EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Prospective Technological Studies (Seville)
Sustainable Production and Consumption Unit

FINAL MEETING OF THE TECHNICAL WORKING GROUP FOR THE REFERENCE DOCUMENT ON BEST ENVIRONMENTAL MANAGEMENT PRACTICES IN THE CONSTRUCTION SECTOR

under article 46(1) of Eco-Management and Audit Scheme, EC regulation 1221/2009

Brussels, 22nd and 23rd of November 2011

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1. Introduction

The Community Eco-Management and Audit Scheme (hereafter EMAS) was originally established in 1993 by Regulation (EC) No 1836/93. This voluntary scheme was originally restricted to companies from industrial sectors. EMAS was revised in 2001 by Regulation (EC) No 761/2001 of the European Parliament and of the Council of 19 March 2001 allowing participation by organisations from all economic sectors, which is currently in force. Now, a second revision of EMAS has been undertaken, called EMAS III. This new regulation foresees the development of sectoral reference documents on best environmental management practice (Article 46). The goal of this workshop was to bring stakeholders together to discuss on the current draft version of the reference document for the construction sector.

2. Opening of the workshop and Introduction to EMAS Sectoral Reference Documents

The chairman, Harald Schoenberger, opened the session and welcomed the participants. After a brief explanation of the meeting procedure, an introduction was given. Working group members presented themselves and summarised relevant experience in environmental assessment, the Construction sector, and EMAS. The meeting agenda (Annex 1) was accepted without changes.

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3. Purpose and Goals of the Meeting

A short presentation was given by the chairman. The purpose of the meeting is to discuss and conclude on suitable indicators and benchmarks of excellence, refine the list of best practices, exchange information and to have the feedback and the input from the technical working group to finalise the document. It was remarked that there are still gaps in the document that should be filled and one of the goals of the workshop is to get information and recommendations in order to remove these gaps.

After the presentation, it was further explained that the concept of the reference document is not prescriptive and it is descriptive. Some attention should be paid to the application of the document to the EMAS regulation Annex IV, where some sector specific indicators may be required to be reported in the EMAS statement, where appropriate.

4. Overview of the information exchange

Main contributions to the document were summarised, including participation in different meetings, site visits, expert meetings, publications and other projects. Extended deadline of June 2012 proposed, with an additional commenting round. Participants alerted to the timeframe and requested to remain engaged over this period.

5. Approach, findings, changes in scope, gaps and commenting

The approach consists mainly in the identification of front-runner approaches, which are assumed to be much more proactive and apply best practices in a systematic way. It is important to develop best practices, indicators and benchmarks using a process level. Some other elements, as the importance of site visits, consideration of a wide scope to account for important indirect effects, and the avoidance of questionnaires were also explained. Distinction is made between environmental impact, and influence over environmental impact, for different stages and actors along the value chain, from inception and land planning through to demolition and waste management. Civil works is exclude and, at the end of the meeting, it was decided to make a separate chapter with the main links to building construction (see 6.4.). Additional emphasis is now placed on inception and planning process, construction processes and building products. Important gaps were listed, including performance data for buildings, environmental criteria for buildings and construction products, biodiversity aspects, etc., (see slides).

During the presentation, it was stated that some best performances were observed in SMEs. It was suggested that SMEs are having good performances because of the cost-efficiency of many measures. As well, it may be easier for small companies to monitor and to show environmental performance than for big companies managing several hundreds of sites. Big companies are also making great efforts and can react faster. Nevertheless, the identification of front runners of construction companies may not be possible for construction organisations. Long-term frontrunners have not yet been identified who implement best practice across wide range of processes and for a long time. The diversity of construction processes also hamper clear comparability.

Nevertheless, business culture has strong influence on the environmental management and on the achieved performance. It may be easier for SMEs to implement environmental management because there are fewer people to train and fewer processes and sites to coordinate action across and to demonstrate environmental performance, although the size of the company should not be the excuse

for best practice implementation and monitoring in big companies. As well, performance reporting is seen as a controversial issue due to confidentiality and competitiveness by large companies.

As well, it was recommended to develop some definitions to be used in all chapters.

Following clarification of process level indicators for EMAS registration, DG Environment highlighted that process level is a complement for the organisational core indicators. The use of too many indicators is seen as a main drawback for EMAS, especially if they are somehow mandatory. The main outcome of the process is the comprehensive description of best practices and the applicability of key indicators should be clearly stated in the document. It was proposed to develop a short list of indicators. Final user of the indicator should also be specified in the document. A new document developed by the Spanish advisory board for the certification of construction companies, CACEC (acronym in Spanish) will provide information on indicators for the construction sector that they have developed. The number of indicators is of about several hundreds.

6. Indicators and benchmarks

The understanding of best environmental management practice, techniques, indicators and benchmarks of excellence was given (see attached slides). Questions to the TWG were summarised, including best practice examples, indicators, benchmarks relevant experts and organisations, etc.

6.1. Building design

This section of the document is focused on the design options to minimise energy and water consumption during use phase and waste generation during deconstruction. In total, 17 techniques are described.

Specific energy consumption, expressed as kWh/m^2yr or equivalent, is the primary indicator for building energy consumption. Sub-sector benchmarks are required owing to variation across building types. There is not a proposed methodology. It will be always referred to exemplary existing methodologies. It was agreed to use Passive House as an example of best practice and, therefore, the methodology for specific energy consumption recommended in this standard should be used. The benchmark of excellence from the Passive House is 15 kWh/m^2yr for heating (new buildings) and 25 kWh/m^2yr for existing buildings. Nevertheless, Passive House is used as an exemplary approach and others schemes with similar criteria may be acceptable (regarding to best practices implementation). If the methodology is not common, comparability is not assured. Correction factors, if available, should be proposed among exemplary schemes or calculation methods.

As well, some difficulties are recognised regarding to methodologies and different definitions may be given to heated area, primary energy demand or final used energy demand or consumption, or to usable area (habitable, heated, etc.). It is proposed to insert a table summarising problems and definitions, and suggests consideration of climate-related standards.

The climate applicability (using e.g. Severity climate index and addressing Clima project for cooling in the Mediterranean) of the Passive House standard will be referred. The applicability of the standard to cooling demand in warmer countries and the applicability of the benchmark on heating to Nordic countries will also be studied in detail. A new developed standard for cooling has been already developed by the Passive House institute and may be reflected in the next draft document. The problem for specifying a benchmark for cooling energy is that cooling electricity may not be sub-monitored and may be benchmarked by the use of best practices.

Alternative and complementary indicators will be described in the text, as the kWh/person/day to compare energy consumption more widely as referred in the 'Sustainable energy without the hot air' book by David MacKay. This indicator also reflects differences between countries and urban/rural areas in terms of average space demand for inhabitants. The embodied energy of building materials will also be reflected in the document. Here, it is important to specify that it will be covered in a separate chapter for building products, and indicators and benchmarks developed there are complementary to this section.

Although the U-value is a good technical parameter to benchmark the quality of buildings, it is not useful for the basic understanding of the performance of a building. The use of 10 W/m^2 may be used, but its applicability should be well explained in the final text, as it may depend also on the efficiency of heating or cooling systems.

About the use of integrative standards, definition across different climates and different approaches for (life cycle) zero or plus energy buildings. This definition will be provided according to existing approaches. Also, location can lead to major constraints – e.g. whether possible to install large wind turbine onsite. In the final document, more relevance to the use of integrative approaches will be done and the benchmark will be referred to the coverage with renewable energy.

Lighting energy benchmarking should be made with two indicators: the specific power density, W/m^2 and specific energy use (kWh/m^2yr). Best practice on also lighting planning (including different strategies and automatic control systems) should be explained in the text. EN 15193 will be used for benchmarks, but more data may be needed to set realistic values. As well, IPTS will incorporate additional information.

Indicator for renewable energy sources will be the coverage of total needs with 'clean' energy source. A clear definition of what a renewable energy source will be provided in the text, with a clear distinction on how to differentiate purchasing, from own produced energy (localised) and the usability of certification schemes.

For water consumption, best practice is based on monitoring all building units and processes, implementing leak detection and integration with building management systems. The definition of building unit will be elaborated for the indicator and for the benchmark, based on the current definition of the Energy Performance of Buildings directive.

Water consumption per person per day is a relevant indicator, although it includes consumer behaviour. It is considered significant as its 'theoretical' value can be used to benchmark the current technology for the processes inside the building. Subsector approach is needed for the definition.

Recovery of grey and rainwater is a best practice, but there are some ineherent difficulties to benchmark it. Process approach is needed, with climate considerations. Meeting demand on specific processes such as toilet flushing can be considered in a benchmarking process. IPTS will propose framework methodology based on BSI and UN guidance, and will refine percentage indicator.

Qualitative benchmark proposed regarding design for deconstruction, and designing out waste (some contributions were offered here). England example was explained: Site Waste Management Plan Regulations require designers (architects, electricians, others) to demonstrate waste prevention measures. IPTS will propose new conclusion to reflect this, and emphasise waste prevention.

For waste prevention during deconstruction, it is needed to distinguish between between hazardous and non-hazardous waste, and to go further up supply chain to refer to provision of recyclable materials, but that this subject at early stage of development. DGNB example in Germany awards points for this aspect, so certified buildings could provide examples of best practice. Links with construction and products chapters will be established. Classification per type of waste and quantity (including its monitoring) should be defined in the document. The high number of products is a

drawback for this task. Grades of recycling will be defined (a proposal for low and high grade recycling was received). Regarding to design-out of waste, it was suggested to use 14006 guidelines for incorporating ecodesign in environmental management systems and it was also recommended to propose measurable, comparable and affordable indicators.

6.2. Construction

Construction waste
To develop indicators, it was recommended to use the new publication indicators from CACEC to be used by all sizes of construction companies and to refer them to ISO 14031 and ISO 14033 classification. Nevertheless, an exhaustive list of indicators can not be really provided in the document, as proposed indicators are linked to the implementation of best environmental management practices. Some discussion was held regarding to the 'number of claims' as an indicator because it reflects impacts on people. Nevertheless, it should be taken with caution.

It is not possible to have a comparable benchmark owing to different types of construction sites and different construction wastes, which should be differentiated in a final indicator.
Some inputs were offered at this point. The 0% or 0 kg recyclable waste sent to landfill was refused as benchmark and a 5% benchmark (based on current construction companies benchmarks) will be established. This benchmark will be disclosed per type of waste and incineration with heat recovery will not be excluded. As well, infrastructure for waste management can be a limitation for the benchmark, which has to be described in the applicability section. There was a proposal on describing organisational level (or at least different business units) indicators and benchmarks for waste management and also to describe best practices on how contractors control waste management after given to waste managers. There was agreement on the benchmark for less than 5% sent recyclable waste to landfill or incineration without energy recovery, to be differentiated according o waste types.

Materials reuse and recycling are techniques linking between construction activities, waste managers, designers and products manufacturers. It was proposed to link it with designing out waste and building end-of-life practices. It is important to recognise the limited capacity of the contractors. Onsite separation of material by constructors, ready for reuse, could be best practice and the exemplary target of 25% recycled concrete for Olympics was proposed. Some building standards already refer to this, with a value of 20% achievable, and there is an ISO14021 standard relevant, with reference to pre and post consumer recycling, with need to break down for different materials. ENCORD draft waste protocol being developed will be sent to IPTS.

Dust minimisation
It was proposed to differentiate between particulate matter from heavy machinery and dust from the site – which have different health impacts and different control mechanisms. However, on a mass basis, machinery PM is very small proportion. It was proposed to describe dust prevention plans, which may be differentiated according to location (e.g. urban or rural area). Deconstruction phase not included within scope of this technique and should be included. Dust *prevention* efficiency is preferred.

Water
Water monitoring should be included as an indicator of best practice, differentiated according to source (current monitoring practices maybe are far from best practice in some cases) and by use if possible. Some data will be provided by group members. Water costs are related mostly to disposal where e.g. river water is extracted, and no distinction between potable and non-potable water, except for the water quality needed for some structural concrete. A quantitative benchmark may then be developed from these data in the future. Control of discharged wastewater is controlled according to regulations. Maybe, implementation of a water management plan at all sites could be best practice, but

costs of this may be too high. Application of SUDS is best practice, but this depends on other factors (i.e. not implemented for construction sites alone and maybe mandatory). In slide 22, it should be added that polluted water should pass into sewage network (if present) as the benchmark.

Energy consumption
It is impossible to benchmark across different types of sites. Comprehensive reporting on energy consumption may be considered as a benchmark. Not all energy is under control of the primary contractor – subcontractors use energy and data needs to be collated from these. Absolute value should be used, but reference to area area as a denominator is most practical method as methodologies exist for calculating building floor area, and emphasises importance of process-based benchmarks. Usually, cost control is performed and no data on litres of fuel or kWh, so comprehensive monitoring, collating data from suppliers, would represent significant progress. It is better to relate energy consumption to building operation. For one site, 40% of electricity use was detected for heating cabins, compared with 12% for cranes. Some data will be provided for this section. ISO 16001 for energy management is relevant for the description.

Environmental management and monitoring of sites
Site-level management should include weekly checks as best practice, although a minimum monthly basis will be described in the document. There is a strong importance of site based compliance lists filled out every week that can be checked by verifiers or other site inspectors.

This practice may constitute basic EMAS or ISO requirements, but it was reminded that the scope is beyond certified or registered EMS. For certified systems, it will be specified in the applicability description. As well, the use of management indicators maybe useful. For public tenders, it was suggested that the document should recommend to move from price-based to quality-based tendering, but this requires that clients are willing to pay for quality. As well, criteria for private tenders should also be reflected in the document. Clients should consider lifecycle costs, which will reflect some environmental efficiency measures. For this, there are already some indicators that could be used.

Adherence to main contractor's management system may be too restrictive. It is difficult to achieve training across all workers, and suggests at least foremen should be trained. It was proposed to use hours per year, but this would not reflect the quality of the training.

Others
Noise prevention should be included in the document. As well, cabins energy and water consumption should be covered in the document.

6.3. Construction Products

Labelled products according to type 1 labels are preferred and the benchmark should be 100% for more than one product categories. This is maybe not applicable in some countries where the availability of eco-labelled construction products is low. Then, environmental criteria from labels and equivalent criteria can be used to choose non-certified products, although priority is given to third party verified protocols. This will be described in the text. Exclusion criteria are also very important for this best practice. The use of GPP criteria, or the use of equivalent approaches to include non-certified products complaint with equivalent criteria will also be described as best practice. This will be reflected under applicability. As well, IPTS will provide further information for different categories of product. The role of ISO Type 3 labels of relevance (environmental product declarations).

Criteria will be developed for the exclusion of hazardous products. It was suggested to cross-link with Ecolabel for office buildings, DGNB in Germany for 170 substances banned in relation to indoor air quality and other certification schemes. Ispra JRC is working towards standardisation of limit values for indoor air quality and should be taken into account.
Chain of custody certificate requirements should reflect the type of product (e.g. FSC mix versus FSC certification). It is proposed to avoid wood preservatives, which is covered in techniques for the

avoidance of hazardous substances. Wood also may be associated with indoor air emissions. Relevant environmental criteria for the standards will be proposed. IPTS will propose a number of relevant or exemplary certification schemes in the final draft.

6.4. Remaining work

Land planning will be developed with reference to relevant environmental criteria for new construction and renovation and also for building inception. Standard ISO 21929-1 relating to classification of brown and green field sites, DGNB criteria for city districts and other relevant schemes will be used. Biodiversity aspects will be included here.

Operation and maintenance should be controlled using indicators per person per day (e.g. for water and energy), referring to measurable behaviour in different types of buildings (link to the Swiss initiative 2000 Watts society, looking at how average energy consumption can be reduced to 2 kWh per person per day).

Building end of life: it was recommended to look for indicators and criteria in existing approaches (e.g. DGNB). To include reuse of building for other purpose also important – e.g. shift from offices to apartments. Nevertheless, this should be considered as reuse and not as end-of-life. As well, it was recommend to set the definition of risk (e.g. as in ISO standards) when discussion on the Demolition Recovery Index defined by UK Institution of Civil Engineers'.

About civil works, it was decided not to cover comprehensively this section. Then, the new chapter should include relevant best practices with strong cross-links or synergies with building construction. Netherlands has developed a lot of work on this, so contacts will be sent to IPTS.

7. Way Forward

New deadlines are summarized in the table below.

Written comments to be sent before	9/1/2012
New draft with filled gaps will be published in the IPTS webpage by	15/4/2012
Written comments on the new draft to be sent before	1/6/2012
Final draft to be published in the IPTS webpage by	30/6/2012
Tele or videoconference (to be organised by IPTS)	April 2012

8. Conclusions

Next pages show conclusions slides, as presented at the end of the meeting. There was a comment on the inclusion of GPP environmental criteria best practice application for business to business construction consents.

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CONCLUSIONS

Indicators and Benchmarks of Excellence proposed for the Building and Construction Sector

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Indicator: Specific energy consumption per area and year, kWh/m²yr

Benchmark of excellence: Many benchmarks already implemented and can be used to compare performance.

Requirements should be established for them. BoE should:

- benchmark **processes**: e.g. heating
- use **comparable** and understandable indicators, (e.g. kWh/m²yr), but **not ratios**
- define and use appropriate **methodology** to calculate the indicator, based on international standards
- **not include offsetting**

Indicator: Specific energy consumption per area and year, kWh/m²yr

Benchmark of excellence:

- And, at least, as ambitious as Minergie:

  Passive House

  Minergie-P

  ...

Indicator: Specific energy consumption per area and year, kWh/m^{2}yr

Benchmark of excellence: NEW BUILDINGS

< 15 kWh/m^{2}yr heating

Methodology will be elaborated, applicability for northern countries will be checked

The same for cooling in southern countries

Indicator: Specific energy consumption per area and year, kWh/m^{2}yr

Benchmark of excellence: EXISITING BUILDINGS

<25 kWh/m^{2}yr heating

Methodology will be elaborated, applicability for northern countries will be checked

Indicator: Installed heating or cooling (W/m^2);

Benchmark of excellence : 10 W/m^2 (Minergie-p and Passive House)

Indicator: Use of integrative standards, as passive house, (y/n), use of integrative concepts, as ZEB, LCZEB, PEB, LCPEB, (y/n)

Benchmark of excellence : Cover building energy requirements with renewable sources

IPTS will elaborate definition

Indicator: Electricity use (LENI), kWh/m²yr, Installed lighting, P_N, (W/m²); use of daylight beyond legal reqs. (y/n)

Benchmark of excellence :

per type of building, as defined in EN 15193 for LENI and P_N (automatic switching) to be revised, will include intelligent control strategy

Type of building	P_N, W/m²	LENI, kWh/m²yr
Offices	15	35.3
Education	15	27
Hospitals	15	

Table 3.43, p. 134

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Indicator: Use of localised renewable energy sources (% of primary energy demand);

Benchmark of excellence : 100% building energy from renewable sources

IPTS will refine

Indicator: Water monitoring;

Benchmark of excellence : Water monitoring of 100% building units and 100% relevant building process

IPTS will elaborate definitions of 'units' and 'relevant processes'

Indicator: Water consumption, L per occupant per day and/or L per m^2 per day (or sectoral approaches);

Benchmark of excellence : Sub-sector approach needed

- **More data needed**
- **BoE will be proposed where available**
- **To be referred in other reference documents (e.g. Tourism, Public Administration)**

Indicator: Water recycling, (% of rainwater reuse, % of grey water reuse);

Benchmark of excellence : 100% of rainwater reuse

IPTS will define methodology and refine benchmark based on BSI and UN guidance for rainwater recycling

Indicator: -

Benchmark of excellence : Building is designed for best recycling and reuse at deconstruction, using the concepts explained in the description of pages 158 and 159

IPTS will include new benchmark referring to the design-out of waste (prevention), also relating to products (draw on DGNB), and to level of recycling (high/low grade) considering future situation and ISO14006

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Indicator: Specific Waste generation, kg/m², tons/km, etc, differentiated according to waste type

Benchmark of excellence : n.a.

Indicator: Waste sent to landfill, % (mass basis?)

Benchmark of excellence : <5% sent to landfill or incineration without energy recovery

IPTS will differentiate according to waste classes

Indicator: Reuse of materials, use of recycled materials %

Benchmark of excellence : ?

IPTS will develop

Indicator: When appropriate, use of dust suppression techniques of Table 5.31, y/n

Benchmark of excellence : Dust prevention efficiency higher than 90%

Indicator: Specific water consumption, m^3/m^2, m^3/km, etc

Benchmark of excellence :

Monitoring of water consumption from different sources at site level

Implementation of a water management plan for every site?

Indicator: Implementation of techniques to improve water drainage during construction, y/n

Benchmark of excellence : n.a.

Indicator: Implementation of techniques to reduce water pollution during construction, y/n

Polluted water sent to sewage network, y/n

Benchmark of excellence : n.a.

Indicator: Specific energy and or fuel consumption (kWh/m^2, kWh/km, kg/m^2, kg/km,) etc.

Benchmark of excellence :

Monitoring of all energy consumed onsite, from different sources

Indicator: Use of checklist-based performance, y/n

Benchmark of excellence : site environmental management is checked comprehensively and monthly according to a semi-quantitative method, across all processes

Indicator: Tenders include environmental criteria (y/n), (app. to public administrations and clients for design and construction phases)

Benchmark of excellence : environmental criteria are used in consents and are included in an environmental management plan

IPTS will develop further

Indicator: Workers are trained in environmental management aspects, y/n

Benchmark of excellence : all site foremen are trained according to an environmental management system

IPTS will define good management systems and training quality

Indicator: Use of ecolabeled materials (y/n) – type I ecolabel (ISO 14024), percentage of ecolabeled materials (%) in one product category

Benchmark of excellence : 100% compliance for more than one product category

IPTS will refine. Compliance = type 1 label or equivalent, and depending on availability

Indicator: Avoidance of hazardous products, level of compliance with GPP (and other Ecolabel criteria)

Benchmark of excellence : 100% compliance with GPP (and Ecolabel) criteria for indoor chemicals avoidance criteria

Indicator: Percentage of recycled/reused material, per product category

Benchmark of excellence : Ecolabel criteria compliant

Indicator: Percentage of wood with certificates of chain of custody

Benchmark of excellence : 100% compliance

IPTS will elaborate on relevant certification schemes

LAND PLANNING

Strong links to public administration document.

Main aspects to focus are:

- Environmental criteria at urban (local) level to define "new construction" needs
- Environmental criteria at urban (local) level to define refurbishment needs
- Also considers building incepcion: site location, orientation and interaction with surroundings, etc.
- Green and brown field sites (ISO 21929-1)

OPERATION AND MAINTENANCE

Many techniques in previous chapters are oriented to building user, so a cross-sectoral approach is needed

Main aspects to focus are:

- Building management system
- Energy and water monitoring
- Best practices to address behavioral aspects

BUILDING END-OF-LIFE

Description from Background Document very comprehensive

Strong difficulty in the definition of indicators and benchmarks at design or construciton phases regarding end-of-life

This section covers best practices on deconstruction phase

Indicator: Recycling rate, %

Benchmark of excellence : 95%

How to achieve? BEMPs:

7.2.1 Selective deconstruction of buildings
7.2.2 Selection of environmentally friendly deconstruction/demolition techniques
7.2.3 Deconstruction/Demolition waste sorting
7.2.4 Plasterboard/Gypsum recycling
7.2.5 Use of recycled concrete in building construction

Indicator: Demolition Recovery Index or similar, defined as the percentage which describes, in terms of area (m^2) how much of the structure, cladding, flooring, ceiling elements can be capable of being dismantled without significant risk or damage. (Or similar)

Defined by the Demolition protocol, Institution of Civil Engineers (ICE), UK

II

CIVIL WORKS

Some descriptions are already applicable to civil works (chapter on construction will be further elaborated with this thought)

Nevertheless, particularities should be gathered in a separate chapter, specially for:

- Environmental criteria for materials sourcing
- Best practices for biodiversity and soil alteration.

This section needs deep revision, but will limited to a summary highlighting crosslinks and synergie

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Annex 1. List of Participants (plus absences from the Kick-Off Meeting)

(*Absents in Italics*)

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Massimo Cassinari	ICMQ	Italy
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Annex 2. Meeting Agenda

EUROPEAN COMMISSION
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JOINT RESEARCH CENTRE
Institute for Prospective Technological Studies (Seville)
Sustainable Production and Consumption Unit

WORKSHOP ON THE EMAS REFERENCE DOCUMENT FOR THE BUILDING AND CONSTRUCTION SECTOR
BRUSSELS, 22-23 NOVEMBER 2011
DRAFT AGENDA

22 NOVEMBER 2011: 15.00 – 18.30

15:00 - 15:20	**Opening and welcome by chairperson**
15:20 – 15:40	**Purpose and goals of the workshop**
15:40 – 16:15	**Overview of the information exchange to develop the draft document** – presentation followed by discussion
16:15 – 17:00	**Approach, findings, changes in the scope, gaps and commenting** – presentation followed by discussion
17:00 – 17:15	**Break**
17:15 – 18:30	**Indicators and Benchmarks of Excellence on Building Design**– presentation followed by discussion

23 November 2011: 9.30 – 17.30

09:30 – 10:00	**Indicators and Benchmarks of Excellence on Building Design (cont)**– presentation followed by discussion
10:00 – 11:00	**Indicators and Benchmarks of Excellence on Construction Processes** – presentation followed by discussion
11:00 – 11:20	**Break**
11:20 – 12:20	**Indicators and Benchmarks of Excellence on Construction Processes (cont)** – presentation followed by discussion
12:20 – 13:00	**Indicators and Benchmarks of Excellence on Construction Products** – presentation followed by discussion
13:00 – 14:30	**Lunch**
14:30 – 15:15	**Indicators and Benchmarks of Excellence: remaining work** – presentation followed by discussion
15:15 – 15:30	**Way forward** – presentation followed by discussion
13:00 – 14:30	**Break**
16:00 – 16:30	**Conclusions: Identified gaps, information needs and TWG input**
16:30 – 17:00	**Conclusions: Indicators and Benchmarks of Excellence**
17:00 – 17:30	**Any Other Business**
	Close of workshop

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