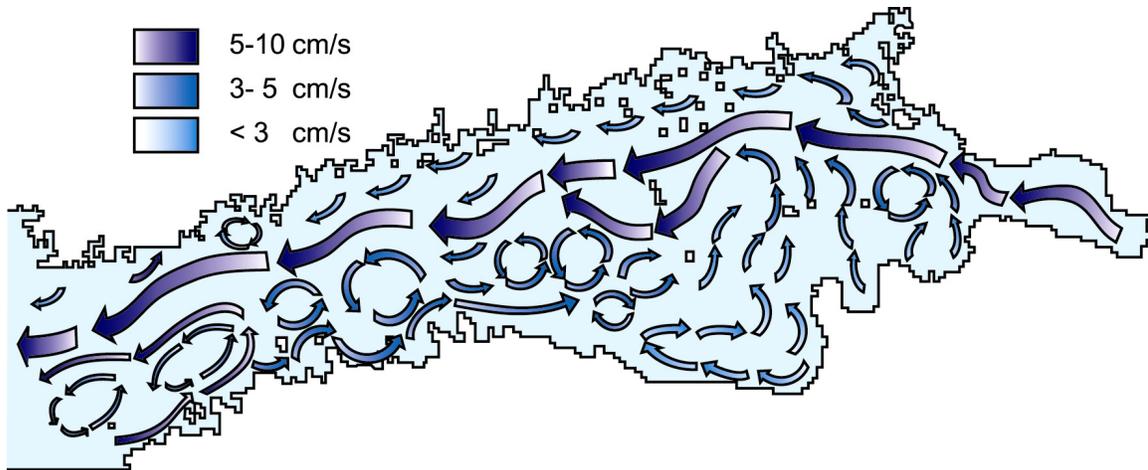


## BONUS+ Project

# BalticWay

## The Potential of Currents for Environmental Management of the Baltic Sea Maritime Industry



Annual Report 1  
January– December 2009

## Synopsis

- The project started overall successfully, in spite of some delays in the first half-year because of financing issues that needed to be resolved.
- Cooperation established; deliverables and (internal) milestones mostly on track; one deliverable ahead of the schedule; two additional deliverables released.
- Clear progress in scientific content; very positive feedback from several scientific conferences.
- Estimated 80% of the first-year activities performed; several items ahead of time.
- Great success in dissemination & demonstration of the importance of cutting edge science in the political decision-making process (Nord Stream consultations), followed by public distinctions of the members of the IoC group.

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## Scientific Results

### Work Package 1 – Forcing and boundary data

WP Leader: ICR

- Task 1.1 *Gathering and unification of data for running the circulation models*, PM 1-12, Leader: IoC
- Task 1.2 *Gathering and unification of data for running the risk model*, PM 1-18, Leader IoC
- Task 1.3 *Common weather forcing and wave-induced radiation stress*, PM 7-24, Leader: DMI

**Key progress:** the evaluation and validation of wind fields, long-term calculation of wave fields

- (1.1, 1.2) Generation of a common meteorological forcing database (12 nm downscaled product of the ERA-40 data covering the North Sea and the Baltic Sea), shared by all Baltic Way partners (DMI).
- Total 40 years of hourly weather forcing data has been extracted and pre-processed: surface pressure, temperature, wind speed components, total precipitation, snow depth, actual albedo, short and long wave radiation, evaporation, relative and specific humidity and total cloud cover.
- Forcing data and oceanic responses have been validated against independent data sources (ICR).
- Evaluation and validation of wind fields from a regional atmosphere model driven by ERA40 data at the lateral boundaries for 1961–2007, to be shared by Baltic Way partners as alternative forcing data (SMHI).
- Evaluation and validation of wind fields from a regional atmosphere model driven by ERA40 data at the lateral boundaries for 1961–2007, to be shared by Baltic Way partners as alternative forcing data (SMHI).
- SMHI geostrophic wind data base shared with IoC in order to perform calculations of wave properties in the Baltic Sea
- Ongoing testing, evaluation, analysis and validation of wind fields from a regional atmosphere model, with a goal to update the atmospheric forcing for both medium- and high-resolution circulation simulations (SMHI).
- (1.3) Wave properties for the Baltic Sea calculated for 1970–2007 with a resolution of 3 nm (IoC).
- A subroutine was developed to calculate the wave induced radiation stress (i.e. the wave induced momentum) for scenario runs (DMI).

The WP is running as planned.

## Work Package 2 – Circulation modelling in the target areas

WP Leader: SMHI

- Task 2.1 *Simulations of circulation in the entire Baltic Sea with a moderate resolution*, PM 4-18, Leader: SMHI
- Task 2.2 *High-resolution simulations of circulation in the Gulf of Finland and the western Baltic Sea*, PM 7-30, Leaders: Gulf of Finland-SYKE; Western Baltic: IFM-GEOMAR
- Task 2.3 *Validation modelling of the circulation of the entire Baltic Sea*, PM 7-24, Leader: Different circulation model-ICR; Operational ocean model-DMI

**Key progress:** performing RCO circulation simulations (with 2 nm for 1961-2007) and their validation; distribution of wind and simulation data within the consortium; preparation of model runs with the latest updates of atmospheric forcing.

- (2.1) Performing and validation of RCO simulations 1961–2007 with 2 nm resolution; model validation with focus on currents; distribution of simulation data within the consortium (SMHI).
- New model simulations (2 nm horizontal resolution, improved vertical resolution with 83 layers) with recently improved atmospheric forcing and improved model parameterizations, being analyzed at the moment (SMHI).
- (2.2) Preparation of bathymetry data for the entire Gulf of Finland with the necessary 0.5 nm resolution in the central and eastern parts of the basin and with 0.25 nm resolution in Estonian and Finnish waters (IoC).
- Test simulations have been run with the high resolutions (down to 0.25 nm) with encouraging results; the OAAS circulation model for the Gulf of Finland has been vectorised and it now works much faster than before (SYKE).
- Implementation of the 0.5 nm grid for the Gulf of Finland, getting the boundary conditions for the western boundary of the Gulf of Finland and meteorology (from SMHI) completed (SYKE).
- As a first step for longer high-resolution runs in the Gulf of Finland, the entire Baltic Sea run for 1987-1992 with a resolution of 1 nm is now in a starting phase and results are expected to be obtained in February 2010 (SYKE).
- Preparatory work increasing the horizontal model resolution to 1 nm and analysis of atmospheric forcing for the period 1950-2008/9 with respect to climate variability and change (IFM-GEOMAR).
- Analysis of the meteorological forcing data for 1986–2008 for the BSH model input. One-year validation simulation of the BSH model was successfully compared against climatic sea temperature and salinity data (ICR).
- With the DMI code and 40 years forcing database, a comparison between the performance of the DMI and BSH models based on a one-year simulation (2002) was carried out (ICR). The results have been compared against climatology and post-processing tools were developed.

The WP is running as planned.

## Work Package 3 – Particle trajectory and oil spill modelling

WP Leader: MISU

- Task 3.1 *Implementation of the MISU method for exact and invertible calculations of trajectories at IoC and ICR*, PM 1-12, Leader: MISU
- Task 3.2 *Calculation of Eulerian and Lagrangian trajectories of water particles*, PM 4-30, Leader: MISU
- Task 3.3 *Modelling of oil drift patterns in the Baltic Sea*, PM 10-33, Leader: DMI

**Key progress:** Updating of the TRACMASS code; release of the TRACMASS manual; TRACMASS intense course for the BalticWay personnel in Tallinn.

- (3.1) Ongoing updates of the TRACMASS code and its documentation (MISU).
- First version of a user-friendly TRACMASS manual released May 27 (MISU).
- Exporting the TRACMASS code and necessary information about hydrophysical fields to Tallinn (MISU, IoC, SMHD);
- Intensive course "TRACMASS - A Lagrangian Trajectory code" for newly recruited personnel and graduate students at IoC, July 14–24, held by Anders Anbo (Uppsala University and MISU).
- (3.2) Calculations of trajectories of water particles started in IoC from August, as a first step for the years 1987–1991 in order to compare the results with existing data.
- First off-line version of database of trajectories realized (IoC).
- Test runs with IFM-GEOMAR drift model, where drifters are launched along the ship routes and the times when drifters hit the coast are evaluated for different seasons of the year, analyzing the seasonally resolved drift tracks.
- (3.3) In order to meet the requirements for resolution used in circulation modelling, the grid resolution of DMI's operational circulation model is increased from 3 nm in the Gulf of Finland to 0.5 nm (DMI). The set-up is currently tested.
- A development plan for the improvement of the description of the wave effects in DMI's oil drift model has been worked out.

There is a certain delay in the implementation of the TRACMASS code at ICR (Task 3.1) but this has not affected trajectory calculations in which there is clear success (Task 3.2; see also Task 4.1).

## Work Package 4 – Synthesis: Identification of areas of reduced risk

WP Leader: IFM-GEOMAR

- Task 4.1 *Identification of areas of reduced risk from the analysis of Lagrangian and Eulerian trajectories*, PM 7-30, Leader: MISU
- Task 4.2 *Uncertainties and seasonal and interannual variability of the areas of reduced risk*, PM 13-36, Leader: IoC
- Task 4.3 *The effect of local wind and waves*, PM 13-33, Leader: DMI
- Task 4.4 *Areas of reduced risk associated with favourable subsurface current patterns*, PM 16-36, Leader: SYKE

**Key progress:** Identification of several new dynamic patterns of current-induced transport; construction of numerical methods for the analysis of large pools of trajectories.

- (4.1) Implementation of fast methods for search, analysis and comparisons of large pools of trajectories (IoC).
- Establishing basic time scales for the first hit and massive hits of current-driven adverse impacts for the Gulf of Finland (IoC).
- Identification of the presence of nontrivial patterns in net transport and the ratio of net and bulk transport in the Gulf of Finland based on 2 nm model results (IoC).
- Introduction of the new concept of equiprobability lines for relatively narrow sea areas; construction of several algorithms for their calculation for the Gulf of Finland (IoC, see also Task 6.1).
- The positions of the main ship routes through the western Baltic Sea were collected and prepared for drift model calculations (IFM-GEOMAR).
- An initial analysis of the direct problem of tracer propagation has been made for the southern Baltic Sea (IFM-GEOMAR).
- (4.2) Initial analysis of seasonal and interannual variability of the patterns in net transport and the ratio of net and bulk transport, and the location of the equiprobability lines in the Gulf of Finland for 1987–1991, based on the results of the 2 nm model (IoC).

Although the analysis of the trajectories created in WP3 has only just begun, there are indications showing that the chosen approach is feasible and may reveal certain principally new features of the dynamics of currents that cannot be extracted directly from the velocity fields.

Tasks 4.3 and 4.4 in this WP are only planned to be undertaken from year 2 on.

## Work Package 5 – Validation experiments

WP Leader: SYKE

- Task 5.1 *Measurement of the current-induced surface drift and its dispersion properties in the Baltic Sea Proper*, PM 4-18, Leader: MISU
- Task 5.2 *Measurement of current-induced surface drift and its dispersion properties in the surface layer and subsurface layer of the Gulf of Finland*, PM 7-30, Leader: SYKE
- Task 5.3 *Measurement of current-induced surface drift and its dispersion properties with the use of airborne and remote sensing methods*, PM 1-36, Leader: LDI

**Key progress:** Development of an economical technical solution for in-situ validation drifter experiments; preparation of a database of spectra of typical oils for remote sensing measurements

- (5.1) Development of a low-price technical solution for drifter experiments based on car trackers equipped with a GPS and GSM (MISU, SMHI, IoC).
- Key components of the drifting buoys to be used for the experiments were identified and the manufacturers contacted about specifics (MISU, IoC).
- (5.2) Preparation and field validation of a database of spectra of typical oils for remote sensing measurements (LDI).

The possibility of arranging small-size experiments in year 1 as preparations for the main experiments in years 2&3 was discussed during the kick-off meeting in January and during several regional meetings but in the end no experiments were realized in this year, focussing the effort (both in personnel and finances) on the main experiments in the coming two years. At present the planning for the experiments in 2010 is ongoing.

## Work Package 6 – Risk analysis and mathematics of inverse problems

WP Leader: IoC

- Task 6.1 *Modelling of environmental risk*, PM 1-33, Leader: IoC
- Task 6.2 *Analysis of the properties of the water age*, PM 7-33, Leader: SMHI
- Task 6.3 *Development of a probabilistic approach for ensemble forecasts*, PM 13-33, Leader: SMHI
- Task 6.4 *Mathematical background of the concept of areas of reduced risk*, PM 1-36, Leader: IoC

**Key progress:** Development of several new time scales and quantities characterising semi-persistent patterns of currents and environmental risks of current-driven adverse impacts; development of algorithms for their calculation from pools of trajectories.

- (6.1, 6.4) Identification of the presence of nontrivial patterns in net transport and the ratio of net and bulk transport in the Gulf of Finland based on 2 nm model results (IoC, see also Task 4.1).
- Introduction of the new concept of equiprobability lines for relatively narrow sea areas; construction of several algorithms for their calculation for the Gulf of Finland (IoC, see also Tasks 4.1 and 7.1).
- An initial analysis of the direct problem of tracer propagation has been made for the southern Baltic Sea (IFM-GEOMAR, see also Task 4.1)

A large part of the progress has been achieved together with the activities within WP4. Due to the late availability of funds for some partners, the work in this WP has been carried out to a somewhat lesser extent than originally planned. The tasks in this WP, however, are largely activities supporting and quantifying the reliability of the results of other WPs. Therefore they were not deemed as critical for the overall progress of the project, and priority was assigned to other WPs. As the progress in other WPs has picked up speed by the end of the first year, we now also expect rapid progress in WP6.

### Work Package 7 – Applications

WP Leader: DMI

- Task 7.1 *Development of a prototype of the fairway design*, PM 10-33, Leader: DMI
- Task 7.2 *Implementation plan and estimates of the gain of the proposed technology*, PM 16-33, Leader: IoC
- Task 7.3 *Implementation plans for potential applications of the results*, PM 16-36, Leader: IoC

**Key progress:** Introduction of the concept of equiprobability lines as a first approximation to the optimum fairway.

- (7.1) Introduction of the new concept of equiprobability lines for relatively narrow sea areas; construction of several algorithms for their calculation for the Gulf of Finland (IoC, see also Tasks 4.1 and 6.1).

No other activities foreseen for the first project year.

## Work Package 8 – Management and dissemination

WP Leader: IoC

- Task 8.1 *Integration and harmonisation of the activities*, PM 1-36, Leader: IoC
- Task 8.2 *Management and overall quality control*, PM 1-36, Leader: IoC
- Task 8.3 *Dissemination and public awareness, exploitation and IPR management*, PM 1-36, Leader: IoC

**Key progress:** Dissemination of the results to stakeholders very successful; delay of financing issues resolved; project largely kept running as scheduled.

- (8.1) Redistribution of some tasks between partners on the kick-off meeting to match the inhomogeneous budget cuts
- (8.1, 8.2) Delay of financing issue resolved:
  - change of budget agreed - movement of the coordinator's activities to partner LDI to be able to start the project in Estonia;
  - acceptance from the Estonian Science Foundation (ESF) for temporary use of some funds from other grants to cover urgent expenses of the project;
  - salary of some team members and travel costs temporarily paid from third sources
- Data flow and competence transfer successfully launched; coordination of efforts of partners
- Consortium agreement still under negotiation
  - Issues raised by partner ICR still to be solved
- (8.3: dissemination) 6 appearances at political and public stakeholder events (IoC), namely for a plenary session of the Estonian Parliament, several committees of the Estonian Parliament, and Finnish-Estonian expert panels
- 19 interviews (IoC) for Estonian TV, radio, and newspapers (incl. one interview to the Finnish leading daily newspaper Helsingin Sanomat)
- Contributions to the electronic BONUS Bulletin
  - BalticWay invited to the HELCOM HABITAT meeting (BONUS Bulletin 7/2009).
  - BalticWay topical meeting in Tvärminne, Finland, May 13–15, 2009 (BONUS Bulletin 7/2009).
  - News from BalticWay/Tallinn: a two-week intense course in TRACMASS trajectory simulation system held on July 14–24, 2009.
- Project web site delayed, only set up in July in a basic version, <http://wavelab.ioc.ee/bonus-balticway> To be expanded substantially in year 2; key information about the run of the project stored on the sister website of the Wave Engineering Laboratory (Activities, Publications etc.)

The WP is mostly running as planned, with small modifications caused by external issues.

See also the appendix on the background for the statistical information.

## Meetings and Events

- January 12, Helsinki                      Project kick-off meeting, attended by all partners
- January 13&14, Helsinki                BONUS+ kick-off meeting, attended by all partners
- March 6, Stockholm                      Planning meeting of the Swedish partners, attended by MISU, SMHI & IoC
- May 14, Tvärminne                        Discussion of model calculations, attended by SYKE, IFM-GEOMAR, LDI & IoC
- May 4-8, Lund                              RCM-Workshop: 21st century challenges in regional-scale climate modelling, Lund University, attended by IFM-GEOMAR
- May 5, Liège                                Discussion of model calculations, attended by IoC, LDI & GKSS
- May 25-28, Szczecin                      Climate change: the environmental and socio-economic response in the southern Baltic Region
- June 5, Kiel                                 Discussion of model calculations, attended by SYKE & IFM-GEOMAR
- June 15-16, Helsinki                      BONUS+ coordinators' meeting, attended by IoC & SMHI
- August 17-21, Tallinn                      Baltic Sea Science Congress, including a project status meeting attended by IoC, SYKE, SMHI, IFM-GEOMAR, LDI
- October 12-14, Helsinki                 Discussion of drift modelling and circulation in the north-eastern Baltic Sea, attended by SYKE & IFM-GEOMAR
- October 15, Norrköping                 Modelling cluster meeting, attended by SMHI, ICR
- December 3, Helsinki                      BalticWay regional meeting and seminar with presentation of first results and discussion of upcoming simulations, attended by SYKE, IoC & LDI.
- December 15, Kiel                         Presentation of the drift experiments from the Gulf of Finland (SYKE) and the southern Baltic (IFM-GEOMAR), and discussion of potential differences in trajectory modelling and data exchange, attended by SYKE & IFM-GEOMAR)

## Comparison with original plans

- The unclear contract and payment situation delayed the start of the project to a considerable extent, especially for the Estonian partners IoC and LDI, and DMI from Denmark. This affected the allocation of existing and the hiring of new personnel as well as the purchase of equipment.
- Consequently, the work undertaken in the project has not fully progressed as expected. As the contractual and financial issues were resolved in the middle of the project year, additional staff has been hired since then.
- Efforts of all teams during the second half-year of 2009 made it possible to complete the majority of activities and plans foreseen for the first year.

### Comparison with original research plan

- Due to the delay in the start of the work, the work was concentrated in the first three work packages, and activities in the work packages 4, 5, and 6 will only start for full in the second project year.

### Comparison with original financial plan

- As personnel at IoC, LDI, ICR and DMI only reached full strength in the middle of the project year; personnel costs for the first year have not reached the foreseen amounts.
- Owing to delay in financing, the IoC and LDI applied for restructuring of their budgets (central issue: costs of coordinating within the first project year to be redirected to LDI). The positive response from the BONUS EEIG allowed for smooth launch of the project and compensating most of delays by the end of the first year.
- As no experiments were run in WP 5 in the first year, the corresponding budget for equipment has not been used.

## Influence of third party results

- The ongoing discussions about the construction of the Nord Stream pipeline created considerable interest for Baltic Sea matters among politicians and state administrators but also from the general public.
- This was also reflected by heightened media attention, which provided increased opportunities to inform about the BalticWay project, as well as get in touch with important stakeholders needed later on for the application of the technology to be developed in real-life situations.
- Meetings with political and public administration stakeholders involving presentation of preliminary results of the project:

- Presentation by T. Soomere (IoC) “Nord Stream: challenges for the Baltic Sea marine sciences” for the joint meeting of the Estonian Parliament Commissions on foreign affairs and on environment, including a short overview of the ideas of the BalticWay project, April 6.
- Presentation by T. Soomere (IoC) “Nord Stream: challenges for the Baltic Sea marine sciences” for the meeting of the Estonian governmental maritime commission, including a short overview of the background and potential outcome of the BalticWay project, May 27.
- T. Soomere (IoC) participated in the official meeting of Estonian experts and official representatives with Finnish representatives and Nord Stream experts, organised by the Finnish Ministry of Environment (Helsinki, Finland), with an explanation of the potential role of anisotropic transport patterns in the Gulf of Finland, based on preliminary results of the BalticWay project, June 25.
- T. Soomere (IoC) presented the lecture “Nord Stream: hard knots of hydrodynamics”, including preliminary results of the BalticWay project, for the joint meeting of the Estonian Parliament’s Environment Committee, Foreign Affairs Committee, and Economic Affairs Committee, October 15.
- T. Soomere (IoC) participated in the official meeting of Estonian experts and official representatives with Finnish representatives, organised by the Finnish Ministry of Environment (Tallinn, Estonia), with comments and explanations partially based on the results of the BalticWay project, October 26.
- T. Soomere (IoC) presented the lecture “Nord Stream in the unique and vulnerable environment of the Baltic Sea”, including preliminary results of the BalticWay project, to an extraordinary Plenary Session of the Parliament of Estonia (Riigikogu) and answered questions posed by Members of Parliament, October 27.

Resulting media coverage: 13 interviews for TV, radio, and newspapers (see appendix on statistics; several interviews on October 27 counted as one event)

## **Changes in the work plan**

- While the timing of the activities has been changed due to the delayed start, the full scope of activities foreseen for the project are still planned to be carried out within the next two years.

## **Changes in the deliverables**

- Only one deliverable was due in year 1 (see below), namely D8.1 – the Project web portal, originally due in April 2009 (project month 4). Due to the financing problems involving – among others – the coordinator institution, the web site was delayed and only set up in a basic version in July at <http://wavelab.ioc.ee/bonus-balticway>, to be expanded substantially in year 2.

- A test version of deliverable D2.1 (database of 3D velocity fields) has been released ahead of the schedule, in autumn 2009.
- Two added deliverables (already published scientific papers) have been delivered.
- At the moment all year 2 deliverables are expected to be on time, with no delays or changes currently expected.

### Added Deliverables

1. Reconsidering uncertainties of wave conditions in the coastal areas of the northern Baltic Sea.  
Journal paper reflecting preliminary studies of long-term calculations of surface wave fields for the entire Baltic Sea in the framework of Tasks 1.1, 1.3 and 6.4: RÄÄMET, A., SUURSAAR, Ü., KULLAS, T., SOOMERE, T., 2009.  
Reconsidering uncertainties of wave conditions in the coastal areas of the northern Baltic Sea. Journal of Coastal Research, Special Issue 56, vol. 1, 257-261.
2. Seasonal and long-term variations in wave conditions in the northern Baltic Sea.  
Journal paper reflecting preliminary studies of long-term variations in properties of surface wave fields of the Baltic Sea in the framework of Tasks 1.1, 1.3 and 6.4.: ZAITSEVA-PÄRNASTE, I., SUURSAAR, Ü, KULLAS, T., LAPIMAA, S., SOOMERE, T., 2009. Seasonal and long-term variations of wave conditions in the northern Baltic Sea. Journal of Coastal Research, Special Issue 56, vol. 1, 277-281.

### Distinctions

T.Soomere received a thanksgiving letter from the Estonian Society for Nature Protection for informing the public and leaders of Estonia, and for ravishing them to protect the Baltic Sea

Estonian Council of Environmental NGOs elected the 2009 Environmental Deed in Estonia to be Tarmo Soomere's and Ivar Puura's initiative in drawing attention to possible negative environmental influences of the future Nord Stream pipeline.

## Appendices

### Current Team Composition

1. IoC, Tallinn:  
Tarmo Soomere tarmo.soomere@cs.ioc.ee  
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(started June 1; financed by third sources until October 31)  
Bert Viikmäe bert@ioc.ee  
(started July 14)  
Raul Isotamm raul@cens.ioc.ee  
(July 14 – October 14)  
Andrus Räämet andrus.raamet@ttu.ee  
(started October 1)
2. SYKE, Helsinki:  
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Oleg Andrejev Oleg.Andrejev@ymparisto.fi
3. MISU, Stockholm:  
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(started August)
7. IFM-GEOMAR, Kiel  
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8. LDI, Tallinn  
Sergey Babitchenko sergeyb@ldi.ee

## Original Deliverables List

Del. no.	Deliverable name	WP no.	Nature	Dissemination level	Delivery date (project months)	Responsible Partner
D1.1	Unified pool of initial, boundary and forcing data for the circulation, oil spill, and risk models	WP1	Database	Public	PM 24	ICR
D2.1	Database of three-dimensional (3D) velocity fields	WP2	Database	Public	PM 30	SMHI
D3.1	Database of trajectories of water particles	WP3	Database	Public	PM 33	MISU
D4.1	Identification of areas of reduced risk from the analysis of trajectories	WP4	Technical Report	Public	PM 30	MISU
D4.2	Uncertainties and seasonal and interannual variability of the areas of reduced risk		Technical Report	Public	PM 33	IoC
D4.3	The effect of local wind and waves on the areas of reduced risk.		Technical Report	Public	PM 33	DMI
D4.4	Areas of reduced risk associated with favourable subsurface current patterns		Technical Report	Public	PM 36	SYKE
D5.1	Measurement of current-induced surface drift and its dispersion properties	WP5	Technical Report	Public	PM 36	SYKE
D6.1	Mathematical background of the concept of areas of reduced risks	WP6	Scientific Paper	Public	PM 36	IoC
D7.1	Development of a simplified prototype for fairway design	WP7	Technical Report	Public	PM 33	DMI
D7.2	Implementation plan and estimates of the potential gain from the proposed technology		Technical Report	Public	PM 33	ICR
D7.3	Implementation plans for potential applications of the results and description of legal and political aspects		Popular publication	Public	PM 36	IoC
D8.1	Project web portal	WP8	Web-based	Public	PM 4	IoC
D8.2	Year 1 report		Technical Report	Public	PM 13	IoC
D8.3	Year 2 report		Technical Report	Public	PM 25	IoC
D8.4	Final report		Technical Report	Public	PM 37	IoC
D8.5	Advanced Study School		Training Event	Public	PM 30	IoC

## Background for the statistical information

1. Number of times your project has contributed to consultations carried out by European Commission.

IoC: 1

T. Soomere participated in the Plenary Meeting of the European Science Foundation Marine Board in Rome, 18-19.05.2009.

2. Number of times the scientists working in your Project have served as members or observers in stakeholder and scientific committees.

T. Soomere (IoC):

1. Member of the expert group of the Ministry of Environment for estimating the content of the environmental impact assessment of the Nord Stream gas pipeline
2. Member of the Estonian national maritime commission
3. Member of steering committee of the Baltic Sea Science Congress 2009
4. Member of the CBO (Conference of Baltic Oceanographers) steering committee
5. Member of the Scientific Council of the Laboratory of Multiphase Flows at TUT
6. Member of the Scientific Council of the Institute of Cybernetics at TUT
7. Estonian representative in the Marine Board of the European Science Foundation
8. Chair of the Marine Board of the Estonian Academy of Sciences (since 2007)
9. EASAC Environmental Steering Panel, Estonian representative (since 2008)
10. Co-chair of the international conference „Complexity of Nonlinear Waves” (Tallinn, 5-7 October 2009)
11. Member of the Board of the Estonian Academy of Sciences

E. Quak (IoC)

12. Vice-chair of the Mathematics-Engineering panel for the evaluation of Marie Curie Industry-Academia Partnerships and Pathways proposals in the EU FP7 People
13. Evaluator of the ComplexityNet call, representing the Estonian Academy of Sciences
14. Member of the Program Committee, FOCUS Workshop on advanced 3D media in gaming and simulation in Amsterdam, The Netherlands, June 16, 2009
15. Member of the Program Committee, Workshop 3D Physiological Human Zermatt, Switzerland, November 29-December 2, 2009
16. Contact point Special Interest Group on Geometric Modeling, CAD, Evolving Interfaces and Surfaces of the European Consortium for Mathematics in Industry (ECMI)

3. Number of times the effort of your Project has resulted in modifications made to relevant policy documents and action plans (in particular, Baltic Sea Action Plan).

1. IoC: Contribution to the Memorandum for Incoming MEPs and Commissioners: Independent advice from the European Academies Science Advisory Council (EASAC).
2. IoC: Contribution to the declaration of the Estonian Parliament concerning environmental impact assessment of the Nord Stream gas pipeline.

T. Soomere (IoC) presented the lecture “Nord Stream in the unique and vulnerable environment of the Baltic Sea”, including preliminary results of the BalticWay project, to an extraordinary Plenary Session of the Parliament of Estonia (Riigikogu) and answered questions posed by Members of Parliament, October 27.

4. Number of suggestions for designing, implementing and evaluating the efficacy of pertinent public policies and governance originating from the work of your Project.

IoC: 6 contributions to the development of the positions of several committees of the Estonian Parliament, Estonian Ministry of Environment, Estonian governmental maritime commission, HELCOM and Finnish-Estonian expert panels

1. Presentation by T. Soomere (IoC) “Nord Stream: challenges for the Baltic Sea marine sciences” for the joint meeting of the Estonian Parliament Commissions on foreign affairs and on environment, including a short overview of the ideas of the BalticWay project, April 6.
2. Information about the novel concept of protection of valuable sea areas by means of relocating human activities and related suggestions to HELCOM Habitat working group May 12.
3. Presentation by T. Soomere (IoC) “Nord Stream: challenges for the Baltic Sea marine sciences” for the meeting of the Estonian governmental maritime commission, including a short overview of the background and potential outcome of the BalticWay project, May 27.
4. T. Soomere (IoC) participated in the official meeting of Estonian experts and official representatives with Finnish representatives and Nord Stream experts, organised by the Finnish Ministry of Environment (Helsinki, Finland), with an explanation of the potential role of anisotropic transport patterns in the Gulf of Finland, based on preliminary results of the BalticWay project, June 25.
5. T. Soomere (IoC) presented the lecture “Nord Stream: hard knots of hydrodynamics”, including preliminary results of the BalticWay project, for the joint meeting of the Estonian Parliament’s Environment Committee, Foreign Affairs Committee, and Economic Affairs Committee, October 15.
6. T. Soomere (IoC) participated in the official meeting of Estonian experts and official representatives with Finnish representatives, organised by the Finnish Ministry of

Environment (Tallinn, Estonia), with comments and explanations partially based on the results of the BalticWay project, October 26.

6. Number of persons and working days spent by foreign scientists using other major facilities involved in your Project.

SYKE: 1 person, 3 working days - Mr. Alexander Sokolov has visited SYKE to assist Dr. Oleg Andrejev with the vectorisation of the OAAS model

7. Number of popular science papers produced by your Project.

Before the start of the Project:

1. Madis Filippov. Estonian scientists will put the Baltic Sea under careful scrutiny (paper about the ideas of the BONUS BalticWay project, Postimees (The Postman, the leading daily newspaper), 12.07.2008, p. 8-9 (in Estonian))

During the run of the project:

2. T.Soomere. Sea currents bring pollution to the Estonian coasts. Postimees, 57(5537), March 11, 2009, 5.
3. Anonymous, Scientists think the gas pipeline may be dangerous to the sea. Editorial, Postimees, 57 (5537), March 11, p. 1 (in Estonian).
4. T.Soomere. What would think Andres and Pearu about a gas pipeline at the border of their land sections? Maaülikool (newspaper of the Estonian University of Life Sciences), 161, March 23, 2009, 2 (in Estonian).
5. T.Soomere. Nord Stream ignores the specific features of the vulnerable Baltic Sea, Text of the presentation to the Estonian Parliament on October 27, 2009. Postimees 249 (5729), October 28, 2009, 12–13 (in Estonian).
6. T.Soomere. Marine science in Estonia and in the Baltic Sea region: past, present and future. Meremees (The Mariner), 4/2009 (in Estonian).

8. Number of interviews to media given by members of your Project's consortium.

IoC: 19 for Estonian TV, radio and newspapers, and for the Finnish leading daily newspaper “Helsingin Sanomat”

1. Interview of T.Soomere to the leading radio channel Kuku Raadio in Estonia about breaking developments in the process of the Environmental Impact Assessment of the planned Nord Stream pipeline in the Baltic Sea, broadcast in Meretund (Marine Hour), February 21
2. A comment by T.Soomere about topics discussed on the extended meeting of the Commission of Marine Sciences of the Estonian Academy of Sciences, broadcast in the Kuku Raadio Meretund, February 28

3. M.Filippov, “The environmental impact assessment of the Nord Stream pipeline ignores specific features of the Baltic Sea”, based on an interview with T.Soomere (IoC) about the potential threats of the planned Nord Stream pipeline, including anisotropic current patterns to be considered in the BalticWay project in the Gulf of Finland  
Postimees (The Postman, the leading Estonian daily newspaper), 57 (5537), March 11, p. 4
4. A longer comment by T. Soomere (IoC) about potential risks to Estonia connected with the construction and operation of the planned Nord Stream pipeline and about possibilities of their mitigation, including a short overview of the BalticWay project,  
Estonian state radio channel Vikerraadio, Huvitaja (a series of popular science broadcasts), March 12
5. A longer comment by T. Soomere (IoC) about potential environmental risks to Estonia connected with the planned Nord Stream pipeline, including a short overview of the ideas and potential results of the BalticWay project,  
Estonian radio channel Kuku Raadio, within a series of popular science broadcasts "Kukkuv Öun", April 12
6. Interview with T.Soomere: Research into the Baltic Sea may teach the entire world. *Mente et Manu* (newspaper of the Estonian University of Technology) 7(1764), April 17, p. 3 and 8(1765), May 8, p. 3.
7. Kristjan Kaljund, Tarmo Soomere and his black box of waves, *Tarkade Klubi* (The Club of Smarts, the popular science journal), 4(28), April 2009, 44–47.
8. Madis Filippov, Nord Stream environmental reports are extremely superficial, reflects an interview with T. Soomere, *Postimees* (The Postman), June 17, p. 6.
9. A longer comment by T.Soomere (IoC) about the outcomes of the 7th Baltic Sea Science Congress held in Tallinn on August 17–21,  
Estonian radio channel Kuku Raadio Meretund (Marine Hour), August 22
10. Interview with T.Soomere by J.Holvandus. Nord Stream is the challenge for society. *Eesti Kirik* (Estonian Church, weekly newspaper of the Estonian Lutheran Church), 33(989), September 9, 2009, 4-.
11. Comment of T. Soomere (IoC) in the framework of discussions of the environmental impact assessment of Nord Stream, including preliminary results of the BalticWay project,  
Estonian national TV program “Aeg luubis” (for extended news and comments), October 25
12. Madis Filippov, Finland tends to say “yes” to the Nord Stream pipeline, reflects on an interview with T. Soomere (IoC),  
*Postimees* newspaper, 247(5727), October 26, p. 6
13. Comments of T. Soomere (IoC) on the presentation of the lecture “Nord Stream in the unique and vulnerable environment of the Baltic Sea” (with one of the central

arguments based on preliminary results of the BalticWay project) about the Nord Stream environmental impact assessment to the extraordinary Plenary Session of the Parliament of Estonia (Riigikogu), October 27

Broadcast in all Estonian national and private TV channels (TV2, TV3, Russian TV news, etc.), and in radio channels, October 27-28

14. Phone interview of T.Soomere (IoC) with comments to the answers of the Nord Stream research team to critics of the environment impact assessment, Estonian national TV channel, “Aktuaalne Kaamera” (main nightly news program), October 28;
15. A citation from the presentation of T. Soomere to the extraordinary Plenary Session of the Parliament of Estonia (27.10.2009) appeared as “the word of the day” of the leading daily newspaper “The Postman” (Postimees), 250(5730), 29.10.2009, p. 13.
16. Broadcast of almost the full version of the presentation of T. Soomere (IoC) to the extraordinary Plenary Session of the Parliament of Estonia, Estonian national radio channel, program “Reporteritund” (Reporter’s Hour, broadcast twice), October 30
17. A longer comment by T. Soomere reflecting the basic message of the address given on the occasion of 90th anniversary of the Estonian Marine Academy; broadcast by the Kuku Raadio Meretund (Marine Hour) October 31
18. Kunnas, K. Tutkija: Vaikutukset on selvitetty heikosti (based on comments of T.Soomere about the environmental impact report of Nord Stream gas pipeline). Helsingin Sanomat (the leading daily newspaper in Finland), November 2 (in Finnish).
19. Interview of T.Soomere by phone about co-operation of Estonian and Italian (Venice) scientists in the framework of tsunami studies and about problems connected with climate, December 11.

12. Number of times your project has contributed to dissemination products/events addressed to general public concerning coupling between marine environmental quality and human health and well-being.

IoC: 10 - See also overlapping activities under #8

1. Interview of T.Soomere to the leading radio channel Kuku Raadio in Estonia about breaking developments in the process of the Environmental Impact Assessment of the planned Nord Stream pipeline in the Baltic Sea, broadcast in Meretund (Marine Hour), February 21
2. Madis Filippov, The environmental impact assessment of the Nord Stream pipeline ignores the specific features of the Baltic Sea, based on the interview with T. Soomere, Postimees, 57 (5537), March 11, p. 4.
3. A longer comment by T. Soomere (IoC) about potential risks to Estonia connected with the construction and operation of the planned Nord Stream pipeline and about possibilities of their mitigation, including a short overview of the BalticWay project,

Estonian state radio channel Vikerraadio, Huvitaja (a series of popular science broadcasts), March 12

4. A longer comment by T. Soomere (IoC) about potential environmental risks to Estonia connected with the planned Nord Stream pipeline, including a short overview of the ideas and potential results of the BalticWay project,
 

Estonian radio channel Kuku Raadio, within a series of popular science broadcasts "Kukkuv Öun", April 12
5. Madis Filippov, Nord Stream environmental reports are extremely superficial, reflects an interview with T. Soomere, Postimees (The Postman), June 17, p. 6.
6. Comment of T. Soomere (IoC) in the framework of discussions of the environmental impact assessment of Nord Stream, including preliminary results of the BalticWay project,
 

Estonian national TV program "Aeg luubis" (for extended news and comments), October 25
7. Madis Filippov, Finland tends to say "yes" to the Nord Stream pipeline, reflects on an interview with T. Soomere (IoC),
 

Postimees newspaper, 247(5727), October 26, p. 6
8. Broadcast of almost the full version of the presentation of T. Soomere (IoC) to the extraordinary Plenary Session of the Parliament of Estonia, Estonian national radio channel, program "Reporteritund" (Reporter's Hour, broadcast twice), October 30
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10. Kunnas, K. Tutkija: Vaikutukset on selvitetty heikosti (based on comments of T.Soomere about the environmental impact report of Nord Stream gas pipeline). Helsingin Sanomat (the leading daily newspaper in Finland), November 2 (in Finnish).

13. Number of datasets your project has delivered to the common metadata base of the Programme.

SMHI: 3 datasets in 2009

14. Number of scientists that attended international workshops, WG meetings, conferences, intercalibration exercises, etc. paid by BONUS+

IoC: Total in 2009: 14

Ewald Quak	Finland, Helsinki	2009-01-12	2009-01-14
Tarmo Soomere	Finland, Helsinki	2009-01-12	2009-01-15
Ewald Quak	Sweden, Stockholm	2009-03-05	2009-03-07
Tarmo Soomere	Sweden, Stockholm	2009-03-05	2009-03-06

Tarmo Soomere	Finland, Kotka, Tvrminne	2009-05-11	2009-05-15
Tarmo Soomere	Italy, Rome	2009-05-16	2009-05-21
Nicole Delpeche	Sweden, Stockholm	2009-05-28	2009-05-29
Tarmo Soomere	Finland, Helsinki	2009-06-15	2009-06-16
Tarmo Soomere	Finland, Helsinki	2009-06-25	2009-06-25
Bert Viikmäe	Sweden, Sigtuna	2009-11-16	2009-11-17
Nicole Delpeche	Sweden, Sigtuna	2009-11-16	2009-11-17
Tarmo Soomere	Sweden, Sigtuna	2009-11-16	2009-11-17
Nicole Delpeche	Finland, Helsinki	2009-12-01	2009-12-01
Tarmo Soomere	Helsinki	2009-12-03	2009-12-03

SYKE: 2 persons - ICES ASC 2009, BSSC 2009

IFM-GEOMAR: 2 persons

### Use of Infrastructure

IFM-GEOMAR:

HPC facilities at Kiel University, NEC SX9

Purpose: performing of model runs of the general circulation model of the Baltic Sea, running Lagrangian drift tracking model

Amount of use: 240 CPU hours

Approximate costs as in-kind contribution: 2000 €

SMHI:

Supercomputer at the Swedish National Supercomputer Centre NSC, Linköping University (Gimle, Vagn, Tornado) and at the Centre for High Performance Computing PDC, Royal Institute of Technology, Stockholm (Ekman).

Purpose: Production and storage of forcing data sets and RCO model simulations (cpu time, disk and tape storage).

Amount of use: 1 100 000 CPU hours

In-kind contribution: 100 000 EUR.

The climate computing resources Tornado, Ekman and Vagn are funded by grants from the Knut and Alice Wallenberg foundation

IoC: Cluster of 98 Opteron CPU

Purpose: Performing calculation of Lagrangian trajectories with the use of the TRACMASS code, intermediate storage of trajectory data

Amount of use: 10 000 CPU hours

In-kind contribution (approximate): 5 000 €