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# Experiences of the GNU consortium members

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"Dass etwas neu ist und daher gesagt werden sollte, merkt man erst, wenn man auf scharfen Widerspruch stößt." (That something is new, and therefore should be said, you notice when you encounter fierce opposition.)

(Konrad Lorenz, 1903-1989)

# Introduction

## Overall working method

During the first meeting held by the GNU consortium in Baden, Austria, from 16-18 January 2008, three parallel workshops were conducted, each of which consisted of several sessions which lasted in total 6½ hours. These workshops were facilitated by Gebhard Banko, Stefanie Linser and Robert Höller, respectively, all of the Austrian Environment Agency. The purpose of these workshops was for the GNU members to

- learn about each other and from each other
- achieve a broad view of GMES by combining the complementary individual perspectives
- better understand current practices, solutions, and existing problems that need to be solved

The preliminary collation and interpretation of the workshop results was presented to the Consortium at its second meeting in Nottingham, UK, 20 and 21 May 2008. At the latter meeting, small self-organised groups of 4 to 6 people were formed to discuss and improve the preliminary report and to deduce practices that can be presented in the GEOSS Best Practices Wiki.

Consortium members had several months to comment on the first draft of this document and consecutive versions. These comments were used to amend the text.

At the GNU Extended Consortium Meeting on 13 January, in Barcelona, Spain, a short summary of this report was presented in a plenary session, and, subsequently, one of the four breakout sessions was dedicated to jointly reflect on the outcomes and to specify certain issues. The discussion held at this session was summarised and the summary sent to all participants, and their comments were included in the final version of this summary. Subsequently, these results were added to the revised version of the current report.

## Topics addressed

The three breakout groups at the first GNU Consortium meeting were put together reflecting the topics represented in the consortium, land, forestry, and one group combining atmosphere and geosciences. Some GNU members additionally provided limited experience as to GMES projects developing marine applications. Feedback recorded in this text relates to those projects which are

represented within GNU, in that GNU members also participate or participated in respective GMES projects.

GNU focusses on the environment part of GMES (as stated in the DoW). Thus, emergency and security related projects are not mentioned in this report.

### **Structuring of this text**

The discussions during these workshops related to the same set of seed questions appended to this text. The worksheet was sent to the GNU members by the author of this report prior to the workshops to enable GNU members to prepare their contributions. At the workshops, lively discussions developed which, in several cases, ended up following a structure that more or less deviated from the one predefined by the worksheets. It was, thus, considered sensible, to structure this report in a way that best accommodates the issues the groups placed most emphasis on. This structuring has been revised in this second version of the report.

### **Content of this report**

In many regards, the three groups independently of each other came up with alike views. In some regards, however, they deviated from each other, which is then mentioned in this report. This text is an attempt to concisely recapitulate the workshop discussions. It summarises the workshop minutes, in that statements were combined from the three groups, condensed and much restructured to be better comprehensible. Statements are, thus, not presented in the order they were given.

On the one hand, many of the statements in this report might have benefited from mentioning concrete examples. However, the naming of particular projects was in most cases avoided, because it could have caused various conflicts. Moreover, the purpose of this text is not to blame particular projects or service providers for problems that currently exist within GMES, but to summarise typical problems and to enable the joint development of strategies to avoid such problems in the future. Some additions were made to the text based on feedback received by Extended Consortium members.

Certain readers have mentioned that this report is not a comprehensive investigation of the GMES process. Indeed, the text outlines GMES related experiences and opinions of the particular members of the GNU consortium. The observations and views described herein are not a compilation of enquiries involving all GMES users of the national and regional political levels or a statistically representative sample of them. Nevertheless, considering the diverse composition of the GNU Consortium, the statements in this report can reasonably be considered typical. It may be worthwhile mentioning in this context, that also the technical GMES user requirements were never collected in a comprehensive and statistically representative way.

Thus far, GMES user's opinions were related only through documents of projects or events led or dominated by service providers. Therefore, we consider this first effort to document unfiltered GMES user statements, gathered in the frame of a project entirely led by users, an important step within the development of GMES.

**Editor:**

Herbert Haubold, based on workshop minutes by Stefanie Linser, Gebhard Banko, and Robert Höller (Austrian Environment Agency); these minutes were written after the workshops, based on audio-recordings

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Note: Outcomes of this session are presented in the below text.

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## Annex: Worksheet

*Acronyms are explained when they first appear in the text.*

# 1. Working with GMES products

*This first section of the report relates practical experiences of users when they apply or test GMES products within their work environment. The first paragraph, "Uptake of GMES...", provides the frame or introduction for the below text. In order to use GMES products, the general process must play a particular role for these users.*

## 1.1. Uptake of GMES as a prerequisite to work with GMES products

The users represented in GNU consider a range of products and models interesting and helpful. GMES (Global Monitoring for Environment and Security) products, in this context, are considered final outputs of GMES projects or (preoperational) services, this involves primarily derived data which include substantial value adding, but also raw data. Broadly speaking, these users currently encounter a general inventiveness as to the ways, environmental information and data are acquired and processed. They appreciate the opportunity to learn about new ideas and new technological applications. Russian users value the independent and unmanipulated nature of remote sensing derived information because owing to Soviet history, land data have been frequently altered and are, thus, not reliable. Moreover, data access is still a major issue in Russia.

Thus far, uptake of GMES data products in the work practices of the organisations represented in GNU varies, but it is generally small. Particularly organisations primarily associated with subsidiary level environmental reporting (eg, national environment agencies) are stimulated by the opportunities offered by GMES, but they have many concerns on the operational, data policy and costs issues related to GMES services and products. Moreover, although a small number of individuals is much interested and actively participates in GMES related activities, typically, the broad majority of the personnel of these organisations are not actively involved, because they are not yet convinced of the benefits to be derived from GMES in the short and medium term. That is, GMES does not penetrate these organisations. Nevertheless, those national/regional level consortium members which rather focus on research or which form an intermediary between data providers and users (eg, NILU, BGS, TNO, APAT) are currently more interested on an organisational level.

*Decisive factors for the inclusion of GMES outcomes in the daily work practices include spatial and temporal resolution, accuracy, coverage, reliability and repeatability, data access, costs, and time. Because the issues costs, data access, and time were considered most important by GNU members, the following paragraphs reflect this focus.*

## 1.2. Data product costs as a decisive factor to influence work with GMES products

State-funded institutional budgets typically are linked to monitoring obligations related to European directives, and global environmental agreements. Thus, purchasing GMES data would mean an additional financial burden for users. There is hope that once more organisations will use the GMES services, costs will decrease. Information concerning reporting obligations to the European Commission, the UN, OECD and the like, should be available free of charge. For environmental monitoring, besides directives, also particular programmes, such as EMEP (European Monitoring and Evaluation Programme, under the Convention on Long-Range Transboundary Air Pollution) may provide a justification to utilise institutional budgets, with the prerequisite that GMES data products will in the future completely fit to the respective monitoring requirements. On the contrary, seismic monitoring or oil spill monitoring does not relate to European directives but are funded by private sources (water, energy, oil companies).

Importantly, for users to understand the full and real costs of deploying GMES services, the ratio between price and accuracy, i.e., both thematic accuracy and general data accuracy, and also the workload associated with developing and using the products (which is, again, a cost factor) should at all times be made transparent. During the translation of user needs to specifications (see below), direct and indirect costs were not always sufficiently taken into consideration, so that products were conceived that theoretically meet the user's needs, but in practice became unaffordable. As long as the European Space Agency (ESA) covered all costs of product development within the GMES Service Elements (GSE) projects, users were tempted to define their specifications for data products merely based on technical feasibility. These users, however, did not take into account that in an operational future service, they would have to cover value adding costs themselves.

## 1.3. Data access conditions as a decisive factor to influence work with GMES products

Currently, different sets of commercial data can only be obtained in dissimilar ways from various sources such as different project home pages, and for users to gain access became a rather tedious process. Moreover, several administrative burdens were imposed by the data owners. To a degree, such formal registration procedures for data users are advantageous, because knowing who uses which data is a prerequisite to adapt and improve data products. But currently, several users view such administrative procedures as intimidating.

## 1.4. Time as a decisive factor to influence work with GMES products

Time plays an important role in that, on the one hand, the GMES process moves at a pace that makes it difficult for users to follow and to adapt. On the other hand, the time span between useful products being announced and actually being available already is considered long and in some instances, once existing interest vanishes. A third time-related issue is that end users often do not have the time that it would take to get acquainted with GMES products.

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*The above text relates issues relevant for all topics of GMES. Eg, data costs play a role for a user of geological data products in the exact same way as they do for a user of atmosphere related products. However, certain issues in the frame of working with GMES products are topic-specific. Such issues are related below.*

## 1.5. Specific issues related to working with products for land monitoring

For land based applications at national levels, in several cases, pan-European GMES data products do not meet the resolution needed for reporting and environmental assessment, especially if the respective users already have information superior to that offered by GMES services and without the gaps of the latter. However, some users of sub-national political levels have already purchased GMES services related to land cover, which clearly demonstrates that they were satisfied with these products. Apparently, during early stages of GMES, more products were aimed at the needs of regional level users as is the case for currently developed ones. The situation is, however, different for larger scale applications, eg, monitoring of river catchment areas. And, as explained below, CORINE (Coordinated Information on the European Environment) Land Cover (CLC) is increasingly viewed as a standard for land surface monitoring that is valuable on all political levels.

Owing to the complexity of the land surface, and its huge differences between the European countries, land monitoring clearly is the most complex one of the GMES topics. Nevertheless, most of the different topics addressed by environment agencies relate to the land surface in one or the other way, eg, land use, agriculture, forestry, biodiversity, soils, waste, surface water, ground water, resources, traffic, etc. In spite of this complexity, the GMES land related projects started with very ambitious targets and tried to satisfy large groups of users concerned with very different working areas and problems. Because the projects can only develop a limited number of data products, all the users addressed can impossibly have their needs fulfilled, this even relates to some of the users actively involved in the projects. Those land related projects that worked in a well focussed way were not as much affected by this issue. Already at the proposal stage, projects were expected to present a substantial user group characterised by common views and needs, but only recently, effective efforts were taken to actually form such user groups. These steps are considered

very promising, but may not be sufficient or come too late altogether. More efforts are needed to build an active user community for land cover and, likewise, for the other GMES topics. These efforts should take advantage of existing user related networks.

Accordingly, those consortium members which operate on a European level (ETC Lusi, EFI) partly already apply GMES products, eg, the last CLC forest mask and soil sealing layers produced within the Fast Track Service Precursor (FTSP). The European Topic Centres can also better take advantage of GMES products for their reporting obligations than national and regional entities can, provided these data will be covering all of Europe and be comparable between the individual states. Currently, existing methods and pilot applications still vary between the member states and yet have to be adapted to each other or to a common standard. Even within one and the same service, users from different countries sometimes provide different specifications. Especially the land related services suffer from the problem that common user specifications are yet missing.

## 1.6. Specific issues related to working with products for Forest Monitoring

The European Forest Institute (EFI) considers certain existing GMES products suitable for its purposes. Such an example for a promising pan-European data product is a European forest inventory. Currently, the UN-ECE/FAO (United Nations Economic Commission for Europe/Food and Agriculture Organisation) relies on reporting by national forest inventories which are conducted with a periodicity of some ten years. Remote sensing and orthophoto data can provide information in between the labour intensive measurement campaigns which would be considered advantageous on both the European and the regional levels.

Similarly, on a national level, in Germany, the national forest management plans cover only state forests, and excludes privately owned ones. Remote sensing data can partly fill this gap and cover all forests disregarding ownership. However, a suggestion to reduce the number of sampling sites of the Austrian Forest Inventory and replace them by satellite based data was not accepted by the agency that conducts the Austrian forest inventory, because in situ measurements cover some thirty parameters at each site, out of which only a small number could be determined using remote sensing. Thereupon, GMES forest related work in Austria focussed on data for reporting obligations that could not be provided via in situ measurements, for some indicators of the UNECE/FAO and MCPFE these data were already used for reporting. But there are examples where remote sensing products allowed a reduction of the density of the in-situ monitoring network (eg, in Germany). It should be noted that any successful EO-based forest mapping application is or will be strongly dependent on in-situ data as monitored by national forest inventories. Another recent example for useful integration of different national data sources is the determination of clear-cuts by using satellite images in Sweden as supplementary information to the in situ based forest inventories. Thus concluding, GMES products have a potential to cover spatial and temporal gaps in data provision and contribute to national forest inventories, however they can not replace national forest inventories.

## 1.7. Specific issues related to working with products for atmosphere monitoring

Resolution and coverage are a very different issue regarding GMES atmosphere monitoring. Firstly, also here, optical satellite data are used, but to a larger degree, in situ data are integrated with satellite weather data in models. These in situ data provide the resolution and coverage needed for obligatory air quality reporting. The satellite based atmospheric monitoring capability, shows considerable differences when comparing what is required for atmospheric monitoring and what is provided via GMES. While eg, stratospheric ozone/UV (ultra violet light) services are already used operationally, some Air Quality (AQ) products are still in the demonstration phase, due to the type of available satellites. In general, satellite based AQ monitoring suffers from low temporal resolution and also low temporal coverage, eg, one measurement per day, whereas AQ guidelines require daily averages or numbers of exceedances. Moreover, to assess the state at ground level, the entire air column has to be subtracted, and especially in northern Europe, clouds and snow cover may impede the use of satellite data. Several services rely on research satellites without fallback systems (such as EnviSat), however, for an operational service, data sets have to permanently be guaranteed on a daily basis. The Sentinels are expected to improve this situation.

## 1.8. Reflections on this chapter gathered at the Extended Consortium Workshop

GMES currently is not sufficiently linked to reporting obligations. Especially addressing current data gaps would be sensible. Some service providers did not sufficiently or not at all investigate users' current practices, including in situ work. In-depth understanding of everyday-working practices by users would be a prerequisite to design products with high utility in the mainstream work environment. Likewise, in-depth understanding of current in situ work would facilitate an integration of GMES products with the data sources users currently apply.

Products that provide more insight than final maps would increase users' understanding and acceptance of GMES. Users in many cases would prefer a data-centred approach to a service- or product-centred one.

GMES products focus too much on the international level. It is hoped that the downstream services will well interface with existing data on the national level.

Solving these issues would likely improve the uptake of GMES products by users.

## 2. Users in GMES projects

*The practical experience of users is mostly related to GMES projects. Moreover, projects are considered essential for the process because they develop tangible products and services within the strategic frame the political process GEMS has set. Therefore, this chapter is dedicated to users' experiences as to GMES projects. The first paragraph outlines general aspects as to user's roles in these projects, and the second one elaborates specifically on users' roles in projects of the GSE programme, which is, at the time reflected by this report, the most important GMES project funding mechanism.*

### 2.1. User's roles in GMES projects

All GMES projects are initiated and led by service providers, as it was defined within the frame for these projects laid out by the ESA and the European Commission. This frame also allocated some 90% of the project budgets for production. Nevertheless, within these margins, service providers can involve users in quite different ways, and the role users play in the projects depends on how the providers views them, as prospective customers or just as a politically motivated necessity. In the former case, providers understand the value of true partnership and act accordingly. In the latter case, however, users have little opportunity to influence the projects and the data product design, they are not well represented in discussions, or even only formally participate without really being involved beyond providing their organisation's logo for the project documents.

The planning of GMES projects is, in most cases, done without significant user inputs, so that the future implementation of the services is not always envisaged, and existing data of the users are insufficiently integrated. In several cases, not those test sites most relevant to the project's users were selected, but the selection rather related to the funding available owing to the georeturn principle, or to convenience for the service providers, eg, if they already own data sets for these areas. Thus, in some cases related to land cover, the same areas were mapped several times to provide pilots for different products. In atmosphere related services, some users who are also data providers selected test sites rather focussing on their own interests than on those of other users.

The word "user" on the one hand appears mantra-like in FP7 (The European Commission's Framework Programme) proposals, but it is not clear, which relationships service providers have established to them, and the real end-users of the projects in many cases remain outside of reach. The services show a strong centralisation close to monopolies. Users cannot choose products based on a comparison of their quality, but are restricted to the particular service providers' products. For ESA calls, the georeturn principle is applied, which enhances this problem, in that it predefines how funds have to be spent, and it is one of the barriers that distort the GMES market.

GMES was intended to become an open service network, however, few large service providers now dominate large projects, and, thus particular fields of GMES. This became evident eg, in the recent evaluation of a large land-related project. Although the evaluators much criticised the project, it basically had to be accepted, because there was no real competition. Accordingly, SMEs become increasingly dependent of being subcontracted rather than being able to participate in the process at their own initiative. For users, it is however essential to never rely on monopoly structures for their data needs, particularly if these are associated with obligatory reporting.

## 2.2. Users roles in first and second stage GSEs

Which users can be included in the projects is decided by the service providers. User representation in projects has changed from the first to the second stage of GMES. The services initially included a user group to define the products' specifications. This group was, however too small to elucidate specifications applicable throughout Europe. Moreover, independently of the topic, several projects chose users who were relatively easily satisfied and behaved rather uncritical. Those users are not necessarily suitable to define the general needs of the user base, that is, they are not representative. Subsequently, with new users becoming involved in the services, and with users becoming clearer about their needs, newly defined requirements became more difficult to be satisfied, which causes several services to hold on to requirements from the first stage although these are not adequate anymore. Likewise, if users enter a project in the second stage, a range of product specifications is already fixed based on only few users' opinions, and whether useful products for these new users be developed, then depends on the flexibility of the respective service. This needed flexibility was partly impeded by ESA stipulating service consolidation at a rather early stage in the service development processes. Moreover, in the case of the GSEs, whether particular users may be served or not, is also decided by ESA which finances the projects. Commercial companies currently are not permitted to become formal users of GSEs which contradicts the aim for services to become financially sustainable and which has, in the case of ground motion observation, reduced the amount of available test cases within projects.

In second stage GSEs, users are not formal project partners any more, but rather just associated, and have less opportunities to directly influence the services, because they are not a part of the projects management structure. Again, the ESA defined GMES project structure assumes that user needs are already captured to a sufficient degree, and, now, rollout must be as quick as possible. Instead of a remuneration for their time and resources invested, users should receive data products from the projects that help them do their work. This assumption is, however, only valid if the available data products already fit to the work practices of the respective users, which is not often the case, as described above.

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*The issue of funding users in GMES projects is often discussed. GNU members consider it decisive, as became already apparent in the preceding paragraph. Therefore, funding was elaborated on during the discussions that formed the basis for this text.*

### 2.3. Funding users' work within GMES projects

As mentioned above, evaluating products and participating in a project's user federation are time consuming, and, thus, costly. Also further project related activities like implementing test services and providing specifications for data product development require funding. The fact that the already insufficient funding for users' project work further decreased, significantly minimised their opportunities to influence the projects. Insufficient funding for users sometimes leads to users being asked to evaluate project results in their final stages rather than being involved in the project planning from the beginning which would have required substantial time resources, but, likewise, would have been a prerequisite for the design of truly useful products in later stages of the project. Indeed, a range of products were conceived at early stages of the projects, and then developed without making users part of the processing and information chain.

The tax-funded public sector can hardly conduct risky investments, and, thus, depends on receiving funding for getting involved in GMES projects. There is a clear mismatch between the large amounts of funding available for the space component and for the service provider side and the small amounts actually available for users. In first stage GSE projects, funding for users typically was in the range of 3 to 5% of the overall budget, in second stage GSEs and in most FP-projects, it is even considerably smaller. The georeturn principle has in some instances enhanced this problem and impeded a range of intended user activities.

A special case are those EU countries that are not members of or among the co-operating states with ESA (Bulgaria, Cyprus, Latvia, Lithuania, Malta, Slovakia). Neither their potential providers nor potential users could participate in GMES projects funded by ESA. To achieve a common European GMES programme, this drawback should be made up for.

A less obvious, but potentially large obstacle for users' involvement in GMES projects is their bureaucratic nature and the large amount of paper to be handled, particularly since the purpose of several of the project documents is not obvious to users. The vast amounts of documents to be delivered further increase the costs, users have to bear to participate in GMES projects. This approach may go along with the hardware development related heritage of ESA.

To avoid a common misunderstanding: ESA and the European Commission should not provide funding to users to do their work with. The above described need for funding exclusively relates to all activities related to product development, not to the utilisation of final products.

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*Product quality is, obviously, and as mentioned above, a decisive criterion for users to actually apply GMES products in their work environment. Since product quality originates in GMES projects, this topic is considered in this frame.*

## 2.4. Quality control in GMES projects

Frequently, GMES products do not meet the quality standards initially promised to the users, and the time frame for product development exceeds the anticipated range. Validation procedures still need improvement, they were in several instances adapted to the services, because otherwise validation would fail, or they were predefined by ESA, and do not go along with users' preferences. However, in several projects, collaboration between service providers and external validation has much improved.

Thorough product evaluation is often impeded by the low funding of participating users who do not always have sufficient capacity needed for a detailed testing of products and particularly of complex models. Product evaluations based on questionnaires showed quite a range in their return rates: less than 30% return for one of the currently running GSE projects, but 95% for another one. Moreover, the degree of detail in these evaluations varies a lot, with only a part of the users who respond also providing specific and detailed answers. For a third running GSE, product evaluation by 100% of the respective users was a mandatory part of the self defined project cycle. For several projects, cases are known in which providers supported their users in filling in the questionnaires or pre-filled the forms for them, which then caused a bias. Certain providers have eagerly placed only positive user statements on their promotional material, some such documents even recycled the same user statements and used them again after several years, which made users rather cautious to publicly endorse products.

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*User federation work and training sessions are among the most important means for service providers and users to interact in the frame of GMES projects. When discussing experiences made within GMES projects, user federations and training sessions are often considered by users.*

## 2.5. User federations in GMES projects

The importance of user federations within the different services is obvious, such federations should actively interact as equal partners with the service providers and be involved in steering the projects. However, the existing user federations, independently of the topic of the service, suffer from limited or no funding. Since only the most active core users participate in the federations, they have limited effects and are not representative of the other users involved in the project. Meetings are rare to impossible because only some projects provide travel funding for their user federations. User federation related activities require a substantial commitment of resources from the users involved, which should clearly be reflected in the projects' budgets.

Budget alone will not solve current user federation related problems. In some cases, limited user federation related activities simply happened because they were paid for, without being clearly connected to product and service development. Thus, the budgets for user related activities should not be managed by the service providers, as is typically the case, but by the users, as a prerequisite to enable effective federating. It is considered a positive signal that in some future GMES projects this will, indeed, be the case.

The more complex a project is, and the more diverse the data products are that it develops, the more difficult it is to put together a user federation, because the users have different backgrounds and interests. Again, well focussed projects would be advantageous in this regard.

## 2.6. Training conducted in the frame of GMES projects

Those training sessions were most appreciated which provided hands-on experiences related to the field of work of the respective users. Such training sessions were and are held by several projects, either bilaterally or in user workshops. Some services offered open workshops that gave prospective users the opportunity to try products out. This has been shown to be a very suitable way to get new users interested and to promote the respective services. In some cases training was provided to only few people within end-user organisations. It would have been more interesting from the user organisation perspective if services were exposed to a wider variety of staff. The poorest training sessions experienced within the GNU consortium were delivered in the form of presentations, which obviously had little effects. These were, however, only few cases.

The level of detail in training sessions should be adapted to the respective users. On the one hand, technically-minded users need a high degree of details, because these technical details can be decisive in a real work situation. Other users are not interested in much detail and rather want to see general applications and results. Nevertheless, especially such end-users may need systematic training to understand the complex GMES products. Training from one user to another, in particular from a core user to another user can be most effective, however, some users who have done so, felt being instrumentalised as unpaid sales personnel for the providers. For training activities to have a promotional character is certainly not negative, but this should openly be addressed between service providers and the users who provide the training, so they are aware of what they get into.

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*The largest GMES project represented in GNU is GeoLand I, with several consortium members being involved. This project was, thus, discussed in greater detail than others, and is named here, because the issues discussed are not of general nature, but specifically relate to this project.*

## 2.7. Experiences made in the project GeoLand I

Overall product development did not appear transparent to users and some enquiries by users regarding technical details (classification, accuracy) were not answered. There were several false promises as to product quality and time scales until products would be available. Products that in 2005 were announced to be available in 2008/09, will not be available for the next five years owing to insufficient satellite data supply. Product quality varied, with especially some regional users being quite content with GeoLand I products, and some European directives and thematic strategies being well addressed. However, a range of other users did not receive useful outcomes at all. The relation between the core service products and the more detailed observatory products were not understandable to the users – neither was the added value of the GeoLand Core Service Land (CSL). However within the project, users were not able to raise such important issues for detailed discussions. Regional users were hardly considered, the same as in the current (at the time of this report) GSE Land. The industrial partners did not enable users to have much influence within the project, and they did not show much market orientation. Moreover, the large amounts of lengthy documents with little consequences to them was considered a significant waste of time.

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## 2.8. Reflections on this chapter gathered at the Extended Consortium Workshop

Without clearly knowing the outcomes of GMES activities, users cannot and should not participate using tax based budgets that were allocated to non-risk activities. Also political decisions as to the inclusion of GMES products in environmental monitoring will not be reached before a financial frame exists. Thus, it is crucial to clearly and transparently communicate all costs associated with GMES to national decision makers.

To build up capacity, user organisations require funding they currently do not have; this would also include recruiting new specialist (eg, hybrid) staff to work with GMES products. Moreover, if the user organisation is involved in production, costs arise for satellite images and the time-consuming processing and other work needed.

Well conducted training sessions have aroused interest in GMES services in several instances. Training should not only be given to the core users in the GMES projects/services, but also to the final end users and decision makers addressed by the respective products.

# 3. Communication

*GMES is a sociotechnological system, that is, people collaborate in different social systems (projects, bodies...) in order to jointly develop technology. Thus, besides the technological issues, human interaction is equally decisive for the process to be a success. GNU addresses communication in GMES in that it starts with the most obvious practical experiences by users, namely by interacting with their service providers in GMES projects. Subsequently, this chapter considers communication within GMES in an increasingly general fashion.*

## 3.1. User provider interaction on project level

Within the GMES projects, direct personal interaction between providers and users usually works well. "GMES projects", in this context, are all projects funded by the European Commission or ESA, with the call texts directly relating to the GMES process. Several such projects provide good examples of an ongoing exchange that enabled an iterative improvement of the products and ensures that service providers become increasingly clear about their users' views.

Formal communication on project level still needs improvement. The Service Level Agreements (SLAs) provide a rigid framework and sometimes hamper continuous direct communication, so that some final products were delivered based upon the documents only without direct interaction. SLAs also form a certain barrier for users, in that by signing them, users have to commit to a considerable amount of obligations without yet knowing that they will ever receive a useful product. SLAs nevertheless, fulfil an important purpose, in that they require a commitment on both the user and the provider side, and enable the users to document the mutually agreed upon delivery. Ideally, SLAs stipulate the rights and duties for both service providers and users. On the one hand they specify issues like user input data needed by the service providers to calibrate and/or validate the products. On the other hand they (should) document user standards and requirements towards the services, the fulfilment of which is usually checked annually or upon service delivery. That is, SLAs should certainly not be abandoned, but they should enable a stepwise approach to joint product development, generally allow for more flexibility, and they should not be mistaken for a replacement of personal interaction.

The structure of the project progress meetings has not always been adequate for users, other than that they could uptake information, because the settings were not suitable to relate in detail their views. In general, formal communication in GMES projects is not truly bidirectional, but tends to rather reflect the provider side's perspectives. Typical for this situation is the often heard stereotypical answer to users' requests that there is not enough budget or that the requests are out of the already defined scope of the project. Then the discussion stops at this point rather than elaborating a solution or compromise suitable for either side. Several projects publish user news letters. These are suitable to address a large number of individuals, but in some cases, they were misinterpreted by the service providers as promotional material.

The GSE and FP6/7 projects' communication structures are partly predefined by the procurement processes, but they can, nevertheless, be shaped in different ways. Several providers make up for the weaknesses of the formal communication structures by combining them with effective personal interaction. Several cases of effective interaction between users and service providers have led to successful data products within GMES and also external to it. Unfortunately, in some projects the situation is quite different.

*The following paragraph is a specific addition to the preceding one, in that it specifies the particular observation that within GMES projects, requirements and needs are sometimes mixed up.*

### 3.2. Communicating requirements versus needs

Between users and providers, language issues play a role in a direct and in a metaphorical sense. The former is especially an issue with regional and local level users. The latter causes users to have difficulties in articulating their desires in a way intelligible to the providers and with the necessary degree of details. On the other hand, the provider side which leads all the GMES projects, has difficulties in accepting that paradigms of the space industry and of environmental users are quite different from each other, and that technology should adapt to users instead of the other way round. Eg, air quality services operators ask users to define the needed accuracy for the entire bandwidth of possible measurements, whereas for these users, only exceedances of particular threshold values are of importance. These, however, the respective users want to be determined with a close to 100% probability, whereas the respective satellite based data show an error margin considerably larger than the in situ data these users currently work with. The questions given to them are aimed at assessing data requirements in the form data producers can work with, but they are only partly suitable to elucidate the real needs of these users. User needs, more than requirements, vary a lot between different user groups, so they are difficult to capture. Typically, scientific users can more easily articulate requirements that go along with their needs, because their paradigms are closer to those of the service providers than is the case for operational users.

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*After summarising specific observations made by users within the individual projects, the perspective of this text is now widened, firstly, to consider communication between the projects, that is, an overarching view is taken. Subsequently, an even broader perspective relates to the entire political process of GMES.*

### 3.3. Communication of crosscutting issues

Crosscutting (that is between the various topics and projects) GMES related issues are not well addressed, there is an insufficient exchange between the various projects funded by the European Commission and ESA. Such an exchange should be enhanced eg, as to cost sharing or multiple use of data. There is too little exchange between users in general, as described above, and even

between users within one and the same project who are rarely aware of the entire portfolio of that service. Nevertheless, GMES has already initiated a range of discussions between users and other stakeholders. Several users became more active in networks within and outside of GMES projects and they have established new contacts.

Through GMES, environmental monitoring became more visible in Europe, and systematic attempts are fostered to connect national and European data, also several topics were stronger promoted to the European level as was the case before GMES, such as forestry or air quality. When comparing the impact of GMES with that of the INSPIRE (Infrastructure for Spatial Information in Europe) directive, the latter shows a much higher influence on and penetration of national and regional institutions. So it is a good prospect that synergies between GMES and INSPIRE could be more exploited in the near future. Moreover, considering the global dimension of GMES, users will not only be European entities, but also organisations from other parts of the world, especially Africa. A dialogue such as the GMES-Africa event in Lisbon in December 2007, is, thus, considered very useful.

### 3.4. Communication on process level

Communication is decisive for GMES on its various levels, this relates to the above mentioned project level, and to the political process on European scale and to related activities within member states and regions. Unfortunately, the existing major communication channels focus on the provider side, as ESA is in close contact with the primes of the services. The GMES Advisory Council (GAC) consists primarily of representatives of the space and technology sector, only few delegations comprise representatives of user organisations. The GAC is composed of delegates from all EU and ESA member states, and relevant international organisations, such as EUMETSAT, EU Satellite Centre or the EEA. It meets on an ad-hoc basis and provides strategic advice regarding the GMES process. Several European level users, such as the EEA (European Environment Agency), are represented in the Fast Track Services (FTS) Implementation Groups (IG), and have, thus, established an effective communication channel, which is not the case for subsidiary level users.

A prerequisite for the development of widely applicable and accepted solutions would be for users to play a decisive role in the GMES process, and, thus, existing user committees and technical expert groups should be involved in GMES on project and process scale. This would be a means towards obtaining more representative user requirements than is currently the case. To a degree, such activities are already conducted by users operating on a European level (ETC Lusi, EFI) who act as focal points to federate users on a broader scale than just within the projects. This involves activities such as identification of the wider user base, collating user needs and requirements, bundling user interests in forums and workshops, reviewing of service utility, and maintaining a forum to allow interaction between users and service providers. Users appear fragmented in the GMES context, but there is a range of user organisations in other contexts. To get these involved in defining GMES services, a considerably larger portion of the GMES budgets would have to be allocated to determine user requirements and, first of all, user needs on a broader scale than is currently the case. Instead of only relying on the statements of the few users chosen by the service providers, as described above, GMES should actively invite users to get

involved. A professional and systematic marketing effort would be helpful, because the GMES process is hardly known by stakeholders not directly involved, which is especially true for the regional level. Obviously, this is even more an issue in the new member states.

In several cases within certain member states, a successful integration is already practised of different stakeholders concerned with subsidiarity-based national data acquisition, since it becomes increasingly important to achieve national level data sets and models. It remains, nevertheless, a difficult undertaking, owing to the diverse communities and, even more, owing to the large number of actors who have to be taken into account when environmental information is collected on local or provincial levels and then aggregated. Moreover, several European and national networks enable users to stay informed about the current development of GMES, which is a prerequisite to participate in ongoing governance related discussions, the same is true, on a national level, through structures such as GMES related committees, conferences, and the like. The majority of the consortium members are optimistic that in the future, users will become more influential within GMES.

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### 3.5. Reflections on this chapter gathered at the Extended Consortium Workshop

Some service providers have promised more than they can achieve and oversold their services. More honesty would increase users' trust in GMES. In general, services rarely are the all-in-one solution of EO and in situ data that was initially anticipated.

The success of GMES depends on articulating reasonable user requirements that services can be built upon, and it is crucial that all agreements between providers and users are observed.

When users articulate their needs, they are often incapable to directly express these in the form of technical requirements the data producing community can relate to. The same is true the other way round, in that services are often described in too technical a way to be understood by prospective users. All participants should accept the distinction between needs and requirements. Users' needs can best be approached through an ongoing dialogue, and in that service providers repeatedly update the inferred requirements (in a project after each phase). Dialogues have especially been neglected if user input is much deviating from the service providers' expectations.

## 4. Driving GMES

*GMES is, by definition, "user-driven". The consortium wanted to investigate to which degree this is actually true. The first of the subsequent paragraphs outlines the impression GNU members currently have as to their opportunities to influence GMES. The subsequent paragraph tries to look into the political background of this situation, in that it relates particularly to the administrative levels the GNU members operate in. Finally, issues are outlined that are not clear to the GNU members. This is important, because in order to "drive" a process, it would be essential to really understand it.*

### 4.1. Observations as to the influence of users within GMES.

To the GNU consortium members, thus far, the driving forces behind GMES appear not to be users, but rather technology and the space industry. This situation was enhanced by the migration of the political responsibility for GMES from the Commission's DG (Directorate General) Research to DG Enterprise and Industry in 2005.

As described in the previous chapters, for users there is little opportunity to drive GMES on the whole, nor to really influence the services. Although the current industrial focus of GMES means that users may exert little influence on whether certain satellites will finally be built or not, they nevertheless consider it worthwhile to document their requirements that will then become a factor in the mission specifications. In this way, users may ascertain that these satellites will produce useful data.

### 4.2. The role of subsidiary-level users within GMES

National, regional, and local level users, that is, users who operate on subsidiary administrative levels, play a marginal role in the GMES process. This is particularly evident in the FTS with their Implementation Groups primarily representing European institutions and these services excluding topics that are essential only on a national or regional level, eg, ground subsidence. The new GMES governance structure should contain a clear mechanism to reflect the subsidiary principle of environmental monitoring in Europe. Within this frame, a concept is needed which political levels GMES finally intends to address, as it currently contributes much to the European, but little to the national and regional political levels. This situation was different some years ago, since all GSEs started with a policy analysis and, initially, primarily aimed at directly supporting national and regional users' reporting requirements. Had it been clear from the beginning that GMES will later develop a strong or even exclusive focus towards the European level, subsidiary level users' approach to the programme would have been very different.

### 4.3. Open questions regarding GMES in the context of users's ability to "drive" GMES

In-depth understanding of a process is a prerequisite to "drive" it. However, a range of issues remain not clear to the GNU members.

GMES was initiated as the "Global Monitoring for Environmental Security": The Baveno-Manifesto says it "calls for an examination of the issues associated with the elaboration of a common agenda towards global monitoring of the environment (...) at the Union level and in Member countries (...)". Later, GMES was renamed to "Global monitoring for Environment and Security, but what users can expect from the security part and how it is related to the environmental monitoring part, appears still not clear to the Consortium members.

Several essential questions regarding GMES still remain open among users. Some users view a threat of their in situ measuring methods being partly replaced by remote sensing, and that they will then have to use lower quality data. This threat is partly reasonable, partly not, since in some cases, remote sensing data show similar or even higher accuracies than the respective in situ data. Certain data centres are unclear how they will be integrated into the future system, or whether they may lose their role altogether.

The definition of the core- and downstream service concept appears rather obscure to users and seems to change with time. Although the core services' specifications are not yet consolidated, and a significant part of their input data (remote sensing and in situ) have not been sufficiently secured, the FP7 calls now for downstream services which should already address these core services. It remains unclear whether the core services will truly support these downstream services. The GMES-specific definition of the term "in situ" as being equal to non-satellite derived (that is air-born and ground based remote sensing is considered in situ) is adding to the uncertainty and strongly underlines the space focus. "In situ" is Latin and literally means "in position" or "in its place". In the field of environmental monitoring, "in situ" typically describes measurements in contact with the medium.

The overall reasoning behind GMES is not transparently presented in the official GMES documents. Several factors make clear that that the true driving force behind the process is not user needs. These factors include the unimportant roles users play in GMES on both project and process level, as described above. Similar to the composition of the GAC, also national responsibility for GMES mostly is with technology or economy ministries. The way user statements are reported in GMES documents again underlines the supply focus, as some participants experienced in the workshops related to the FTS.

When visions of humans entering space were still high on the political agendas, the space industry has built up considerable capacities which were not fully used anymore, after these ideas became basically obsolete. Nevertheless, political visions remained in place, of prestigious advances in technology, especially space technology, and of surpassing competing areas in the world. These visions go along with a general belief by many decision makers that technology is the solution to all our environmental problems. GMES was then set up to provide a justification for this approach.

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#### 4.4. Reflections on this chapter gathered at the Extended Consortium Workshop

In the broader political frame, GMES has paved the way for users to interact across borders. Nevertheless, a range of open issues exists between the various political levels among users and among users and other stakeholders. This includes the way how the Implementation Groups have defined the Core Service requirements, which appears unclear to users on the national level. Likewise, the GMES in situ component is ambiguous in the frame of land monitoring. A formal way to define user requirements across the political levels is, thus, needed.

# 5. Users expectations: an integrated environmental monitoring system

*Users, as the ones represented in GNU, got involved in GMES because they expect that it would pave the way for an integrated and innovative environmental monitoring system and foster European data harmonisation and standardisation. The first paragraph specifies these expectations users have regarding GMES and, thus, provides an introduction to this topic. The largest obstacle to an integration effect through GMES is its space focus. Therefore, the second paragraph of this chapter is dedicated to this issue.*

## 5.1. Environmental data harmonisation and standardisation

Probably the most important opportunity provided through GMES would be to foster Europe-wide data harmonisation and standardisation efforts. This would, however, require in-depth participatory processes on all political levels, which are time consuming and, therefore, intimidating. Up to now unconnected decision makers who are concerned with eg, future operations of ESA, or national contributions to GEO, or the activities of Environment ministries should now be coordinated. Currently, there is clearly an insufficient exchange between space and other data sources operators.

In spite of this importance of new participatory processes throughout Europe, a reasonable ratio between participatory work and demonstration must always be maintained. Eg, CLC became popular primarily by being easily accessible and being available at not costs. Based on previous experience, CLC will, using the upcoming Sentinel data, be very useful on a European scale, and several GMES core service products might fulfil an alike role in the future.

The linking of GMES and SEIS (Shared Environmental Information System, coordinated by the EEA) and INSPIRE is an important step forward for GMES to become part of an integrated environmental monitoring system. INSPIRE results should be used as a reference for GMES. In this way, public resources should be saved through reshaped and standardised monitoring capacities. Directives should not call for a specific type of data (including pre-defining in situ or remote sensing), but for the best data source available to answer the pertaining questions. Not directly related to GMES, the WISE project (Water Information System for Europe) could provide an example for an effective process to translate user needs to product design in an area relevant to a

broad user base within the frame of environmental policy. It combines various data sources operated by different entities and makes data and information available to users.

Considering the likely upcoming ecological and economical crisis situations, it is essential to make best use of and combine all available data sources, in situ, remote sensing, statistical, in the most effective way. Such a future system would chose data independently of their provenance but rather based on their information content and cost efficiency. In situ data would form the foundation, whereas satellite data would provide an overall frame and facilitate georeferenced information, and, in some cases, remote sensing data may fill gaps where in situ data are missing. Coherent quality control and advanced modelling would allow hind-, now-, and forecasts, and provide transparent and real-time information as to the state of the environment in the frame of the European directives.

## 5.2. The space focus of GMES as an obstacle to an integrated environmental monitoring system

Initially, GMES was described as a system which will integrate space derived and in situ data and considers either data source equally important. This concept was nicely illustrated by the GMES-diamond which is now not used anymore. GMES currently is much more a space programme focussing on satellite based Earth Observation (EO), rather than a concept to optimise European environmental monitoring. The space focus in several cases impedes defining truly useful solutions, eg, in water management, GMES places emphasis on imagery, which is useful in flood control, but excludes applications that require system parameters which cannot be measured using satellites, such as distribution of aquatic species. Not enough options were developed to link, on the one hand, predominantly in situ data based state-of-the-art monitoring processes which users currently apply, and, on the other hand, new methods that integrate promising EO data.

A balance between space agencies pushing satellite-based remote sensing data and environmental institutions being expected to pull them, can be obtained only if remote sensing data are considered a part of a purposeful data package. In some cases, the a priori preference of satellites as the data source is questionable even for remote sensing data, as for small areas and spontaneous measurement needs, airplanes, helicopters or drones may be the method of choice.

The recent creation of the ISOWG (In Situ Observations Working Group) shows that the need to strengthen the GMES in situ component is now widely acknowledged. It would have been desirable to start this initiative years ago because integrating and coordinating the many actors involved in data collection from various sources requires a sufficient time frame. Moreover, product definitions and service roll out are likely too far advanced to be significantly influenced anymore.

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*The anticipated effect of GMES to integrate environmental monitoring across Europe and to foster data harmonisation and standardisation requires the provision of widely supported services across Europe. Only if services are used by the mainstream users, GMES will actually influence environmental monitoring practices. A basic prerequisite for this to occur is a sound economic standing of GMES. Therefore, this matter is tackled in this context. Google Earth is then looked into in the subsequent paragraph because this is often mentioned as an example for a widely accepted economic model, but its applicability to GMES may be questionable.*

### 5.3. The economy of GMES services as a prerequisite for an integrated environmental monitoring system

Clear scenarios are needed as to the funding and coordination of sound environmental monitoring programmes on all administrative levels, including in situ data acquisition, and the integration of the GMES services in this system. The future costs for using GMES services by the public sector must yet be clarified, and overall financial transparency would be desirable for the GMES process with all costs, including the space and ground hardware for data acquisition openly declared. As a prerequisite, already on project level, costs should be considered in detail, and estimates should be included in the respective SLAs. This would not only relate to image or other data product costs, but to the overall costs of operating the service (both on the service provider and the user side). It should nevertheless be considered that especially at early stages of product development, predicting all costs will only partly be possible, owing to unforeseeable circumstances.

The GMES data policy should be as open as possible for its outcomes to be widely applied. To facilitate data access, a clear GMES data distribution and licensing system would be very helpful, including a GMES label guaranteeing agreed upon quality standards, and a mechanism to provide an overview on all data products available. For users participating in GMES projects, access conditions to remote sensing data have already significantly improved in comparison to the situation before GMES. Data access should be regulated for the life time of the respective projects, as to how it could continue after the projects have ceased, and as to how those users not directly involved in the projects may have access as well. Nevertheless, utilisation of relevant data that are provided to the projects by third parties may be conditional upon provisions the project parties have no influence upon.

The GMES space component and its related ground infrastructure and its operation are, with the exception of privately funded satellites, paid for by the public. Data should, thus, be available as public good, and not be sold again to public entities, so that data are paid for twice. This would also go along with the European INSPIRE directive on the reuse of public sector information, and the Aarhus convention that calls for a right of access to environment information.

### 5.4. Google Earth as a possible economic model for parts of GMES

Google Earth could, indeed, provide an example for open and easily accessible data distribution. This widely known and freely accessible tool has significantly increased the general awareness regarding EO within several organisations. Also images that were widely distributed by the media,

such as the worldwide NO<sub>2</sub> distribution maps, or the Antarctic ozone hole, much increased the popularity and demonstrated the importance of particular satellite derived data. Importantly, without in detail investigating Google's licensing policy, one must be careful to use Google Earth as a model case for open data access. Moreover, the images currently distributed by Google are rarely the latest ones available, and, thus, not suitable for monitoring purposes. Nevertheless, the mechanism of Google Earth is an example for user-friendliness and, accordingly, these data are already widely applied for various purposes.

A related model for GMES could be an image core service, which would be the basis for further services. Value adding to these data could then reasonably be conducted on a commercial basis. Although ESA data are in principle freely available, this applies only for scientific purposes, for a two to three years usage, and it involves an application procedure. So in reality, for many purposes, they are not freely available. Many European groups use various land and atmosphere related data from the USA which can be downloaded for free.

Currently, in the European context, the INSPIRE directive calls for free (or low-cost) exchange of data between public entities in Europe. National and regional data policies vary, with several of them focussing on ways to recover costs. The US system of NASA satellite and ground based data distribution could provide an example for Europe, because once data are easily accessible, they likely stimulate a range of scientific applications.

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*Data Harmonisation in many regards appears more practical than standardisation. Within GMES, land monitoring is currently the most important example for this reasoning. Likewise, in this field, considerable positive effects of GMES are already visible and may be applied to other fields as well.*

## 5.5. Bottom up versus top down approaches in land monitoring as an example for an integrated environmental monitoring system

Traditionally, environmental monitoring data in Europe are reported from subsidiary to central levels, that is, upwards, whereas the GMES land monitoring related data products are centrally defined, and intended to be given to subsidiary levels in a downstream manner. Also the CLC classes were defined in such a top down manner. However, it appears to be more logical to aggregate the detailed national and regional land cover data upwards to more general products for the European level, rather than trying to adapt European level products to the needs of national level users.

The JRC (Joint Research Centre) high resolution forest layer is designed as a forest/non-forest map using parameters suitable for a European level product. However, the different national forest inventories are based on different definitions of parameters (including forest/non-forest) and require different minimum mapping units (MMU), and it would be impossible to match them in the current top down manner of GMES. Therefore, users of subsidiary levels currently cannot use the JRC forest layer.

To meet their specific needs, some member states now initiated their own land cover systems, eg, SIOSE (Land Cover and Land Use Information System of Spain), LISA (Land Information System Austria), current developments in the Nordic countries). The value of CLC is two-fold in this regard: It has, on the one hand, shown the usefulness of land cover services and it fostered the development of their technical aspects, which would not have happened on national levels only. Secondly, it is now voluntarily being used as a common standard that allows for comparisons between the countries and enables upwards aggregation of national products. There is a clear need for compatible data based upon harmonised international definitions and methods. Nevertheless, it must be considered that an all-European bottom up land cover mapping is a far reaching goal that requires an effective coordination of a multitude of actors. Currently, some detailed regional maps are produced simultaneously to the more general European ones, so there is duplication of work. This relates not only to the European level, but also in some cases to production within countries, where national products are produced parallel to regional ones with some duplication. In future planning, to the degree possible, the principle should be applied of measure once, use several times for different purposes, and finance the products through a joint mechanism. Ideally, such an innovative monitoring system would be a data network with information flow in either direction.

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## 5.6. Reflections on this chapter gathered at the Extended Consortium Workshop

The bottom-up versus top-down approaches must yet be specified and clarified, but in general, a bottom-up one appears preferable, because more detailed local and regional products can be upwards aggregated, whereas adapting European scale product to regional needs is not possible. Nevertheless, in several regards, an intermediate strategy may be most useful to combine the advantages of either approach. A standardised tool for validating the CORINE classification would be helpful, and a reference layer for landscape indicators could increase the value of CORINE.

# Annex: Worksheet

## Preparation for the GNU experiences workshops, January 17 and 18, 2008

The following questions are recommended to be discussed at the workshops. Not all of them will be relevant for each partner and there are overlaps, because certain issues may be tackled by different people in different ways.

### Focus on the complementary nature of the GNU members

- please list your roles fulfilled, such as (core) user of GMES or other pertinent projects, member/ leader of national GMES groups, delegate to bodies or groups, involvement in related networks, and the like
- your major GMES related interests, and expertise related to project work and to the political process
- your personal pertinent experience in comparison to GMES related experience existing in your organisation, i.e. the penetration of GMES outcomes in your organisation
- if and how GMES is currently changing your activities and work practices, i.e. what impact it has on you and your organisation or will likely have in the near future, provided that operational services are available

### Focus on the human aspects – the soft facts – of GMES

- perception of your roles within specific GMES projects and within GMES as a whole
- views and attitudes regarding the GMES political process as the overall frame of practical work
- specifically, how you view your capacity as a user to »drive« the GMES related activities you participate in
- your most essential positive and negative experiences made and what to learn from them, i.e. the highlights of your GMES past, good and bad
- your perception of relations and communication between data users and providers or value adders
- design and effectiveness of GMES training activities you attended
- your involvement in and opinion about user federations of GMES projects
- any further lessons learned and solutions to problems that may be widely applicable

**Focus on data product design within GMES projects and pre-operational services**

- observed effectiveness of various ways to translate your user needs into data product specifications and design
- observed effectiveness of current procedures to evaluate (appraise and validate) data products and their usefulness
- whether and how specific GMES data products could actually be integrated in your daily work
- whether you consider GMES data suitable to supplement in situ data you use
- to which degree GMES data products are, or will likely be, used for environmental policy support within your overall area of expertise
- whether for you GMES data are relevant for reporting obligations
- which role GMES data products play within policy cycles you are involved in (eg, do they influence issues like setting the agenda, laying scientific foundations, articulating or implementing policy, etc.)

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[www.gmes-network-of-users.eu](http://www.gmes-network-of-users.eu)