda, the type of funders and stakeholders will be different. The research topics, formulated in the NICOLE-network and research needs from the Clarinet project, can act as starting points.

In the next paragraphs a description is given about the stepwise development in the co-operation in the programming of the R&D, divided in the development of the research agenda, the organization of the programming process and the selection of R&D projects.

### 6.3.1 The research agenda

- **Step 1: Common vision.** The common vision about the research agenda has been established in discussions with national programme funders and scientists in project meetings and a think tank meeting. It is mainly an expert view on the R&D agenda. This vision is the basis for the funding of a joint pilot call for research projects. The results of this discussions is summarized in table A. Based on this agenda the scope of the projects is formulated as follows:
  - **Principles of Sustainable Land Management.** This project aims a better understanding of the meaning of Sustainable Land Management in practice based on a review of (mainly) Snowman-countries experiences. The project will deliver **guidance** for regulators across Europe for the development and implementation of Sustainable Land Management. Based on the review the research need from a stakeholder perspective will be identified.
  - **Soil System Processes.** This pilot is focused upon soil processes over larger areas and lower concentrations. It should reflect the state of knowledge about the functioning of the soil as a system and the relation between soil quality and land use. Of particular interest is consideration of the resilience of soils, the attenuation of contaminants in space and time, and the impacts of the attenuation processes on soil functions and microbial diversity. The project delivers a judgement of the existing knowledge and necessary developments from a scientific perspective.



- Application of Science and Technologies This pilot is dedicated to the **application** of scientific knowledge and contaminated land technologies, related to sustainability. What new technologies are available for contaminated soil and groundwater treatment? How sustainable are each of these new technologies? Are there new technologies or approaches in the scientific literature which have the potential for greater sustainability than those presently available?
- Tools for Sustainable Land Management. In many countries tools have been developed for sustainable land management. In this field of work, there is an opportunity to build on the existing experience by developing and promoting the use of harmonized decision support tools which support sustainable approaches. The pilot focus is the exchange of know how and the development and **harmonization of tools** for the management of contaminated land. The pilot will deliver suggestions for the harmonization of the scientific basis of these tools and recommendations of the promotion of their use.
- **Step 2: Coherence in European, national and regional R&D programmes.** The funding of a coordinated R&D programme by the participating countries out of their national budgets will enforce the participating countries to create more coherence between European and national programmes. The funding of the coordinated programme must also contribute to the national programme. In this way funders will have a benefit in coherence with national programmes. To create this coherence funders will have to discuss with national policy makers, stakeholders and scientists. Coherence with the 7FP is important to increase the opportunity of additional funding by the EU for projects in the coordinated programme as well in the national programmes.
- **Step 3: An European R&D programme on Sustainable land management.** The final step will be the direct involvement of funders, policymakers, stakeholders and scientists in the formulation of an European programme. This programme has to comply with the European R&D agenda. European networks of these groups are necessary to address representatives from these groups to participate in the programming process. Existing networks, such as the Common Forum, the SNOWMAN-group can be involved already in an earlier stage. Networks of stakeholders and scientists still have to be build up, making use of the Clarinet group or participants in other former or running European R&D projects.

For applied research the same steps have to be carried out. Only the group of funders and stakeholders will be different. The NICOLE network can act as a starting point for this process.



**Table 5: Research topics of European Soil Thematic Strategy” – Part “Contamination” and Clustering of contamination topics**

Processes underlying soil functions and quality	Spatial and temporal changes of soil processes and parameters	Ecological, economic and social drivers of soil threats	Factors influencing soil eco-services	Strategies and operational procedures for soil protection
1 sources, fate and behavior of pollutants	2 development of fast and cost effective screening methods	7 harmonization of methodologies for the identification and quantification of potentially dangerous chemicals	9 improvement and harmonization of concepts and models for the transport of contaminants in soil and their transfer to other environmental compartments (water, air, biomass)	13 improvement of soil functions, contributing to natural attenuation
	3 identification and quantification of new hazardous substances in soils	8 identification and quantification of social and economic driving forces on local and diffuse soil pollution and their impacts	10 development of concepts and models for the direct and indirect transfer of contaminants from soil to humans	14 quantification and improvement of natural rehabilitation processes
	4 early warning systems for soil pollution, including bioindicators		11 improvement of risk assessment methodologies for remediation activities, with the final aim of developing a "fit-for-use" toolbox for risk-modelling, including the re-use of decontaminated soil	15 improvement of methods for alternative management options, taking into account environmental, social and economic conditions
	5 definition of indicators for the assessment of soil quality		12 development of harmonized methods for defining "tolerable" loading on soil and groundwater systems	16 development of techniques, e.g. containment devices for safe storage, handling and transport of harmful substances
	6 mobility and availability of contaminants to other environmental compartments			17 sustainability/persistence of remediation technologies and their environmental impacts
				18 economic models for assessing the cost-benefit relationship for cleaning-up methods of contaminated soils



Water system quality management



Implementation of Natural Attenuation



Risk based land management

### 6.3.2 The organization of the programming process

- **Step 1: Steering committee of funders.** The organization of the co-operation between research funders can be based upon a steering committee responsible for formulating the scope and funding of the coordinated programme and projects. The steering committee consists of representatives of the participating funding organizations. They must have the authority to make decisions about funding projects and signing contracts.
- **Step 2: A programme advisory committee.** Academics in universities and institutions, policymakers and stakeholders can be involved in an advisory committee for programming the RTD. To improve the involvement of networks the members of the board are selected linking pins between programmes, RTD projects and networks of stakeholders. They also can be involved in the execution of the programme and have a specific task to communicate with their networks or with people in their networks who are especially interested in specific subjects in the projects
- **Step 3: A research council on soil.** In the final stage European networks are established for end-users, policy makers, stakeholders and scientists. Representatives of these networks are forming a research council of an European R&D programme on Sustainable land management. It is possible that on a national level also representatives of the different groups of stakeholders are discussing the national research agenda. Representatives of these “national research councils” could also act as the research council for the European programme. This situation could form an intermediate step between step 2 and 3.

### 6.3.3 The evaluation of proposals

The Evaluation procedure is suggested to be a two step procedure:

Proposals will be pre-selected by the **Steering committee of funders**. The pre-selection will be based upon eligibility criteria such as:

- Multi stakeholder perspective
- Formulated by those organizations, eligible for national programmes
- Trans nationality
- Requirements for the consortia: participation of stakeholders, institutions, universities, service suppliers, internationality of the consortium;
- Financing and co-financing requirements of the research
- Formats for the content of the proposals.
- Dissemination plan
- Social aspects (land management)

Selected proposals will be evaluated in a review team on two aspects:

- scientific quality
- relevancy for the programme

A ranking will be made of the selected projects.

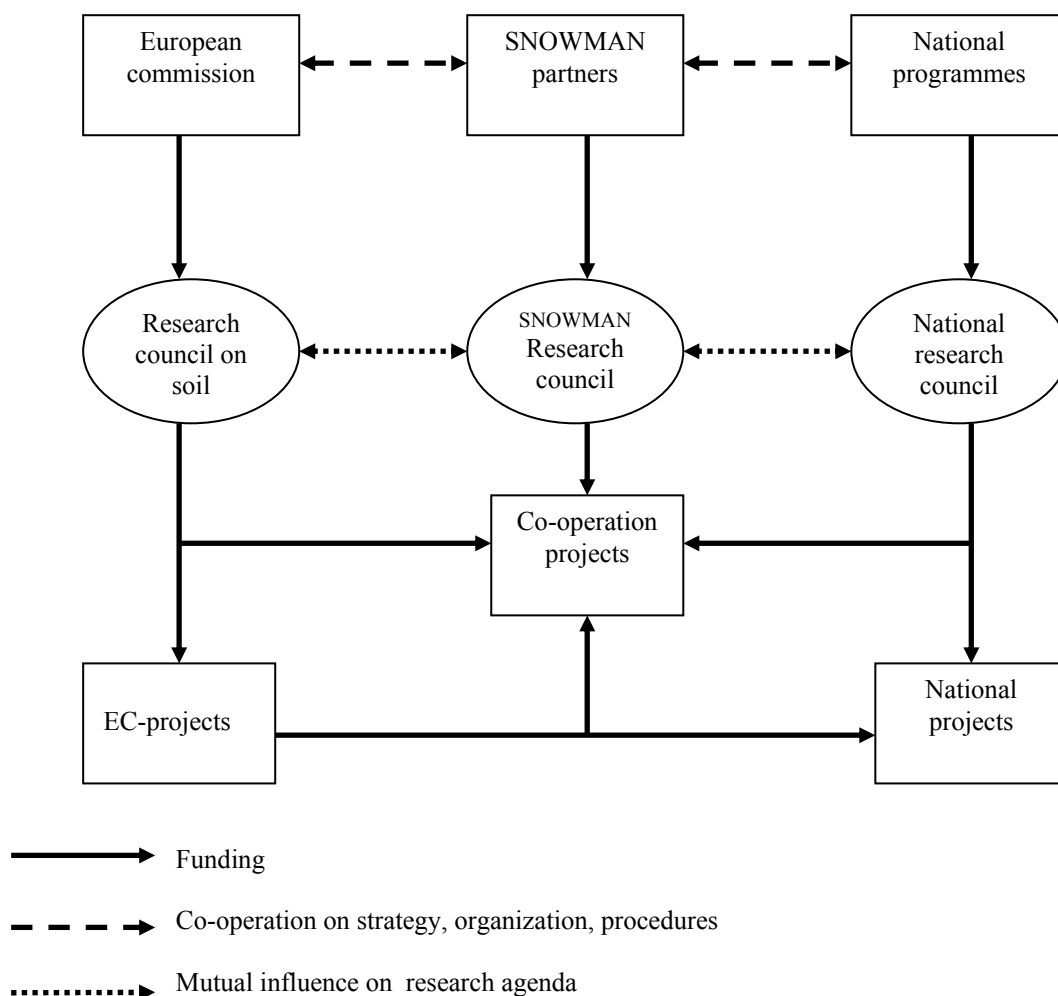
A programme coordination team is executing the operational tasks of the call. It can be formed by the managers of participating programmes or their representatives.

The increase in co-operation in the evaluation process can follow the next three steps:

- **Step 1: Representatives of national peer review panels.** The review and selection of the proposals is done by a Peer Review team. The peer review team consists of peer reviewer from the participating programmes.
- **Step 2: European peer review panel.** From all participating countries peer reviewers are selected to be part of a “pool” of European peer reviewers. From this pool the Programme advisory committee will select a peer review team that reflects the expertise necessary to review the submitted proposals. The interests of the end users shall be considered during the evaluation procedure by organizing a communication phase with the relevant stakeholders during the pre-selection phase.
- **Step 3: European review panel.** In the review panel not only experts, but also end users, representatives of solution supply organizations and researchers from institutes and universities are present. Members of the panel also will have a task in the review of the execution of the projects. Stakeholders can guide the execution of research projects and identify interesting subjects and results to communicate with their networks.

The organization of the decision making process is summarized in the next figure.

**Figure 6: Possible future co-operation scheme**



## 6.4 Implementation and evaluation

Implementation is the process of dissemination of know how, demonstration and application in practice flowed by the evaluation of practical experience. Implementation is defined as “flow of knowledge” from research to the use in practice.

Dissemination is a process that starts at the beginning of the project or even during the programming phase, the so called early stage dissemination. This can be assured by involving the end users of the results in the process. It is important to “turn on the receiver” (= end user) right from the start, otherwise dissemination at the final stage may fail the receiver. The final stage dissemination focuses on the output of results. Besides the output of results, also knowledge management (transfer of expertise, skills, knowledge) is important. Dissemination is a part of research projects, just like collecting R&D information.

For a successful dissemination of results from research projects several aspects should be considered.

- The target group for the results:  
Four different target groups can be differentiated:
  - the research community
  - technical experts (applicants, operators, consultants)
  - end users (policy makers, industry, problem owners, consultants)
  - the general public

For a specific audience particular output types from research are helpful. Consultants and engineering companies should be addressed by proven technologies. Final commitments and school programmes may be other helpful outputs from research.

- The type of research involved:
  - basic/fundamental research,

- strategic research,
- applied research and demonstration
- Translation
 

Regarding the information content, the technical information has to be translated in understandable information for the target audience. Depending on the audience group, the information has to be simplified or focused on certain aspects. The translation secures that interdisciplinary language barriers are overcome (scientists from different disciplines use the same words but mean totally different things).

The media that can be used for dissemination of knowledge can be different:

- For the scientific community:
  - Scientific journals
  - Workshops
  - Scientific posters
  - Websites
- For end user and technical experts:
  - Reports of projects
  - Fact sheets
  - Guidelines
  - Conferences
- For general public:
  - Newspapers
  - TV-radio
  - Education

The increase in European co-operation in the dissemination process can follow the next three steps:

- **Step 1: Dissemination to the scientific community.** The programme, the projects and results are communicated via scientific journals, scientific posters and web sites. EUGRIS is used as the central website and database for information about the programme and projects. Consoil is used as the central conference for communicating the programme and the projects.
- **Step 2: Dissemination to the professional community.** During the execution of the projects members of the review panel can act as interlinks between the projects and the professional community being policy makers, technical experts and professional end users. They can initiate special workshops on specific themes. As projects are finalized the results can be presented as reports, fact sheets, guidelines etc. EUGRIS can be used as an internet platform for information and communication about research projects and their results.
- **Step 3: Acceptance of results in practice.** Results of R&D projects must be validated and evaluated in practice. Finally these results should be accepted as state-of-art in the participating countries. An extension of the EURODEMO project could be a start for this step.

## 6.5 Networking

As earlier stated the development of network is not an activity in itself, but a result of involving networks in the activities of the coordinated programme. The existing networks can act as starting points for this process.

In the field of contaminated soil already a few networks exist:

- The network of funders formed in the SNOWMAN project itself;
- Some specific networks between research institutions;
- The Governmental network or network of policy makers of the COMMON FORUM;
- Network of industrial stakeholders, institutions and service providers in NICOLE;
- Network of stakeholders and solution suppliers involved in the EURODEMO project that started recently.

Also important European research projects that are running or recently finished like Clarinet, WELCOME, CORONA, Aquaterra, and JOINT are also strengthening the European networks. Local and regional authorities, service providers have international networks, but these are not specific in the field of contaminated soil. To build these networks their activities must be of interest to the (potential) participants. This means that the networks must have an influence on European research programmes and research funds and improve the effectiveness and evaluation of RTD results in practice.



In the long term, the ERA-networks and other networks could evolve into a European RTD- network connected to the European Research Council, related to the theme of contaminated soil or sustainable soil management (see Figure 6).