Report

First JERICO FerryBox workshop

Contributing to the activities of workpackages 3, 4 and 5

J*oint*
E*uropean*
R*esearch*
I*nfrastructure network for*
C*oastal*
O*bservatories*

Helmholtz-Zentrum Geesthacht

30th -31st August 2011.

Prepared by

W. Petersen, M. Hartman, D. Hydes, G. Petihakis

Agenda:

Tuesday, 30th of August 2011

10:30 Welcome

10:45 – Morning Session:

- Current overview of FB-within JERICO: (HZG, HCMR, IMR, NOC, MUMM, NIVA, SYKE, SMHI, CNRS/IFREMER, CEFAS)

12:30 Lunch

13:30 Afternoon Session

- Continue Current Overview of FB (all)
- Status of FB questionnaires by W. Petersen
- Quality Assessment
    - Status on quality control and data handling (in connection with WP5)
    - Overview of quality assessment procedures in the community (NIVA)
    - Quality criteria appropriate fro FerryBox
    - Quality flags (according to SeaDataNet)
- Best practise:
    - Data vocabularies consistent with SeaDataNet for use by EMODNET
    - Goals of QC development in JERICO (OGS)
    - Status data transfer, communication (GPRS, satellite…)
    - Real time data processing incl. QC/QA - community needs
    - Post processing incl QC/QA - community needs
    - Data storage and access for internal and external use (via pick user pick up from a ftp site?) and data flow to other communities (MyOcean, JERICO, EMODNET)

17:30 end of session

Wednesday, 31st of August 2011

09:00 Morning Session

- Calibration (George)
    - Common procedures
- Biofouling (George)
- New and special sensors
    - Algal (chlorophyll-a fluorescence, phycoerythrin and phycocyantin, fluorescence, chlorophyll-a absorption)
    - Nutrients
    - CO2, pH and alkalinity
    - Radiance (photochemistry, chlorophyll-ratio)
    - Specific Calibration and biofouling requirements for new sensors

12:30 Lunch

- Continue: New and special sensors
- Summary and action list from above
- Input to next JERICO workshops and to other WPs
    - Recommendations concerning quality control to be addressed to WP4
    - Recommendations concerning data handling to be addressed to WP5
    - Recommendations concerning new sensors to be addressed to WP10
- Any other business

17:00 End of session

List of participants:

First Name	Last Name	Institute	email
Chris	Balfour	NOC-L	cabal@noc.ac.uk
Dominique	Durand	NIVA	dominique.durand@niva.no
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John M.	Howarth	NOC-L	mjh@noc.ac.uk
David	Hydes	NOC-S	djh@noc.ac.uk
Pierre	Jaccard	NIVA	pierre.jaccard@niva.no
Seppo	Kaitala	SYKE	Seppo.Kaitala@ymparisto.fi
Bengt	Karlson	SMHI	Bengt.Karlson@smhi.se
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Olle	Petersson	SMHI	olle.petersson@smhi.se
George	Petihakis	HCMR	gpetihakis@hcmr.gr
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Jukka	Seppälä	SYKE	jukka.seppala@ymparisto.fi
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Henning	Wehde	IMR	henning.wehde@imr.no

1. Objectives of the workshop:

The objectives of the workshop were to review current status of operations and to take forward developments of Ferrybox operations supported by other JERICO work packages WP4 and 5.

1. Overview about the current status of existing FerryBox systems in Europe.
2. Review status of Ferrybox operations within the evolving network European marine sustained (operational) monitoring activity.
3. Review development of appropriate new sensors
4. Plan development of recording of best practice procedures for Ferrybox operations (sensors, maintenance, antifouling, QC/QA, data handling).

2. Overview of FB activity within JERICO:

Status reports about FB systems were presented by following institutions:
MUMM (P. Roose),
HZG (W. Petersen)
NIVA (K. Sørensen)
CEFAS (D. Sivyer)
CNRS (P. Morin)
SYKE (S. Kaitala)
NOC-POL (J. Howarth)
SMHI (B. Karlson)
HCMR (M. Ntoumas)

FerryBoxes are operated on fixed routes either on ferries or other commercial ship by HZG, NIVA, CNRS, SYKE, NOC-L and SMHI. Ferryboxes aboard research vessels ("random walk systems") are operated by MUMM and CEFAS. HCMR is going so reinstall an upgraded Ferrybox System (only operated in the years 2003-2005) on the Athens to Crete soon. NOC-L had to stop Ferrybox operation in 2011 due to cut-off of financing. NOC-S will start operating a random walk Ferrybox with Marine Scotland in early 2012.
All systems are measuring the basic parameters of S, T, Turbidity and Chl-a fluorescence. In addition some lines have installed sensors for pCO2. Automatic nutrients measurements are only performed by HZG and MUMM. Down-welling and up-welling irradiance for satellite validation is measured by NIVA only. Nearly all systems have the possibility to water samples using automated water samplers. Some systems already have a real-time data transfer via satellite connection. On the other systems data are transferred during the stay in the harbour.
Raised questions and problems:

1. Automatic nutrient analysers need to be more reliable than those available commercially
2. Consistent across JERICO QC/QA and flagging of the data are required. See Later

Actions

HZG will provide JERICO web page with a link to a page in www.ferrybox.org which shows the tracks and links to the operational webpages of the specific FerryBox operator.
All to provide HZG with the needed information

3 FB status questionnaires:

Two questionnaires (Excel sheets) concerning the FerryBoxes were sent to all Ferrybox operators before the meeting.

In the first sheet general information about the lines (FB_Routes EuropeJerico.xls) was requested and the second one (FB_equipement_lists_Jerico.xls) requested details of the measured parameters and instruments used.
Most have been returned these questionnaires.
A share site would be helpful so that the most up to date versions of all forms and JERICO manuals can be accessed reliably and simply.
The key point of the discussion was on how best to improve and standardise the reporting of instrument meta-data. Bengt Karlson agreed to take the lead on looking at what was required for optical systems.

Actions

All to return questionnaires

HZG An updated version of these questionnaires will be circulated

HZG will try to get in addition the data from FerryBox operators in Europe which are not involved of JERICO

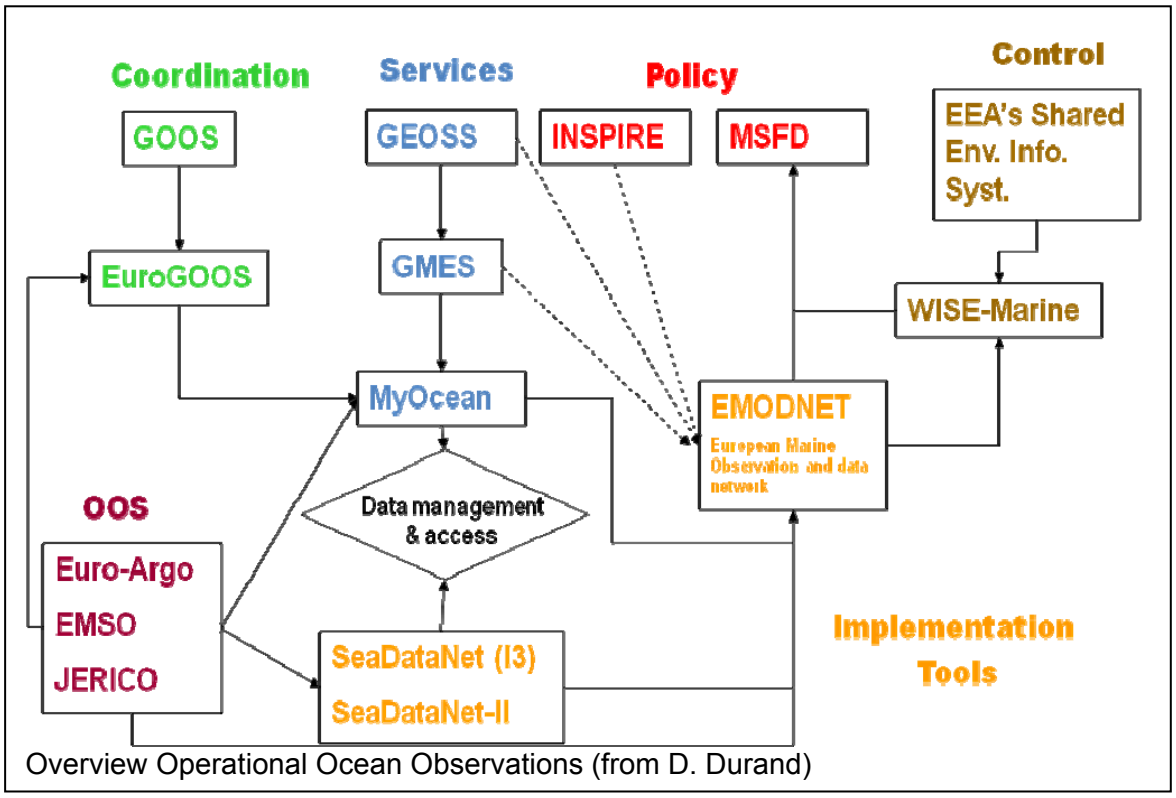
All to (1) check for correctness of the tables, (2) fill in missing information (3) add further details requested by WP 4 und WP 5.

HZG will test working with these files on a common server (Google docs?) in order to have a single shared document, which can only be modified and updated by one partner at a time.

SHMI to prepare “straw man” meta-data reporting form

4. Role of JERICO in Operational Ocean Observations

At a global and EU level a number of initiatives now exist which potentially provide an overarching framework for FB operations and also need the data collected by FB systems. Dominique Durand (NIVA) gave an overview about the role of JERICO in Operational Ocean Observations, infrastructure projects and related EU initiatives. He explained the role of FerryBox systems in MyOcean. All FB data supplied to MyOcean will be managed through the MyOcean FerryBox FTP portal.



Overview Operational Ocean Observations (from D. Durand)

The Marine Strategy Framework Directive (MSFD) should benefit from the European Marine Observation and Data Network (EMODNet). EMODNet has the potential to link existing and developing European observation systems, by providing a common data management structure across European data centres. This should facilitate long-term and sustainable access to the high-quality data on bathymetry, biological, chemical and physical parameters. Currently cross linkage of the data centres and access to the data is being tested through the development of data portals. EMODNet will be mechanism for providing data to WISE-Marine, the marine component of the EEA's Shared Environmental Information System (SEIS). WISE-Marine is intended to fulfil the reporting obligations of the Marine Strategy Framework Directive. It will inform the public on indicators for Good Environmental Status of sea basins. EMODNet exists at EU level within the INSPIRE directive and large-scale framework programmes on European and global scales (GMES and GEOSS).

The SeaDataNet project provides the data tools and common vocabularies needed for the implementation of the EMODNet data access management processes and establishing practical interoperability with other GMES, GEOSS, and WISE-Marine activities.

Discussion Point

Key to improved data use is the reporting of appropriate meat-data. The simplest form of which is the data quality flag attached to the reported data. JERICO has to ensure that consistent data flagging is used across all its data sets.

In MyOcean all data will be flagged according to SeaDataNet and EuroGOOS Data MEQ working group. For real-time or near-real-time data flags 0,1, 4 or 9 are mandatory.

Code	Meaning	Comment
0	No QC was performed	-
1	Good data	All real-time QC tests passed.
2	Probably good data	-
3	Bad data that are potentially correctable	These data are not to be used without scientific correction.
4	Bad data	Data have failed one or more of the tests.
5	Value changed	Data may be recovered after transmission error.
6	Not used	-
7	Not used	-
8	Interpolated value	Missing data may be interpolated from neighbouring data in space or time.
9	Missing value	-

Note from John Howarth (NOC) based on conversation with BODC

The Ocean Data Standards report is recommending splitting data flagging in two parts. The primary layer must be simple and strictly limited to data quality with unambiguous definitions of flags. It should offer quick access to quality information to assess the fitness for purpose of the data. The second layer provides information justifying the quality flag applied at the primary level and information on data processing history The proposal is intended for all local, national, and international bodies, programs, and projects that exchange oceanographic and marine meteorological data. It applies to all instances where quality flags are used to inform the users of the quality of oceanographic and meteorological data.

There are five primary data quality flags, listed below, not too dissimilar to the MyOcean and SeaDataNet flags used in practice. These can be applied to JERICO Ferrybox and fixed instrumentation data – the only flag which may create any discussion is 'questionable / suspect'. The idea is the flag order is monotonic to aid a user.

Code	Primary level flag's short name	Definition
1	Good	passed documented required QC tests
2	Not evaluated, not available or unknown	used for data when no QC test performed or the information on quality is not available
3	Questionable/suspect	failed non-critical documented metric or subjective test(s)
4	Bad	failed critical documented QC test(s) or as assigned by the data producer
9	Missing data	used as place holder when data are missing

Note from Leonidas Perivoliotis (HCMR)

MyOcean uses the following list (this is the complete list for all the different layers of QC):

code	Meaning
0	no QC was performed
1	good data
2	probably good data
3	bad data, but correctable
4	bad data
5	value changed
6	below detection limit
7	in excess of quoted value

8	interpolated value
9	missing value

Flags 0,1,4, 9 are mandatory for the real time quality control, which is performed automatically with the data receiving. A delayed mode quality control is also imposed to the data on a 3-months basis. As you can see, the differences with the proposed table by Dr. Howarth are quite small. On that basis, I think that Jerico data flags should comply with that has been already developed for MyOcean. This will ensure the data maximum compatibility and will prevent any possible effort duplication for many institutions.

Note from Willi Petersen:

I agree with Leonidas. It makes no sense to go an extra way with FerryBox data even the scheme may be more logic. We should strictly be confirm with the SeaData Net standard in order to make the data comparable.

Actions

NOC Place copy of Ocean Data Standards report on JERICO shared site.

ALL A decision needs to be made across JERICO as to what level of flagging should be used.

5. Ferrybox data management (requirements from WP5):

Rajesh Nair (OGS) gave a presentation concerning Ferrybox data from the WP5 (Data management and distribution) perspective. He said all FB operators should cooperate with MyOcean developments of FB data handling methodologies and quality assurance procedures to establish community standards and practices. Data should be managed/distributed using the MyOcean infrastructure and procedures.

Real-time FB data will be routed through Task 5.3 of WP5. This task will also manage the necessary interaction between JERICO and MyOcean.

Delayed-mode FB data activities will be routed through Task 5.2. This task will also manage the necessary interaction between JERICO and SeaDataNet II.

Discussion points

The degree of real-time data transfer that can be achieved in different systems on different ships was discussed including (1) costs of satellite communication (2) problems with firewalls if using internet access on board of the ships.

In terms of data QA realistic expectations of the quality targets of each parameter need to be explicitly defined by the group. For example for salinity the target precision would better than ± 0.05.

Actions

OGS A Data Management handbook is in preparation. This will define the approaches that need to be taken for automated QC of the data.

JERICO office to set up common web based server for documents see action on HZG above for Google docs site.

6. Ferrybox QA/QC (requirements from WP4)

Notes after the workshop from George Petihakis (HCMR) who presented the requirements from WP4:

WP4 HARMONIZING OPERATION AND MAINTENANCE METHODS

6.1 Task 4.1 Calibration (Task Responsible, HZG Sub-Task Responsible OGS, SMHI, HZG)

In all sub tasks we have three major actions:

1. Harmonization of calibration practices through documentation and assessment of existing calibration methodologies
2. Sharing of calibration facilities
3. Best practices, dissemination of know-how

Thus I think that in the following months (until the end of the year) it is important to work with the first action

1. Harmonization of calibration practices through documentation and assessment of existing calibration methodologies

The aim is to gather all information available within JERICO (documentation), which will help us move at a later stage to assessment etc. More, we have to work towards the deliverable, which is **Report on Existing Facilities (M18 – HZG).**

The obvious tool is a questionnaire. Stefania and Rajesh have already worked on that so what I propose is to circulate among us their version and made additions/modifications on it. I think that among other things it is important to include in the questionnaire the existing calibration methodologies, the equipment as well as any reference material.

The timetable I propose is:

ACTION	**WHO**	**DEADLINE**
1st version of questionnaire	Task – SubTask leaders (HZG, OGS, SMHI)	Mid Oct.
2nd version of questionnaire	All partners	End Oct 2011
Completion of questionnaire	All partners	End Nov 2011
Working on results	Task – SubTask leaders (HZG, OGS, SMHI)	End Dec 2011

2. Sharing of calibration facilities

For the second action (sharing of calibration facilities) the workshop of SYKE in February might be a good opportunity to set an example.

6.2 Task 4.2 Biofouling (Responsible CNR, Sub-Task Responsible HCMR, SYKE, CNR)

Again in all sub tasks we have three major actions:

1. To describe all different methods used across the network with reference to the cost (implementation, maintenance) and adaptability (different sensors and areas)
2. To share best practices and methodologies
3. To evaluate new methods used by the community external to JERICO

In the following months (until the end of the year) we must focus on the collection of information regarding biofouling prevention methods used across the network. Thus:

1. To describe all different methods used across the network …….,

Again we can use a questionnaire, for which a new design is needed. From the questionnaire we must be able to deduce

- Which are the most reliable sensors
- To describe and evaluate different methods in terms of costs

An indicative timetable could be:

ACTION	**WHO**	**DEADLINE**
1st version of questionnaire	Task/SubTask leaders (CNR, HCMR, SYKE)	End Oct 2011
2nd version of questionnaire	All partners	Mid Nov 2011
Completion of questionnaire	All partners	End Nov 2011
Working on results	Task/SubTask leaders (CNR, HCMR, SYKE)	End Dec 2011

2. To share best practices and methodologies

Once we have the results from the questionnaire we can discuss during the next two workshops the best practices and methodologies

6.3 Task 4.3 End-to-End QA (Responsible HCMR, Sub-Task Responsible PUERTOS, NOCS, CSIC, CEFAS)

Three major actions here:

1. to describe best practices in all phases of the system (pre-deployment test, maintenance, calibration etc)
2. to adopt common methodologies and protocols

3. move towards the harmonisation of equipment which will help in reducing maintenance and calibration costs. For this inter calibration tests and in-situ validation will be organised.

The work is separated according to the platform (subtasks) plus one subtask on Running Costs (CEFAS). Thus:

1. Describe best practices ……

To start working on the 1st action, the subtask leaders must collect information, which will help us during the workshops to describe the best practices. This information can be collected with a questionnaire prepared by the Task and SubTask leaders.

An indicative timetable could be:

ACTION	**WHO**	**DEADLINE**
1st version of questionnaire	Task – SubTask leaders (HCMR, PUERTOS, NOCS, CSIC, CEFAS)	End Nov 2011
2nd version of questionnaire	All partners	End Dec 2011
Completion of questionnaire	All partners	End Jan 2012
Working on results	Task – SubTask leaders (HCMR, PUERTOS, NOCS, CSIC, CEFAS)	End Feb 2012

2. To adopt common methodologies and protocols

These will be discussed during the two next workshops.

Regarding the running costs together with CEFAS (Naomi) we will make a spreadsheet where partners will record expenses so within 1 year we will have a very good idea of how much we spend for each platform.

WHO	**ACTION**	**DEADLINE**
HZG, OGS, SMHI	1st version of questionnaire for calibration	Mid Oct.
All partners	2nd version of questionnaire for calibration	End Oct 2011
CNR, HCMR, SYKE	1st version of questionnaire for biofouling	End Oct 2011
All partners	2nd version of questionnaire for biofouling	Mid Nov 2011
All partners	Completion of questionnaire for calibration	End Nov 2011
All partners	Completion of questionnaire for biofouling	End Nov 2011
HCMR, PUERTOS, NOCS, CSIC, CEFAS	1st version of questionnaire for E2E QA	End Nov 2011
HCMR, HZG, OGS, SMHI	Working on results for calibration	End Dec 2011
CNR, HCMR, SYKE	Working on results for biofouling	End Dec 2011
All partners	2nd version of questionnaire	End Dec 2011
All partners	Completion of questionnaire	End Jan 2012
HCMR, PUERTOS, NOCS, CSIC, CEFAS	Working on results	End Feb 2012

7. Novel sensors for Ferrybox sensors (Connection to WP10):

Jukka Seppälä

SYKE have tested phycocyanin-fluorometers for detection of harmful blooms of filamentous cyanobacteria and a phycoerythrin-fluorometer for detection of pico cyanobacteria. The maintenance and calibration are more difficult than for Chla fluorometers. SYKE has also tested fast repetition rate fluorometers, absorption and scattering meters, and the use of bioluminescence for detection of toxic Alexandrium dinoflagellates.

Willi Petersen

HZG have tested membrane based pCO2 sensors have been tested from ProOceanus and Contros. The Contros system is more suited for unattended operation due to easier cleaning of the flat membrane but data have to be returned to the Contros for processing. Currently two systems are in use aboard the vessels Tordania and Lysbris.

For nutrients different devices from the company Systea have been tested. All systems have poor long-term stability and robustness. For operation and maintenance much experience is needed. A new in-house development using sequential injection analysis will be tested for phosphate and later for silicate. Another development (Ph-D thesis) is a high precision underway pH sensor using spectrophotometric detection and automated alkalinity measurement. The development of a PSICam (point-source integrating-cavity absorption meter) is still under test. The idea is to measure absorption spectra of the algae in order to get a more reliable quantitative signal and in addition have the possibility to distinguish between different algal groups. Its main problems as an underway instrument are the changes of the reflectivity of the chamber due to humic substances. Currently the effectiveness of intensive cleaning procedures are being tested. For gene-probes a new automatic filtration unit is under development. The aim is to get samples (fixated filter cakes) automatically which can be analysed later by gene-probes in the lab.

Actions

8. Random-walk Ferryboxes (RWF)

FerryBoxes are now fitted to range of vessels in addition to ferries that run simple repeat tracks. The data from these systems, which do not have fixed tracks, presents a problem for the analysis of data in terms of time series information because the locations of the data are not fixed.

From the monitoring point of view this is not immediately a problem because the fact that there is an improved data return in the different OSPAR areas is a step forward.

However some thought needs to give to the question of how best use is made of the data starting from the identification of which waters in a particular ships operations are crossed most frequently and identifying overlaps with other parts of the network for cross checking of the data.

Actions

RWF operators **CEFAS, MUMM, NOC**(Marine Scotland) should report at the 1st Annual meeting on progress with systematic description of their data sets.

9. Generic display system

"Task 6.1.3 Provision of data from JERICO observing systems onto public display monitors/information hubs including enhancement of NERC-NOCS Ferrybox passenger display. Work will be carried out to design a new template for a ship-based and web-based Ferrybox passenger/web-user display programme. Code will be written that runs the display programme on both the web and ship for built-in flexibility, allowing easy changes to content and format. User interactivity will be designed with a web display programme. NERC-NOCS Ferrybox web pages will comply with the JERICO Community Hub and the passenger display. The aim is to establish guidelines and pave the way for other Ferrybox operators (and for operators of other observing platforms) to set up similar end-user information."

The needs of other operators for such a system was discussed. Interest was expressed by NIVA, SYKE, CEFAS, SB-Roscoff, SMHI.

The information need from them was decided to be

1. Name
2. Organisation
3. Contact e-mail
4. Approximate number of parameters to display including time, latitude and longitude.
5. Names of parameters, time, latitude, longitude, temperature, salinity, chlorophyll-a, oxygen concentration, CDOM, etc
6. Expected range of each parameter.
7. Comments on preferred structure of display.
8. Physical method of connection of FerryBox logging system to display (Ethernet, RS422, ...)
9. Any example or description of stored data and metadata.
10. Brief description of system
11. Any other relevant information.

Actions
NOC To send out questionnaire on requirements ship display system

10. Interoperability requirements:
Discussions considered

1. Public access and visibility of FB data.
2. How can we get all FB data of on a certain date in a defined area ?
3. HZG can offer their database for other users. HZG database has interactive visualization and download tools via an internet browser.
4. In MyOcean NIVA is responsible for gathering FerryBox data. However, data are only stored as netcdf files which may be helpful for real-time use for modellers but has no visualisation tools to get an overview what is available.

Summary action list:
Operations

1. **HZG** will provide JERICO web page with a link to a page in www.ferrybox.org which shows the tracks and links to the operational webpages of the specific FerryBox operator.
2. **All** to provide HZG with the needed information

Status Questionnaires

3. **All** to return questionnaires
4. **HZG** An updated version of these questionnaires will be circulated.
5. **HZG** will try to get in addition the information from FerryBox operators in Europe which are not involved of JERICO
6. **All** to (1) check for correctness of the tables, (2) fill in missing information (3) add some more details as requested by WP 4 und WP 5.
7. **HZG** will test working with these files on a common server (Google docs?) in order to have a single shared document, which can only be modified and updated by one partner at a time.
8. **SHMI** to prepare “straw man” meta-data reporting form for optical instruments.

Status Report

9. **HZG** Deliverable D3.1 Report on current status of FerryBox (Willi, January 2012). Excel tables and a report based on discussions at this meeting.

Data reporting and links to MyOcean etc.

10. **ALL** A decision needs to be made across JERICO as to what level of flagging should be used.
11. **NOC** Place copy of Ocean Data Standards report on JERICO shared site.

Links to WP4 and WP5

12. **OGS** A Data Management handbook is in preparation. This will define the approaches that need to be taken for automation of QC of the data.
13. **JERICO office** to set up common web based server for documents see action on HZG above for Google docs site.
14. **All** Report on existing facilities
    a. HZG, OGS, SMHI (mid October 2011) 1st version of questionnaire
    b. All (end Nov 2011) Completion of questionnaires
    c. HZG, OGS, SMHI Report based on questionnaire (end Dec 2011)
15. **All** Report on biofouling
    a. CNR, HCMR, SYKE (end October 2011) 1st version of questionnaire
    b. All (end Nov 2011) Completion of questionnaires
    c. CNR, HCMR, SYKE Report based on questionnaire (end Dec 2011)

16. **All** Development of end to end QC
    a. HCMR, PUERTOS, NOCS, CSIC, CEFAS (end Nov 2011) 1st version of questionnaire
    b. All (end Jan 2011) Completion of questionnaires
    c. HCMR, PUERTOS, NOCS, CSIC, CEFAS Report based on questionnaire (end Feb 2011)

Random Walk Ferryboxes

17. **CEFAS, MUMM, NOC** should report at the 1st Annual meeting on progress with systematic description of their data sets.

Generic display system

18. **NOC** To send out questionnaire on requirements ship display system (done Sept 2011)

Best practice

19. **NIVA** Newcomers guide to installing a FB (Kai, Nov 2011?)
20. **HZG, SMHI, OGS** Preparation of best practice guides: The following agreed to take the lead on preparing best practice guides that will be revised at intervals during the period of JERICO.
    a. HZG Chemical sensors
    b. SMHI Optical Sensors
    c. OGS Physical sensors
21. **NOC (plus all)** Brochure for Shipping Industry out-lining the requirement for fitting a system in a ship in terms of space, power, access to water and drainage and need for any (e.g, Lloyds' certification) and in addition showing example installations. (end Dec 2011)

Management actions

22. Development of a document sharing site
23. Mailing lists appropriate for joint of workpackages 3 & 4
24. Dendrogram of responsibilities

General Information														Sensor list
Institution	Name of platform		Shipping Company & website		Name of system (e.g. Algaline)	public awareness website	name of contact person	email of contact person	phone number of contact person	Destination harbours	Major route way points (Lat/Long)	Start of operation	End of operation	Observed parameters (detailed information in separate sheet)
BCCR, UiB	M/S Trans Carrier	cargo ship	Sea Cargo	http://www.sea-cargo.no								2005	today	pCO2, T, S, Trb, Chl-a, pH
CNRS/INSU	Armorique	car/passenger ferry	Brittany Ferries	http://www.brittany-ferries.co.uk			Pascal Morin	pmorin@sb-roscoff.fr	+33 298 292 317	Roscoff-Plymouth	48.72, -3.95; 50.34, -4.24	2010	today	T, S, DO, chl-a, Trb, CDOM
Ifremer	Pont-Aven	car/passenger ferry	Brittany Ferries	http://www.brittany-ferries.co.uk			Paul Jegou	Paul.Jegou@ifremer.fr	+33 298 224 113	Portsmouth-Santander-Plymouth-Roscoff-Cork	50.78, -1.00; 43.47,-5.41; 50.34, -4.24; 48.72, -3.95, 51.84, -8.33	2011	today	T, S, DO, chl-a, Trb, CDOM
COM (CNRS/INSU)	Jolly Indaco	RoRo container ship	Linea Messina	http://www.messinaline.it	TRANSMED	http://www.ciesm.org/marine/programs/partnerships.htm	Isabelle Taupier-Letage	itaupier@ifremer.fr	33 4 94 30 49 13	Genova -Libyan harbours	44.41N-8.93E , 32.55N-15.60E	may 2010	march 2011 (interrupted due to pb in Libya)	T, S
COM (HYMEX/CNRS/INSU)	Niolon	RoRo	Marfret	http://www.marfret.fr	TRANSMED	http://www.hymex.org	Isabelle Taupier-Letage	itaupier@ifremer.fr	+33 4 94 30 49 13	Marseilles-Algiers	43.30N- 5.37E, 39.74N-3.63E,36.79N-3.17E	late 2011	2020	T, S
COM (HYMEX/CNRS/INSU)	TBD	ferry	Grimaldi Lines	http://www.grimaldi-lines.com/	TRANSMED	http://www.hymex.org	Isabelle Taupier-Letage	itaupier@ifremer.fr	+33 4 94 30 49 13	Barcelona-Civitavecchia	42.34N-11.96E, 41.98N-3.67E	mid-2012	2020	T, S
HCMR	Kriti II	car/passenger ferry	Anek Lines	www.anek.gr	Ferry Box System I		George Petihakis	gpetihakis@hcmr.gr	+30 2810 337755	Piraeus-Heraklion	37°58'N 23°38'E 35°20'23"N 25°10'49"E	2002	2003	T, S, Trb, Chl-a
HZG (GKSS)	Duchess of Scandinavia	car/passenger ferry	DFDS A/S	http://www.dfdsseaways.de	COSYNA	www.cosyna.de	Wilhelm Petersen	wilhelm.petersen@hzg.de	+49 4152 872360	Cuxhaven - Harwich	53.87, 8.73; 51.94, 1.29	2002	2005	T, S, DO, Chl-a, pH, Trb, nutrients
HZG (GKSS)	TorDania	Ro/Ro-ship	DFDS TorLine	http://www.dfdstorline.com	COSYNA	www.cosyna.de	Wilhelm Petersen	wilhelm.petersen@hzg.de	+49 4152 872362	Cuxhaven - Immingham	53.87, 8.73; 53.63, -0.18	2006	today	T, S, DO, Chl-a, pH, Trb, nutrients
HZG (GKSS)	LysBris	cargo ship	DFDS Lys Line	http://www.lysline.com	COSYNA	www.cosyna.de	Wilhelm Petersen	wilhelm.petersen@hzg.de	+49 4152 872359	Moss-Cuxhaven-Hamburg-Chatham-Bilbao-Immingham	59.43, 10.66; 53.87, 8.73; 53.51, 9.95; 51.40, 0.54:43.05; 3.04;53.63, -0.18	2007	today	T, S, DO, Chl-a, pH, Trb, nutrients
HZG (GKSS)	MS Funny Girl	passenger ship	Reederei Cassen Eils	http://www.Helgolandreisen.de	COSYNA	www.cosyna.de	Wilhelm Petersen	wilhelm.petersen@hzg.de	+49 4152 872358	Büsum - Helgoland	54.13, 8.86 ; 54.18, 7.89	2008	today	T, S, DO, Chl-a, pH, Trb
HZG (GKSS)	MS FunnyGirl	passenger ship	Reederei Cassen Eils	http://www.Helgolandreisen.de	COSYNA	www.cosyna.de	Wilhelm Petersen	wilhelm.petersen@hzg.de	+49 4152 872361	Cuxhaven- Helgoland	53.87, 8.73; 54.18, 7.89	2009	today	T, S, DO, Chl-a, pH, Trb
IMGW	Stena Balitica	car/passenger ferry	Stena Line	http://www.stenaline.se								2008	2009	T, S, Trb, Chl-a, DO
IMR	MS Vesterålen	car/passenger ferry	Hurtigruten Group	http://www.hurtigruten.com/			Henning Wehde	henning.wehde@imr.no	+47 55238650	Bergen-Kirkenes		2006	today	T,S, Chl-a fluorescence
IMR	KV TOR	Coast Watch ship	Coast Watch Norway	http://mil.no/Pages/default.aspx#2			Henning Wehde	henning.wehde@imr.no	+47 55238650	Norwegian West Coast (Bergen)		2011	today	T,S, Oxygen
LOMI	M/S Romantica	car/passenger ferry	Tallink	http://www.tallinksilja.com/en										T, S, Trb, Chl-a
Marlab	MV Hascosay	container ship	North Link Ferries	http://www.northlinkferries.co.uk										T, S, Trb, Chl-a
NIVA	MS Bergenfjord	car/passenger ferry	Fjord Line	http://fjordline.com		www.ferrybox.no	Kai Soerensen	kai.sorensen@niva.no		Histhals, Stavanger, Bergen		2008	today	T, S, Trb, Chl-a, nutrients (weekly samples)
NIVA	MS Trollfjord	car/passenger ferry	Hurtigruten Group	http://www.hurtigruten.com/		www.ferrybox.no	Kai Soerensen	kai.sorensen@niva.no		36 locations from Bergen to Kirkenes		2006	today	T, S, Trb, Chl-a, nutrients (weekly samples), irradiance, radiance, wind
NIVA	MS Color Fantasy	car/passenger ferry	Color Line	http://www.colorline.com		www.ferrybox.no	Kai Soerensen	kai.sorensen@niva.no		Oslo, Kiel		2008	today	T, S, Trb, Chl-a, CDOM, cyanobacteria, nutrients (weekly samples), irradiance, radiance
NIVA	MS Nordbjorn	cargo ship	Nb Norbjorn as	http://www.norbjorn.no		www.ferrybox.no	Kai Soerensen	kai.sorensen@niva.no		Tromsø, Bjørnøya, Longyearbyen, Ny Alesund		2008	today	T, S, Trb, Chl-a, nutrients (weekly samples), irradiance, radiance
NIVA/MARLAB	MS Norrøna	car/passenger ferry	Smyril Line	http://www.smyrilline.com		www.ferrybox.no	Kai Soerensen	kai.sorensen@niva.no		Histhals, Torshavn, Seydisfjord		2008	today	T, S
NOCS	Pride of Bilbao	car/passenger ferry	P&O Ferries	http://www.poferries.com	NOCS FerryBox Project	www.noc.soton.ac.uk/ops/ferrybox_index.php	David Hydes/Mark Hartman	djh@noc.ac.uk;mch@noc.ac.uk	+44 23806596547/6345	Portsmouth-Bilbao	50.81, -1.11; 48.45, -5.41; 43.34, -3.05	2002	2010	auto:T, S, Chl-a, Trb, O2, pCO2; (monthly samples nutients, pigments, plankton, coccoliths)
NOCL	Lagan Viking	car/passenger ferry	DFDS Seaways	http://www.dfdsseaways.co.uk								2006	today	T, S, Chl-a, Trb
SMHI & SYKE	TransPaper	cargo ship	TransAtlantic AB	http://www.rabt.se/en		http://www.smhi.se/klimatdata/2.1326	Bengt Karlson	bengt.karlson@smhi.se	+46 31 751 8958	Gothenburg-Kemi-Oulu-Lübeck-Gothenburg		2009	today	T, S, Trb, Chl-a,, Phycocyan, CDOM, DO, PAR, airPress, airTemp (phytoplankton, salinity, chl a, CDOM).
SYKE	SiljaSerenade	car/passenger ferry	Tallink	http://www.tallinksilja.com	Alg@line	http://www.itameriportaali.fi/en/itamerinyt/levatiedotus/en_GB/levatiedotus/	Seppo Kaitala	seppo.kaitala@ymparisto.fi	+358 50 3506803					T, S, Chl-a, Trb
SYKE	FinnMaid	Ro/Ro-passenger	Finnlines OY	http://www.finnlines.fi	Alg@line	http://www.itameriportaali.fi/en/itamerinyt/levatiedotus/en_GB/levatiedotus/	Seppo Kaitala	seppo.kaitala@ymparisto.fi	+358 50 3506803			1998	today	T, S, Chl-a, nutrients
TTU	MS Baltic Princess	passenger ship	AS Tallink Grupp	http://www.tallinksilja.com/								1998	today	T, S, Chl-a, nutrients (wkl sampl)
Univ. Rhode Island	Norrøna	car/passenger ferry	Smyril Line	http://www.smyril-line.com										T, S, Trb, Chl-a

Tab. 1: Part of FerryBox questionnaire (status of Sept 2011)