MARBENA

Creating a long term infrastructure for marine biodiversity research in the European Economic Area and the Newly Associated States.

Deliverable

The market of 'supply and demand' of marine biodiversity information, and the possible role of SME's and large industries in European Marine Biodiversity research

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1 Introduction

In this paper we explore the opportunities for creating business opportunities from marine biodiversity information in the European research area. We also explore the potential involvement of existing Small and Medium size Enterprises (SMEs) in marine biodiversity research initiatives with the aim of identifying barriers to participation.

2 Marine biodiversity information: an emerging market and opportunities for SMEs

Europe is a maritime continent. Almost half of the population of the European Union lives at the coast, less that 50 km from the sea. Europe's combined Exclusive Economic Zones of some 5.7 million km^2 cover an area 1.5 times its land surface and are an important economic and societal resource. Some five percent of Europe's GNP is related to human activities in the marine environment. Both at a European and national level a number of new initiatives such as the Water Framework Directive, the Marine and Maritime Strategy, together with existing institutions as OSPAR, HELCOM, CIESM, ICES and the EEA, reshape our vision towards the European Seas in terms of welfare, economic prosperity and environmental protection. Sustainable use of Europe's vast ocean resources through an integrated ecosystem type of approach instead of the present sectorial one is a challenge for the near future. Preserving biodiversity is a key element in this as is the involvement of innovative SMEs in this process.

Box 1. Observation systems as an example of an emerging market

Jan Stel - Since the 2002 Johannesburg World Summit a number of important developments are taking place. Firstly this Summit mobilised support for sustainability both at the governmental level and through stakeholder organisations from all over the world, in contrast with the NGO representation at the Rio Summit in 1992, which was dominated by Western NGOs. Secondly a US initiated intergovernmental ad-hoc Group on Earth Observations (GEO) was established in July 2003 to develop a ten-year implementation plan for a comprehensive, co-ordinated and sustained Earth observation system of systems, GEOSS. Thirdly, at a European level, the Global Monitoring for Environment and Security (GMES) was launched. It aims at an operational Earth observation system by 2008. Fourthly, in Europe initiatives with a focus on Marine Biodiversity such as MARBENA and MARBEF were initiated to increase our understanding in this field to be applied in, among others, the ecosystem approach in policymaking and to develop a new industrial sector.

A number of studies show that the use of earth observations for environmental monitoring has reached or is reaching an operational status in for instance meteorology, oceanography, climatology and land cover mapping. The political will to develop and sustain these modern observation and information systems is expressed by a manifold of initiatives such as EOS, GEO, GMES and (Euro) GOOS. Programmes as the Global Climate Observing System, the Global Ocean Observing System (GOOS) and research programmes as CLIVAR (Climate Variability and Predictability) will eventually lead to prediction capabilities of climate and ocean processes. In these studies it is repeatedly indicated that there is an urgent need for and crucial lack of in-situ data to capture the (climate) and ecological signals in ocean space.

Presently the development of the Ocean component of GOOS is well under way; the development of the Coastal component is lagging behind slightly due to its complex legal nature, partly caused by the establishment of Exclusive Economic Zones (EEZs) and due to the need to reorganise existing national and local observing capabilities.

Operational oceanography, including commercial applications, is a rapidly developing area of activity in Europe. Its development is facilitated by EuroGOOS, a regional component of GOOS that consist of an informal association of 31 national agencies (authorities, agencies, institutes) in seventeen countries. EuroGOOS promotes standardisation of operational marine observations, the uniform publication of observations and statistics, the development of operational modelling and forecasting capabilities, the practical application of operational services to a wide range of marine activities and is encouraging research and training in relevant fields. An example of a sub-regional building block is BOOS, the Baltic Operational Oceanographic System. Presently a series

of non-physical or bio-parameters are under development or in the pre-operational development phase of implementation, within EuroGOOS.
Yet, the interface with Europe's marine industry and especially SMEs is underdeveloped in this process and should be strengthened.

3 Business opportunities in marine sciences; A science perspective

There are many economic reasons for conserving nature. Humans benefit from wild nature in two main ways:

(1) indirectly, (aesthetically and culturally) via the provision of ecological services such as climate regulation, soil formation, and nutrient cycling; and
(2) directly from the direct harvest of wild species for food, fuel, fibres, and pharmaceuticals.

In the face of increasing human pressures on the environment, these benefits should act as powerful incentives to conserve nature, yet evaluating them has proved difficult because they are mostly not captured by conventional, market-based economic activity and analysis (Balmford *et al*.[1]).

So can we make an estimate of the value of these services? Ecosystem services provide an important portion of the total contribution to human welfare on this planet. We must begin to give the natural capital stock that produces these services adequate weight in decision making processes otherwise current and continued future human welfare may drastically suffer. The annual averaged value of these services is 33 trillion (10^{12}) US dollars = 27.35 billion (10^{12}) euros by Costanza *et al*.[2].

Accepted hat these services have value, are there business opportunities in ecosystem services? On first sight ecosystem services are not providing benefits and commodities individuals will purchase. However loss of ecosystem services does have a social cost which needs be paid for through taxes and other mechanisms, and for which we are already paying.

So, what are these ecosystem services and who would pay for them? What are the specific ecosystem functions we value in marine systems?

Examples are: gas regulation (uptake of CO_2), climate regulation, regulation of perturbations (mangroves protecting the coast of Indonesia during the tsunami), erosion control , nutrient recycling, contaminant recycling, processing of residual water, marine refuge areas, food production, primary matter, genetic resources, recreation, and cultural values.

3.1 Case studies

Three case studies are presented

3.1.1 Gas regulation.

There is money in CO_2, it has market values: CO_2 sequestration has presently a market (even a stock exchange market) value of about 26.50 €/tCO_2. Carbon emissions trading involves the trading of permits to emit carbon dioxide and other greenhouse gases, calculated in tonnes of carbon dioxide equivalent (tCO_2e). It is one of the ways countries can meet their obligations under the Kyoto Protocol to reduce emissions and thereby mitigate global warming.

[1] Andrew Balmford, Aaron Bruner, Philip Cooper, Robert Costanza, Stephen Farber, Rhys E. Green, Martin Jenkins, Paul Jefferiss, Valma Jessamy, Joah Madden, Kat Munro, Norman Myers, Shahid Naeem, Jouni Paavola, Matthew Rayment, Sergio Rosendo, Joan Roughgarden, Kate Trumper, R. Kerry Turner. (2002) Economic Reasons for Conserving Wild Nature. Science 9 Vol. 297. no. 5583, pp. 950 - 953

[2] Robert Costanza, Ralph d'Arge, Rudolf de Groot, Stephen Farber, Monica Grasso, Bruce Hannon, Karin Limburg, Shahid Naeem, Robert V. O'Neill, Jose Paruelo, Robert G. Raskin, Paul Sutton & Marjan van den Belt (1997) The value of the world's ecosystem services and natural capital. Nature 387:253-260

The reality is that this market is growing: 107 million metric tonnes of carbon dioxide equivalent (tCO_2e) were exchanged through projects in 2004, a 38% increase relative to 2003 (78 $mtCO_2e$). It is not only the large companies buying the stock, there is a market from country to individual levels. There are even companies offering the opportunity to 'purchase' your car emissions on the internet. the money you pay is used to finance sustainable energy projects.

Provided the ocean sequesters about 2 Gt C/year, the market value of this service is 53 billion euro/year.

The conservative message is that globally the marine environment buries 0.12 Gt/year of carbon in bare sediments across the ocean and 0.12 Gt C/year in coastal habitats (mangroves, sea grass beds, salt-marshes). Fifty percent of ocean burial is within 2% of the surface therefore the protection of key-areas will be highly beneficial.

3.1.2 Recreation

This is a fairly straightforward ecosystem service. The marine environment provides business focused on individuals. The sea can be used for recreational uses like water sports, such as sailing, swimming, canoeing, surfing, kite-surfing and a lot of money is made in the dive tourism industry with yearly number of tourists increasing exponentially. PADI statistics show exponential growth with over 10 million certifications have been issued by 2000, with a value of app. 400 euros a certification. This does not include individual paying for a dive after their certification or the value business associated with equipment and other facilities.

However coral reefs are disappearing, 30% of the area could be lost in the next 20 years. Such a loss might significantly impact on dive tourism. Effort should be put in conservation, to not lose the business opportunity of the dive industry.

3.1.3 Genetic resources

If we look at the tree of life we see that animals and plants only occupy a marginal space concerning the diversity of the eukaryotes. The Marine realm contains most species. New genetic resources are linked with the discovery (exploration of) marine biodiversity. The highest potential is in extreme habitats. an example of a recent discovery: The bacteria *Pyrococcus furiosus*, recently discovered by NASA grows at enormous speed (1 duplication every 37 minutes) at 100 º C in submarine volcanoes , and is the only known living organism able to use Tungsten.

Application of discovered species:
Proteins from bacteria isolated from submarine volcanoes are stable at high temperature and can be used for development of more efficient and sure methods for genome sequencing. e.g. polymerase Tfu used in PCR, isolated from bacteria *Thermococcus fumicolans* from hydrothermal vents by researchers from IFREMER

Besides containing high genetic diversity, marine organisms represent 20 times higher bioactive substances (of interest for new pharmaceutical products) than terrestrial organisms ([3]Munro et al. 1990). Some pharmaceutical companies have already several natural substances, isolated from tunicates, molluscs and sponges under clinical trials.

Marine institutes are increasingly aware of the possibilities and using opportunities as demonstrated by the webpage of the Australian Institute of Marine Science where they try to attract possible business partners to develop the natural products potential of Australia's marine biodiversity.

This is just a very small set of examples, it is worth it to go through the whole list of opportunities, among which we can count e.g.:

- Observational technologies

[3] Murray H.G. Munro, John W. Blunt, Eric J. Dumdei, Sarah J.H. Hickford, Rachel E. Lill, Shangxiao Li, Christopher N. Battershill, Alan R. Duckworth (1999) The discovery and development of marine compounds with pharmaceutical potential. Journal of Biotechnology: 70, 15-25.

- Biotechnology
- Food Industry
- Aquaculture
- Cosmetics industry
- Pharmaceutical Industry
- Oil industry
- Consultancies and monitoring
- Ecotourism & Leisure
- Nature documentaries (film)

The potential markets for business opportunities utilising marine biodiversity information and research are clear. What is more difficult is realising that potential and turning ideas into an economically viable enterprise. How this should be achieved is not clear to many scientists who under estimate the effort required for ideas to mature into a viable business.

4 European marine biodiversity research and SMEs

4.1.1 SMEs in Europe

The economic force of SMEs within Europe is clear. SMEs form the backbone of the EU-25 enterprise culture where over 99 % of businesses employ fewer than 250 people[4] and thus play a significant role in the market. In 2003 it was estimated that there were over 1.9 million SMEs' in Europe employing nearly 140 million persons with an average turnover of over €1.5 million per enterprise[5]. In addition to being an important economic force SMEs are a huge competence resource which should be utilised for the development of the European economy, culture and research potential. Yet, the marine environmental market is underdeveloped and turned out to be a rather complex and challenging market.

Above some elements of the policy background are sketched against which SMEs active in the present market of marine environmental products and services have to develop and market their innovative products. The same holds for the 'promising' market of biodiversity related products. Although such a market in a longer (decade) perspective is available, it is paradoxical to note that SMEs that are generally identified by the European Commission as key players in the development of these niche markets don't have the financial capability to address this challenge. So, despite the growing international European awareness about the marine environment and despite the rapidly increasing need for marine information, the market for these products and certainly biodiversity related products remains complex and difficult. A successful example of such an initiative was the EUREKA/EUROMAR initiative of the early eighties of the last century. As a consequence the emerging market for marine biodiversity related products and services is, despite its promise, too complex and fested with uncertainties and risks. This situation is hampering the 'break through' of innovative SMEs in the biodiversity related products and services market.

The clear message appears to be that the aims and objectives of SMEs are primarily commercial and any activities that SMEs become involved in need to, in the long or short term, generate income. The participation of SMEs in any activity needs to provide direct income to cover salaries and expenses, and also profit, or to be seen as an investment which might lead to future activities which are profitable. Without these short term or long term benefits being apparent it is unlikely that SMEs will undertake any activity and is the most likely reason why more SMEs are not fully involved in existing EU research initiatives. Participation in the preparation of proposals (unpaid time and travel expenses) and the participation in projects (unpaid time for administrative tasks) requires an investment from any partner. Such costs may also contribute to the low participation of SMEs in projects.

4.1.2 SMEs and marine biodiversity research: the business perspective

Within the marine biodiversity sector SMEs form a very heterogeneous group. In addition to acting as participants in biodiversity research programmes and applications they are significant users of various kinds of biodiversity and biodiversity information. Most importantly they form an important bridge between basic research and major end users such as the energy industry, fisheries, as well as policy makers on regional, national and EU, and international level.

Three main groups of SMEs can be identified in the marine biodiversity sector:

- producers, exploiters and marketers of biodiversity (mariculture, fisheries, tourism, bioprospecting etc)
- manufacturers and developers of equipment and products (commercial equipment and gear for the group above, research equipment etc)
- research and consultancy companies providing a service to industry and governments

At a European level there may be considerable national differences in the role of SMEs and applied research unit connected to research institutes.

[4] Europe in figures. Eurostat yearbook 2005
[5] Europe in figures. Eurostat yearbook 2003

SMEs also play an important role with regard to the interpretation of scientific results and making this information usable and understandable for industry and environmental managers. Likewise the implementation of technological innovations is best developed and made commercial by involving SMEs.

Thus SMEs have a specific, if not unique role, in marine biodiversity research projects. Within MARBENA/MARBEF a number of specific goals have been identified, being:

1. Increase SME end users' awareness of biodiversity, and their use of biodiversity in broad terms in their activities
2. Increase involvement of SMEs in biodiversity research in general
3. Increase funding of SMEs working with biodiversity research and biodiversity applications
4. In fulfilling goals 1-3, increase the general awareness and funding of MarBEF activities
5. Explore how SMEs can act as a mechanism for the exploitation of new and existing technologies and observing systems, in the exchange between basic research institutes and the industry. This might involve the establishment of a controlled forum where mutually beneficial co-operation can be explored.

These objectives need to be considered taking into account the aims and objectives of SMEs and this should include proper consideration for funding.

In some European areas monitoring of biodiversity is also considered by research institutes, as an opportunity to indirectly feed in financial support to actual research science. Services for biomass monitoring of commercially important species is used, in a scale economy, to pay for the human resources and other expenses needed to fulfil that particular task and also to create scientific background or perform research activities.

From the scientific point of view commercial work can provide a distraction from the science but provide important financial resources. For the SME point of view the competition for monitoring work can result in SMEs being out competed by research institutes or the market being absent.

4.1.3 Regional roles of SMEs

The balance of the roles played, markets exploited and niches filled by marine biodiversity SMEs varies throughout Europe particularly between the established EU states and those from new members states and countries bordering Europe. Many of the markets are driven by legislation, where the implementation of legislation is still immature the markets are immature or absent.

Examples from several states are highlighted in below.

4.1.3.1 Norway

The main direct market for biodiversity in Norway is aquaculture and fisheries. The turnover for cultured seafood in 2005 was €4 billion; with approximately 650 000 tonnes of salmon and trout alone harvested. Around 5 million full time jobs are created directly within the aquaculture industry. In 2005, the Norwegian fisheries harvest was approximately 2.4 million tonnes of finfish and 56 000 tonnes shellfish, with a first-hand value of just under €1.5 billion ([6]Statistics Norway). Many of the fish landing and processing facilities are SME's. Norway exports farmed and wild fish to 145 countries and the export value of salmon and trout alone in 2005 was €1.7 billion ([7]Norwegian Seafood Federation). Within the EU, an estimated 18 000 full time jobs are created through the processing of farmed Norwegian salmon ([8]Sintef report). Harvesting of kelp also is carried out in south-western Norway. Marine bio-tourism based on sea-angling (mostly cod and haddock) is an increasing market. This is operated by independent small businesses along the coast and is a significant source of revenue for rural areas, many of which suffer from de-population. Also some whale-watching safari businesses exist in northern Norway.

[6] Statistics Norway (ssb.no)
[7] Norwegian Seafood Federation (www.lhl.no)
[8] SINTEF 2005: Employment in the EU based on Farmed Norwegian Salmon". SINTEF report SFH 80A05603 (ISBN 82-14-03543-0) 53pp.

The aquaculture and fisheries industries are therefore a major driving force creating SME market opportunities for manufacturers and developers of equipment and products. Norway is a leading producer of fish cage equipment, hatchery, farm management and processing technology, fish feed and trawling equipment, many of which are carried out by SMEs. The annual turnover of fisheries-related equipment, including gear, yards and services, is estimated at €1.5 billion ([9]Norwegian Trade Portal). These markets in turn create applied niches for SMEs specialising in applied research and development both for technology as well as biological research into optimal culture conditions and target species.

Because aquaculture and fisheries are governed by strict environmental resource management policies, a large market is opened for research and consultancy companies providing services both directly to the industry and to the government. Examples here are environmental impact assessments, baseline and follow-up monitoring, concession applications and conflict analyses.

The petroleum industry is perhaps Norway's highest-profile export product, and a major user of biodiversity-related management tools, which rely heavily on sea floor biodiversity monitoring. The annual turnover of such routine monitoring services alone is estimated at around € 2 million. There also is an increasing market for biodiversity research related to petroleum activities in the Barents Sea (assessing baseline conditions and natural variation). Another expanding market in Norway is bioprospecting, including the use of by-products of fisheries, biotechnology and a national species databank.

In summary therefore, SME biodiversity-related market opportunities in Norway are largely driven by the aquaculture and fisheries industries and also indirectly by the petroleum industry. The well-developed state of environmental regulation and legislation for these industries has created a large 'secondary market' within consultancy and applied research. Biotechnology and bio-tourism are expanding markets.

4.1.3.2 Ireland

In Ireland the role of marine biodiversity related SMEs follows closely that in Norway although the scale at which they support the aquaculture industry, and to a lesser extent the oil and gas industry, is proportional to the value of the industry in Ireland.

The main driving force behind marine biodiversity based consultancies is national and European legislation requiring developers and industry to take account of environmental issues. In the last few years the Water Framework Directive has provided a significant momentum to the market and before that, and to a lesser extent, the implemention of the Habitats Directive and the Environmental Impact Assessment Directive. The Convention of Biodiversity also provided a small boost to the market highlighting the need for local and national biodiversity action plans.

The marine sector is still however relatively undeveloped compared to the terrestrial or freshwater sector where public pressure and visibility has driven the need for consultation and issues to be addressed prior to legislative requirements. The general awareness of marine issues is still maturing and is now becoming a contributory market force. As such there are no SME consultancy companies dealing exclusively with the marine environment in Ireland and all also provide services for freshwater and/or terrestrial consultation. There are however numerous consultancies and sole traders who are exclusively terrestrial orientated.

Over the last ten years there has been a noticeable increase in the number of consulting engineering companies, some of who are SMEs, who are developing in-house environmental and ecological expertise. The expertise is however primarily terrestrial orientated with few venturing into the marine field and still relying on external expertise. The need for a significant investment in expertise and equipment to carry out marine work effectively would most likely be a factor.

[9] Norwegian Trade Portal (www.nortrade.com)

Other emerging sectors are marine tourism and leisure and interestingly some are taking advantage of offshore developments such as wind farms to base their business. Sea safaris and whale and dolphin watching are also becoming established.

4.1.3.3 Germany

Outsourcing personnel to establish and support SMEs in marine research: a German example

German marine research institutions are usually government financed. The public employment system is rather inflexible in terms of contracting personnel on a short time basis. E.g. there are only standard contracts which require a certain set of prerequisites in qualifications, previous experience and a minimum time of employment. Furthermore, the maximum time of employment in research positions is currently 12 years. This means that a person on short term contracts cannot accumulate employment time beyond this limit. This also adds to the inflexibility in the public personnel system.

In the last decade, small enterprises have been formed, mainly founded by post doctoral students. They use their experience gained often during the time of working on their dissertation in further support of science projects. These are either single persons or small groups which often establish independent enterprises. They gain their salaries through science support. They also have the possibility to employ either helpers or additional experts for the work on a specific task or deliverable on short term (sub-) contracts. Here, the administrative effort is minimized in contrast to the public system. Marine research institutes tend to support such endeavours by contracting experts or SMEs for either permanent service or single tasks. Further support is given by letting the SMEs use installations, instrumentation and laboratory space of the institutes on a no or minimum rental basis. Furthermore, SMEs are supported by regional employment development programmes. The SMEs in turn maintain their high expertise by staying in permanent contact with the scientific community of the various institutes.

The range of services offered by such SMEs is broad. Many are consultants in research projects, e.g. in aqua- or mariculture. Furthermore, consulting in environmental impact study projects is frequent. Some specialize in managing research projects. Taxonomic expertise is used in evaluating expedition material; here small specialized sorting centres exist. Increasingly, long term ecological observation series are supported again by specialized SMEs; here, abiotic factors or specific taxonomic groups are being determined. Another field is the development, service and maintenance of sophisticated instruments which is being outsourced by the research institutes.

The major advantage is the flexible adjustment in personnel and effort to a given task – often on short notice. The persistence of the SMEs is facilitated by the institutes' permanent support.

With regard to European projects, the use of such a, or similar SME structure would be invaluable. Particularly in employing experts according to need without having to go through a cumbersome employment procedure will facilitate the success of many projects. In fact, during the development of a running project, needs and objectives for additional research emerge frequently. The use of SMEs to cover such unforeseen needs on short notice would certainly smooth the progress of large interdisciplinary projects. At the same time, employment and maintenance of expertise in many scientific fields would be supported.
A prerequisite is to establish a mechanism in EU-project management that allows sub-contracting experts and specialized SMEs at a larger scale; or facilitates the participation of this group in another way (new mechanism).

4.1.3.4 Poland (New Member State)

There are no SMEs with direct declaration of "marine biodiversity" profile registered in Poland. On the other hand, there are a number of small firms who are carrying out activities which are important for biodiversity studies. These include sorting centres who provide sorting and identification services for marine biological samples. These are usually associated with research institutes, which provide quality control and facilities support. The estimated turnover of this service in Poland is close to 1.6 M € annually (as of 2005) and employment (together full time and part- time) makes some 60 positions. The small companies and single scientists providing that service work for the USA, Canada and number of EU research institutes and are processing estimated number of 2000 zooplankton and phytoplankton samples annually.

Other SME's of interest are consultancies able to provide biodiversity assessments (usually on habitat and macrofauna species level), although such services were not yet requested. Manufacturers specialised in marine biological equipment production and dealers are a small group (no more than 5 firms). There is a potential market for marine biodiversity services in Poland, since the implementation of EU directives, Natura 2000 and creation of Marine Protected Areas has created a need for massive information gathering and processing. Here the competition with governmental research institutes and universities is a main limiting factor.

Box 2. Regional roles of SMEs; a case study from Tunisia (South-eastern Mediterranean state)

Karim Ben Mustapha and Paolo Magni - The interest to the market (OG, NGO, SME's and Industries) of marine biodiversity data is well established nowadays, but marine institutes from southern countries are not yet prepared to face such important challenge. We lack taxonomists, expertise in biochemistry of marine organisms, marine ecologist and biologist with expertise in hard bottom habitats; we lack a global and coherent vision of what the future will/should be. Furthermore the new rules driving biodiversity management i.e Convention on Biodiversity (CDB), and the TRIP's agreement (under the WTO) are not understood by our scientists.
In Tunisia, the sources of demand are mainly GO and companies (oil, aquaculture, tourisms). Recent joint programmes (under FAO / fisheries umbrella such as the COPEMED and the MEDSUDMED projects) also requested data. It's obvious that demands are increasing, but are we ready to supply the market? The answer is rather ambiguous as we should work on a better development model for marine biodiversity laboratories from our southern countries: Better coordination of the programmes of research, centralisation of the data - running under data bases and SIG - better knowledge of the existing potential to better fill the gaps (either geographically or thematically). With a clear vision for the future, we will be able to drive the demands and, at the same time, to properly supply the market.
Actually the demands from GO's, NGO's, SME's and companies (mainly oil companies) are rather the same, some ecological indexes, some distribution maps (few cartography), a lot of impact studies.
The pharmaceutical companies, which have not yet showed a big interest in marine BD data supply from southern countries, will be surely the challenges for us. The demands will be more accurate and the needs more important.
One big problem deals with the data property (intellectual property rights): Legally do they belong to the lab/institute that provided them, or to the country (often it's the case for our southern countries), or to the company that requested them? And what about patents?
Are we ready, as marine bd labs to –properly- negotiate with such corporations (SMEs, NGOs and Companies), we had a small experiment with a big pharmaceutical company few years ago, and we learnt that negotiating with such company requires a lot of expertise (financial, legal and communication skills) that is absent from our know-how as governmental institutions.
Another point to be highlighted: to what extent are we able to divulgate data that we collected from the normal running of our national institutes and marine labs? I remember the censure that was set up (hopefully for a short period) in 2000 from local scientist, when *Caulerpa taxifolia* was first recorded from Tunisia.
From another point of view, to what extent are we ready / able to think on (to) the conservation of the marine biodiversity while providing the necessary supply for the market demands? Should we let the demanders be the main driver of this market?
I think that that regional and international fora, such as MARBENA should play a catalyser role for us, in structuring a better way of planning a coordinating marine biodiversity research within a regional framework.

Marine biodiversity data should be improved (in quality and quantity) by a coordinating approach with the aim to supply the demands, in a way which ensure the conservation of this biodiversity.
An important exchange of view from several experts in biodiversity disciplines is necessary to improve our way of thinking and to lead us for a sustainable use of these resources.

4.1.4 What do EU research projects have to offer SMEs ?

Participation in EU funded research programmes can provide a number of opportunities for SMEs. These benefits however are different from typical research institutes and it is important to keep in mind the different priorities SMEs have.

For example, MarBEF as a unique network provides SMEs with several opportunities outside of the direct involvement as funded partners. MarBEF brings together a huge resource in marine biodiversity and can provide information and opportunities which SMEs might exploit. These need to be carefully examined and opportunities for making them available to SMEs identified. It should be noted that the basis of MarBEF is to develop a collaborative network of marine scientists and that SMEs might not wish to share their competence with competing institutes.

An additional concern to SMEs wishing to participate in EU projects is the level of funding. We must assume that an SME exists to make money. Therefore as commercial companies SMEs charge out their time to cover three things, salaries, overheads and profit. In a normal business situation the aim is to minimise overheads and salaries to maximise profit.

Firstly and understandable there is no provision in the EU financial models to allow for profit to be included within the funding. If the company is participating with 100% cost this will cover actual salaries and justifiable overheads. If under many research programmes the funding is only 50% then only 50% of salaries and overheads are covered and effectively the company will make a loss on every hour spent on the project. For SMEs with a developed in house RTD programme which would otherwise be internally funded the participation in EU projects to obtain funding is highly beneficial. For SMEs in the marine biodiversity research sector this is generally not the case. Of course participation in the project will provide additional non-monetary benefits however if these cannot be converted into funding in the future then the funding is a significant barrier to participation.

A number of points need to be considered when examining how best to facilitate the additional involvement of SMEs in such research projects. Matching SME needs with what research projects offer is vital. Such opportunities for SMEs might be to:

- access to new and existing markets for their products and services (linking to new or existing partners for funded projects, opportunities to test and develop products, etc)
- market their products and services (direct advertising, raising company profile)
- develop products and services
- raise profile of their company
- seek a competitive advantage
- identify future staff

Research projects can offer several opportunities for SMEs from each of the three identified sectors (Table 1) but certain areas need to be developed.

Table 1. Potential benefits for SMEs being involved in the research projects with focus on the MarBEF network of Excellence (draft).

SMEs sector	Producers, exploiters and marketers of biodiversity (mariculture, fisheries, tourism, bioprospecting etc)	Manufacturers and developers of equipment and products (commercial equipment and gear for the group above, research equipment etc)	Research and consultancy companies
Participation and funding	no	no	yes (existing partners only and not fully funded)
Potential collaborative partners for future projects	limited	yes potentially	yes potentially
Marketing opportunities for services/equipment	yes but not exploited	yes but not exploited	yes but not exploited
Product/service development	limited	limited	yes but not clear
Raise profile of company	no	no	possibly
Provide competitive advantage	unlikely	unlikely	possibly
Access to good future employees	yes but not exploited	yes but not exploited	yes but not exploited

4.1.5 What do research projects require of SMEs

How to exploit the competence within SMEs by research projects is much less clear. Such competence forms the basis of the marketable value of the SME and as such sharing this with others for no or little return or sharing with potential competitors is not a positive thing.

Clearly there are some benefits from research projects for SMEs, as outlined in Table 1, more so once these have been fully realised by the network. However this involvement should go both ways and MarBEF should be able to draw from the competence within SMEs to achieve its objectives. Although MarBEF has set objectives (1-5 above) how this should be achieved is still unclear, particularly with the minimal incentives outlined above and needs further discussion.

5 Future work

A number of SME and business related ideas have been presented here. In addition a number of initiatives have been presented and are currently being carried out under the MarBEF programme

A pilot national database on SMEs, end users and policy makers involved in marine biodiversity, and their specific tasks and roles is being created based on Norwegian experiences. The database will be used by MarBEF researchers to ease their efforts to identify stakeholders and potential partnerships.

A second task is to establish a *think tank* core group on SMEs activities within MarBEF. The aim of this group will be to outline a plan for the further actions to reach the goals (1-5 above) such as dedicated workshops, meetings with end users and possible funding sources (both SMEs and others), work with end users to organise showcases and to develop projects on biodiversity research. The *think tank* group should also prepare proposals including costs to carry out the activities and fulfil the ideas. These activities should connect real SME projects to all the proposed activities. All the proposals should be defined as projects, and SMEs should be invited to take on and perform these according to contracts.

In addition the group should discuss activities connected to the “European Marine (and Maritime) Strategy”. MarBEF will aim at bringing the results and consideration on marine biodiversity research into EMS. A strategy for this action should be outlined and lead by the *think tank* group.