SUMMARY OF BONUS + IMPLEMENTATION: THE 2st YEAR OF WORK

BONUS+ programme started the year by convening a conference in January 2010 to discuss the first year's progress made. All projects continued to perform well. The outcomes and next steps of the BONUS+ projects are scheduled to be showcased at the second BONUS Forum on 24 October 2011, the scientific results will be communicated earlier at the BONUS Science Conference in late August as part of the Baltic Sea Science Congress in St. Petersburg.

Impact of the research carried out by BONUS+ projects can be characterised by the following key indicators:

During 2010 BONUS+ projects contributed to four **consultations carried out by the European Commission**. For example RECOCA was consulted by the European Task Force Group on the EU Marine Strategy Directive for Quality Descriptor 5 on eutrophication.

• BONUS scientists were members or observers of nearly 200 **stakeholder and scientific committees** ranging from ICES/HELCOM Working Group on Integrated Assessment of the Baltic Sea to Steering Committee of the private fund Baltic Sea 2020 and from BACC II Science Steering Group to Curonan Lagoon Transboundary International Stakeholder Committee.

• **Modifications made to relevant policy documents and action plans** totaled 12 in year 2010 and included among other contribution to "Biological effects" chapter of HELCOM's Assessment of Hazardous Substances in the Baltic Sea (BEAST), contribution to the preparation of the Marine research and coordination strategy in Finland (PREHAB) and contributions to HELCOM's Baltic Sea Action Plan (BSAP) through TARGREV project on waste water directive on river nutrient loads as well as on nitrogen ceiling directive for atmospheric deposition over the Baltic Sea area (RECOCA), the latter two to be implemented as the related BSAP updates are completed.

• A total of 42 suggestions were made by the BONUS+ projects **for designing, implementing and evaluating the efficacy of pertinent public policies and governance**. For example, a draft ICES guideline for eelpout monitoring was delivered for inclusion (BALCOFISH), report for the Nida city municipality on eutrophication and public bathing possibilities was produced (AMBER) and estimates of manure leaching made to be used in Integrated Pollution Protection and Control (IPPC) Directive (RECOCA). Some indicators

BONUS+ have remained actively engaged in pedagogic activities. Altogether seven various courses run in 2010 are referred in the second annual reports (Table 1). Two of the held courses were supported from the central BONUS EEIG budget. The target audience of BONUS teaching activities was mainly PhD students, however it did not exclude postdocs and undergraduate students.

Similarly as in the first year of BONUS+ implementing the summary of in-kind contribution to the projects through access to and usage of significant research infrastructures must be viewed with some precaution. This is due to somewhat incomplete information on infrastructure contributions reported by projects and because of sometimes obscure process of valuation of these contributions. Nevertheless, according to information reported to the Secretariat, projects received indicatively 2100 kEUR in-kind contribution from other national sources in terms of giving access to shiptime, and 2000 kEUR contribution enabling access to advanced computing facilities (Table 2).

The following account presents the highlights of the project implementation picked from the first annual reports.

AMBER aims at creating a full suite of scientific support tools necessary for the implementation and application of the Ecosystem Approach to Management (EAM) in the Baltic Sea with a focus on the coastal ecosystem. The most challenging tasks include separation of climate from anthropogenic signals in the coastal ecosystem, and elaboration of the set of Ecological Quality Objectives and cost-effective indicators of the state of ecosystem. AMBER directly supports implementation of EU Marine Strategy Framework Directive and the HELCOM Baltic Sea Action Plan.

The project has developed a new Baltic Sea environmental (BSE) index, which considers the important processes in the Baltic Sea. Moreover, it has developed an indicator system for the eastern Baltic cod stock that is able to support cod stock management decisions and hence helps developing sustainable fisheries. Climate and land use models were coupled to investigate the impact of combined effects such as precipitation, temperature and riverine nutrient transport. The Baltic Sea may anticipate further nutrient increase due to the increasing economy and the increasing animal protein consumption in all riparian countries. This core result seems to be robust because it is obtained with three completely different model setups. As regards the role of dissolved organic substances as an additional carbon or nitrogen source for production in the Baltic Se, the project has generated new insights through measurement campaigns which provided substantial new information. Project organised a summer school about stable isotope technology (Stockholm, 15-23 September 2010) with participation of 12 students and climate modelling school (Norrkoping, 13 October 2010) with 19 participants ranging from senior scientists to students. Altogether 20 scientific articles have been published or are in the pipeline. In addition, AMBER scientists contributed 68 oral and poster reports at variety of conferences. Also, all obtained results will be compiled into synthesis papers for stakeholders, in particular policymakers, during this year. The project proceeds well and according to the research plan.

BALCOFISH explores the gene-level responses to pollution and coastal fisheries management using single fish species – eelpout - as a model. In spite of their dramatic potential significance, genetic effects of anthropogenic impact have rarely been addressed so far. In addition to generating highly innovative research results, BALCOFISH aims at establishing a network of scientists, managers, and policymakers to build adequate awareness of the genetic effects.

In 2010 BALCOFISH scientists have carried out a serious data-mining for information on biological effects in eelpout. This effort has resulted in 23000 new inscriptions submitted to the BaltHaz database. A formal agreement has been made with ICES to use their code lists from the RECO database. Project has continued applying existing and new tools in studies of eelpout from contaminated coastal sites: biological material collected at 15 Southern Baltic sites has been analysed for a broad range of environmental contaminants including dioxins, mercury, brominated flame retardants *etc.* These data will be statistically treated in 2011. Analysis of biomarker responses in eelpout collected during the extensive sampling campaign of 2009 was continued. Comparative studies with two additional fish species: stickleback and flounder has significantly progressed. Experimental laboratory studies with several brominated organic compounds, conduced mainly with zebrafish, revealed several significant features of contaminant transfer and effects on reproduction and early development. Overall, these results suggest that maternal transfer is an important exposure route for several brominated environmental chemicals, and that these compounds may interfere with reproduction and early life-

stage development in fish. Age structured Leslie matrix population models developed for four reference sites revealed marked differences among sites in several of the measured variables, growth rate, fecundity, age at maturity and longevity being the most important. This model will be further used to analyse population dynamics of eelpout under various conditions. In the course of development of environmental assessment tools for biological effects in eelpout the potential indicators for setting evaluation criteria for the response levels have been identified. An integrative eelpout health index will be suggested during 2011.

Although in general BALCOFISH project follows the original research plan, two research tasks have been delayed. For gene expression studies of the eelpout using oligonucleotide microarrays it was decided to change the originally planned microarray platform to the NimbleGen microarray platform. This change has made it possible to study significantly larger number of genes; however the switch in microarray platforms required additional work to optimise all analytical steps and caused a delay of about half a year. Project still commits to perform all planned measurements. Development of sex-specific genetic markers in eelpout was delayed because of the large effort project team has to put into the microarray work. Nevertheless project plans to be able to perform this work during first half of 2011.

BALCOFISH scientists have contributed 12 reports to conferences and have been involved in several stakeholder activities.

BaltGene pursues the urgent necessity to understand and minimize the threatening genetic effects by human activities in more general and comprehensive terms. The array of its test objects range from the macroscopic benthic algae to populations of pelagic fishes, and the research tasks – from mapping of the genetic diversity of the populations and trying to understand the evolutionary logic and functional effects of this diversity, to assessment of the potential threats to the unique diversity from fisheries, climate changes, aquaculture activities and habitat loss.

During the second year, the project continued mapping the genetic resources of the Baltic Sea from extensive sampling sites on several Baltic fish species, *Fucus* and mussels. The project estimated rates of evolution in three different organisms - salmonid fish, blue mussel and narrow bladderwrack. The project continued assessing the importance of the genetic biodiversity by experimental testing of the correlation of genetic diversity with ecosystem function and resilience as well as local genetic adaptation. Good progress has been made in development of the monitoring programmes for the Baltic Sea diversity, and projects' suggestions have been recognized in high international biodiversity policy level. Textual analyses of legal documents and written policies as well interviews were conducted in Sweden and Finland in order to study the capacity of prevailing governance systems to incorporate genetic diversity in to management policies.

In general, the project has proceeded according to the research plan, except the one year delay in developing genome-screening for two *Fucus* species. However, the project assumes that at least preliminary data will be achieved by the end of the project. The project has an outstanding scientific publication record (28 peer reviewed or submitted article in 2010 or later). Dissemination and stakeholder communication has been active. The project started designing an end-user relevant web-page providing management advisory tool and established an end-user panel. Difficulties were faced in getting members to the panel because many refused due to the lack of time. Among the many stakeholder communication events, a highlight of the year was a side-seminar arranged at the 10th Conference of the Parties to the Convention on Biological Diversity, Nagoya, Japan in October 2010, and project participants' successful contribution in the negotiations.

BALTIC GAS aims at understanding how climate change and long-term eutrophication affect the accumulation of methane, one of the strongest greenhouse gases, and hydrogen sulphide in the layers of sediment below the Baltic Sea bottom, and emission of these gases from the seabed to the water column and atmosphere. The project has committed to develop a predictive model of gas accumulation and emission under realistic scenarios of climate change and eutrophication, which will improve the knowledge base for necessary future policy actions.

In 2010 project continued seismo-acoustic scanning of the selected areas of the Baltic Sea in order to identify presence and characteristics of shallow gas accumulations in sediments. A significant area stretching from the Arkona Basin in the South-west to the Bothnia Bay in North-east was studied by this approach. Sediment sampling along the seismic lines resulted in several new observations. Large number of the sampled locations showed marked coupling between mud thickness and presence of gas. Methane profiles at several of the sampled locations matched the prediction by the dynamic transport-reaction model developed within the project. Such a model explaining development of free methane in Holocene mud was successfully constructed and verified by the results of *in-situ* measurements. Model can be applied to track evolution of organic matter degradation and in particular the liberation of free methane. Data obtained during the BALTIC GAS cruises as well as those recovered from published and unpublished sources were combined with geological and acoustic information and compiled into maps of methane distribution, concentration and fluxes. Data-mining task assumed by the project team proofed to be more effort-consuming than expected and project coordinator had to mobilise additional resources to accomplish it. BALTIC GAS data were submitted to the PANGEA data base. Altogether project undertook four cruises in the Baltic in 2010. A BONUS Course "Seismo-acoustic imaging of sedimentary and gas-related features in the Baltic Sea" (July 2010) was held in Szczecin University and on the Polish r/v Navigator XXI. This course attracted 20 PhD students. Baltic Gas scientists contributed 13 reports at various conferences and three peer-reviewed articles. Project was highlighted in two high profile dissemination activities.

Baltic-C consortium for the first time constructs the organic and inorganic carbon budgets of the Baltic Sea involving C fluxes from land, and the exchange fluxes in the water bodies of the major basins. The outcome of the project will be a model framework in support of water management of the Baltic Sea and its ecosystem addressing the consequences of climate change, eutrophication, increasing atmospheric CO_2 and acid precipitation.

In 2010 Baltic-C has continued field data on total CO_2 (CT), and total alkalinity (AT). The investigations covered all major sub-basins of the Baltic Sea between the Kattegat and the Bothnian Bay. The data together with surface water pCO_2 and O_2 measurements from VOS "FINNMAID" form a unique base for research and model validation data. River input data of river flow, alkalinity, total inorganic carbon, total organic carbon, pH, temperature, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, SO_4^{2-} have been collected into a database and form the base for model development and validation. However, the data are in many instances incomplete, especially for river monitoring data from Russia. Several sediment cores have been taken and analyzed. Large efforts have also been taken to collect and analyze meteorological forcing data for present and possible future developments. The development of models for the Baltic Sea drainage basin and the Baltic Sea itself that includes the CO_2 dynamics are now in progress.
The Baltic-C model system involves two land surface models (LPJ-GUESS, CSIM) and one Baltic Sea model (PROBE-Baltic). Meteorological forcing data and scenarios have been extracted from available sources. The terrestrial vegetation/biogeochemistry model LPJ-GUESS has been enhanced by incorporation of a sub model for Corg production in organic wetland soils. The model has been set up for application across the 50 x 50 km simulation grid on which climate atmospheric data are used. The

Baltic Sea catchment model CSIM is expanded by including base cations, anions, Corg and CT (taking into account the outputs from LPJ-GUESS) and calculates now parameters such as: river runoff, nutrient load, total alkalinity, pH and pCO2 to the Baltic Sea sub-basins. The Baltic Sea model PROBE-Baltic has been expanded by including the CO2 dynamics and the present and past conditions have been studied extensively.

Climate scenario data have been extracted for the Baltic Sea drainage basin as well as for the Baltic Sea basins for a period representing the climate change between 1960 and 2100. Data from several emission scenarios (A1B, A2 and B1) as well as three global climate models (ECHAM 5, HadCM3 and CCSM3) are derived to be used to force the different model components within the Baltic-C. Several contacts between the different participants have been taken to develop the program. Outside the program members of the Baltic-C plays a major role in the Baltic Sea research by contributing in several activities such as: organizing the BALTEX 2010 conference and BACC II initiative (BALTEX Assessment of Climate Change). The original research plan is followed and no adaptation is necessary. Project reported on 7 research articles published and submitted and two PhD theses defended in 2010.

BalticWay core objective is to develop a scientific platform for an innovative low-cost technology of spatial planning of the maritime activities including shipping and offshore, and coastal engineering projects. The technology will be applied to place dangerous activities in locations, an accident in which will have a minimum threat to vulnerable areas. The cutting-edge modelling approach by the project team will allow identifying such areas in the Baltic Sea. Similarly, the most risky areas will be identified and recommended for avoidance.

Most of the first year delays with fulfilling the BalticWay tasks have been levelled and project gathered full speed in 2010. As the highlight of the second year of implementing, scientists of BalticWay have carried out mapping of long-term behavior and dispersion properties of subsurface currents in the Baltic Sea with the use of autonomous drifters based on the longest ever recorded time series of drifters' positions, formulated the key steps of identification of an optimum fairway based on local features of environmental risks, and quantified spatial and temporal variability of average and extreme properties of the Baltic Sea wave fields. All necessary data reflecting forcing and boundary information for circulation models and data about ship traffic has been gathered. These data sets are, however, not yet unified into a coherent system and therefore the relevant project deliverable cannot be regarded as finished. BalticWay coordinator has taken the necessary steps to ensure timely completion of this task. Modeling of water circulation in the target areas of the Baltic Sea has progressed vigorously and several modeling tasks have been fully completed. Large sets of trajectories of particles have been calculated for the Gulf of Finland using two methods and for the northern Baltic Proper using TRACMASS model; modeling of oil drift patterns is in progress for both target areas: the Gulf of Finland and south-western Baltic. To identify the areas of reduced risk, methods for the calculations of the equiprobability line have been developed, seasonal variations of transport patterns identified and role of the impact of ocean model resolution on the optimum fairways analysed. In the course of this work the difference in gradients of risk measures among different sea areas has been discovered. BalticWay team has completed establishing the surface drift properties for the Gulf of Finland using an economical technical solution and established subsurface drift properties for the Baltic Proper using professional drifting buoys. The initial delays in this part of the project have been completely resolved. After a discussion within BalticWay team it was decided to use different devices in different sea areas and to use ships of opportunity whenever possible. This approach has resulted in a much larger amount of high-quality data. Project has commenced the analysis of integral measures of environmental risk and introduced an

improved definition of water age, calculation of 2D fields of the probabilities of coastal hit and water (particle) age. The key steps of the technology of the fairway design have been defined and algorithms for the identification of an optimum fairway based on local features of environmental risks developed. During the second year of implementation BalticWay scientists have published seven research papers in peer-reviewed journals and contributed 18 oral and poster reports to conferences. Project, in particular its coordinator, has been very active disseminating BalticWay findings, also beyond the borders of Europe.

BAZOOCA uses models, experiments and field studies to quantify ecosystem consequences of the recent introduction of the alien comb-jelly *Mnemiopsis* into the Baltic. *Mnemiopsis* invasion is especially alarming, because this species is famous for destroying the pelagic food web of the Black Sea where it was introduced in the 1980-ties.The project has verified by genetic analyses that the comb jelly community in the whole northern Baltic Sea formed by *Mertensia ovum*, a species that is difficult to distinguish from *Mnemiopsis*.

During the second year the project conducted a series of research cruises as well as mesocosm and laboratory experiments. The data collected during four monitoring cruises showed that *Mnemiopsis* was found only in the southern Baltic while *Mertensia* was found in larger parts of the Baltic Sea. Processes controlling *Mnemiopsis* were studied on two cruises in Skagerrak and Gullmar fjord. Specific attention was paid on the role of light environment as a controlling factor and the effects of grazing by *Mnemiopsis* on microbial food web – these aspects were studied both by mesocosm experiments and during process cruises in field. Also, feeding rates and assimilation rates of *Mnemiopsis* on cod eggs and larvae were studied in controlled laboratory experiments. Finally, 100-l mesocosm experiments were conducted to study the cascading effects on the plankton community in Tvärminne, at the entrance to the Gulf of Finland. The project has published its results in international peer revived for – 9 articles published or in the pipeline since 2010. The projects has progressed successfully and according to the research plan.

BEAST is the pan-Baltic project developing a 'multi-level toolbox' to establish links between responses related to chemical pollution within the individuals and effects observed at higher biological levels. It is anticipated by the Baltic Marine Environment Protection Commission (HELCOM) that BEAST will generate a significant methodological breakthrough in the holistic assessment of the Baltic Sea ecosystem health through its approach based on the biomarkers and biological effects of pollutions.

During 2010 BEAST project successfully performed four field campaigns. The planned cruise in December 2010 was divided into two parts to be able to reach more coastal areas and the more shallow coastal parts were visited in January 2011**.** Bioassays using three species of macrozoobentos animals were applied for acute toxicity testing of sediments from the Gulf of Bothnia and Gulf of Riga. Sediments from the Bothnian Bay and Baltic proper were tested for reproductive success in *Monoporeia affinis* and biomarkers for oxidative stress, AChE and LMS were measured. Linking biomarkers to reproduction success in amphipods and comparison between field and lab exposure were performed in the Bothnian Bay. Correlation between contaminant concentrations in sediments and malformed embryos in amfipods was assessed in the Gulf of Bothnia, Baltic proper, Gulf of Riga and Gulf of Gdansk. Behavioural and electrophysiological responses were measured in crucian carp (*Carassius carassius*) to study effect of pH, and injections of contaminants in eelpout to study embryo malformations and biomarker response have been performed. The identification and validation of suitable methods for integrated monitoring and assessment is underway. Work on the handbook with Guidelines and Standard Operating Procedures (SOPs) for integrated monitoring and assessment of contaminant and biological

effects in sub-regions of the Baltic Sea has proceeded and the draft handbook has been uploaded to the BEAST Central Desktop and is constantly updated with so far missing information. In 2010 BEAST team performed several intercalibration exercises: intercalibration of methods for field sampling of biomarkers and fish disease studies, intercalibration exercise on measurement of PAH metabolites in fish bile and intercalibration of measurements on histochemical biomarkers. Set-up and maintenance of the BEAST database (BonusHAZ) has been continued. The BEAST partners have started submitting the data from the various field studies performed in 2009 and 2010. At present, data from about 130 stations covering all studied subareas and different biological effect measures have been included in the BonusHAZ. The first trial was made combining biomarker data and chemical contamination data to test and compare different multivariate statistical analyses and biomarker indices. As contribution to the HELCOM Integrated Thematic Assessment of Hazardous Substances in the Baltic Sea (HAZAS), the ”traffic light approach” was applied, using different biomarkers and indicators for reproductive disorders or prevalence of certain fish diseases. Available monitoring data from pristine and contaminated areas along the Swedish coast were used to calculate limit values for malformed embryos of the amphipod *Monoporeia affinis* in the Baltic Sea. Submission of data from field work took longer than anticipated but no serious delays in fulfillment of the research plan are expected. BEAST received a considerable amount of national and international attention in different scientific and stakeholder events in 2010. As a result, and among one of the most important achievements of the project in 2010, was its nomination as one of the flagship projects of the EU Strategy for the Baltic Sea Region (EUSBSR) Priority Area 3. During 2010, many BEAST partners made significant contributions to HELCOM activities, including a key input to the HELCOM Assessment of Hazardous Substances in the Baltic Sea.

ECOSUPPORT combines the assessments of various drivers such as eutrophication, fisheries, climate change to promote an ecosystem approach to the management of human activities. Project’s main aim is to provide a multi-model system tool based upon scenarios from an existing coupled atmosphere-ice-ocean-land surface model for the Baltic Sea catchment area, physical-biogeochemical models of differing complexity, a food web model, statistical fish population models, economic calculations, and new data detailing climate effects on marine biota to support decision makers.

During the second year of the project focused on production of ensemble scenarios. For the first time 3 institutions with 3 different models of the coupled physical-biogeochemical Baltic Sea system joined their forces by running the same climate and nutrient scenarios in order to compare and learn from the different model approaches. Model runs were performed from 1850 to 2100, giving a chance to study the development of the Baltic Sea, from a more pristine state through the onset of eutrophication and into projections of future climate. Four different runs with Global Climate Models were used as forcing of the biogeochemical models, representing two different Global Climate Models, two different IPCC emission scenarios and two different initial conditions. Runs are also performed with four different nutrient scenarios in order to compare the ecosystem status with nutrient loads as of today compared to reduction scenarios in line with the Baltic Sea Action Plan. The project organized a well-visited scientific workshop on “Uncertainties of scenario simulations”. Communication with stakeholders was active. The projects used a new form of communication using visualizations in an inflatable dome with room for about 20 participants. About 35 presentations were given in the dome for scientists, students, politicians, governmental officials and decision makers at different levels. The aim was both to communicate the processes in the Baltic Sea leading to different sorts of eutrophication-related problems, our current understanding of climate change in the Baltic Sea area as well as current scientific understanding on the impact of nutrient load and climate change on the state of the Baltic Sea, which can serve as a background for policymaking and decision support. The project organized a PhD course

on climate modeling with 20 participants. Project was represented in HELCOM working groups and also visible in several European or international stakeholder events. Publication list is impressive – 28 articles published or in the pipeline since 2010. Project is proceeding very well and according to the research plan.

HYPER synthesizes the knowledge on processes leading to oxygen deficiency in the Baltic at an ecosystem scale and establishes a holistic scientific understanding of the mechanisms leading to this phenomenon and its effects on the living conditions for benthic fauna and recycling of nutrients. Required nutrient reductions to maintain a healthy ecosystem will be estimated taking future climate changes into account.

During the second year the project participated in two research cruises and continued intensive laboratory work analyzing the numerous sediment cores. Altogether five manuscripts concerning the biochemical processes of N and P, based on previous year's experimental and field data were produced. In the modeling workpackage, the physiological fauna model with special emphasis on a mechanistic formulation of hypoxia was applied for a number of sites. The reactive transport model was completed and validated. Two scientific articles with modeling approach were produced. For studying the impact of hypoxia on benthic fauna, a major sample material had been collected during the previous year, and this year the project put considerable effort on analyzing this material. Two papers have already been published or in the pipeline to be published soon. The next step, the focus of the ongoing year, will be synthesizing all the above results. The consortium has actively disseminated Baltic Sea science to school classes an media and participated in scientific and political discussion on engineering approaches to remediate hypoxia in Sweden and Finland. Overall, the project has proceeded well and according to the research plan.

IBAM produces an integrative environmental decision model for one sub-basin of the Baltic - the Gulf of Finland. The applied model combines the risk management of five pressures: fisheries, eutrophication, oil spills, dioxin risks and climate change. Project promises to enable more effective learning in science by providing tools where new information can be integrated to old by use of mathematics.

During the second year the project finalized the ArcGis analyses of common reed coverage in two locations in the Gulf of Finland. Information was collected for the spatial modeling from literature and specialists interviews. Major effort was put into the development of the spatial modeling of reed expansion. The project developed a management tool for setting state-dependent targets to fishing mortality and applied it to historical data. Using this tool the project was able to demonstrate overfishing that started as a result of the suggested claimed regime shift in the Baltic Sea, and to estimate the consequent net economic loss in yields. Using the Bayesian Belief Networks approach, the project developed two scenarios for the central Baltic herring fishery management and uncertainties encountered in the process of the management related situation assessment. Also, it constructed a model of the decision making process of Baltic Sea Regional Advisory Council – a body representing fishing industry, NGOs and other stakeholders. Development of the Decision Support System (DDS) to analyse the risk management of climate change, eutrophication oil spills and harvesting continued by development of an integrative model as well as population sub-models. In particular the common eider submodel was developed further and the effects of historical harvest rate and potential oil spills were examined. Furthermore, estimates of future eutrophication and implementation uncertainty of actions were updated; all information management in Bayesian networks was carried out. The project has produced five scientific publications and presented their results in many scientific and stakeholder

events. According to the annual report, the project has proceeded as described in the research plan and will be completed in time despite minor delays in some work packages.

INFLOW studies the changes of the environmental conditions of the Baltic Sea ecosystem, which strongly depend on meteorological forcing over the area and adjacent NE Atlantic, and the resulting saline water inflow over the past 6000 years. These changes are recorded in the marine sediments. Reconstructions of the past conditions are being compared with results from model simulations, thus providing scenarios of impact of naturally and human induced climate change on the Baltic Sea ecosystem at the end of the 21st century.

In 2010 INFLOV has continued studies of sediment proxies from key-sites along a transect from the marine Skagerrak to the freshwater dominated northern Baltic Sea and experimenting with models to get insight into what extent the ecosystem responded to past natural climate variability and environmental change. Synthesis of information will be started in 2011. The field investigations of the INFLOW project in 2010 concentrated on the northern Baltic Sea and the Russian waters of the eastern Gulf of Finland. Significant effort focused on dating of the cores obtained in 2009 by various methods: paleomagnetic dating, isotope dating and dating by use of optically simulated luminescence (OSL). Various sediment proxies have been used to reconstruct deep water conditions: benthic foraminifera studies, sedimentary-fabric analysis and grain size analysis, and even more methods - to reconstruct surface water conditions: e.g. diatoms, dinoflagellates, a specific sediment biomarker for sea surface temperature, concentration of Br in sediments. In the project's modeling segment forcing data for time slice experiments involving Little Ice Age conditions as well the present and future climate were prepared. The latter, in cooperation with project ECOSUPPORT. An ensemble simulation with several models has been performed. Using the regional atmosphere model RCA3 with a horizontal resolution of 50km data of the global model ECHO-G have been downscaled for the Baltic Sea Region for the period 950-1849. This very long simulation was finalized during 2010. During the reporting period INFLOW has organized three project workshops. Eight peer-reviewed sceintific publications have been either published or accepted for publishing during the year and 17 reports to various scientific conferences made. Project has been remarkably active also in the field of science dissemination. Alltogather this project is progressing very well and its sucessful completion does not rise any daubt.

PREHAB is one of BONUS+ projects generating scientific input to the maritime spatial planning. PREHAB develops methods for powerful, precise and cost-efficient spatial prediction of the biological properties of coastal habitats, searches the most suitable indicators of human pressures as predictors of spatial patterns in coastal habitats, and assesses the combined effects on coastal ecology, ecosystem goods and services and net social benefits associated with alternative management options.

During the second year, based on the review of existing data and gaps done in the previous year, the project conducted sampling efforts for collecting biological and environmental data for complementing and validating the predictive modeling. The data collection included video recording, which is currently processed. A lot of effort was paid on developing methods for spatial prediction. Set of data suitable for modeling were established and simulation and analytical modeling of quantitative response variables was started. Five different statistical techniques used for modeling and spatial prediction of species and habitats were compared. The project has modeled altogether 50 types of predictor variables, classified by their location, bathymetry, substrate, exposure, hydrography and biotic, from different parts of the Baltic Sea. It was found out that the importance of predictor varied among the study areas. 70-80 response variables, grouped as individual species, functions of habitats and benthic communities/

biotopes, from different parts of the sea have been modeled. Also, capacity of two human pressure variables, Secchi depth, and shoreline construction, as predictors in habitat models were tested. Development of tools for evaluation of goods and services had started with the literature survey. Project collated a matrix containing information on ecosystem services provided by each species and biotope that are modeled in the project. This matrix together with the scenario analyses was used to set levels for a questionnaire regarding 'willingness to pay', which forms the basis for the economic valuation. The questionnaire was sent, and c. 800 answers from each country are now analysed by a consultancy company. The work on aiming at demonstrating the methodologies for integrated assessment of regional scenarios was started. In addition, the project organised a multidisciplinary course on marine spatial planning (Husö biological station, Sweden, 22 February – 3 March 2010) with 16 students from 8 countries as participants. Two PhD theses were completed. In summary, the project proceeded well and according to the research plan. Project results have been reported in nine peer-reviewed articles already printed or being in print. Despite some delays caused, according the report, by underestimate of the effort and resources needed and unilateral financing cut that affected Lithuanian partners, the overall progress of this project is good and the risk of non-compliance with the original work plan is negligible.

PROBALT is one of the projects bringing societal dimension into the BONUS Programme. PROBALT suggests that the relative weakness of the attempts to protect the Baltic Sea can be explained mostly by the failure of transforming scientific knowledge into effective and socially acceptable protective practices. Designing policies is ultimately a social activity that depends on many conditioning socio-economic, political and cultural factors. Thus, the main objective of this project is to fill the gap in understanding the role of societal factors in the environmental protection of the Baltic Sea.

One aim of the second year was to analyze the societal conditions for the effective protection of the Baltic Sea by case studies. These case studies were almost finalized in Finland and Poland. For the Baltic States case study 22 in depth interviews were made in Estonia, Latvia and Lithuania, and preliminary analysis was completed. The case study on the European level was finalized and the report was produced. Because the organizational changes in the responsible research institute and because of change and difficulty to recruit competent researchers as maternity leave replacements, it seems that the case study in Denmark cannot be performed. Therefore, it is likely that the project cannot fully complete the research plan by the end of the project. Another goal for the year was to examine nutrient trading as an instrument for protection. The project continued collecting data on WTP and agriculture of the Baltic Sea countries to further formulate cost functions. Complete investment costs schedules were developed and capacity-based cost function was derived. The third goal for the year was to increase national concern about the state of the Baltic Sea. The project organised journalist training on the Baltic Sea protection in Finland with participation of 16 journalists. Also several stakeholder communication events were organized. In summary, the project has not been able to fully follow the research plan due to difficulties in recruiting competent personnel as well as due to the remarkable delayed payments to the Russian participants.

RECOCA project aims to simulate the possible future riverine nutrient loads to the Baltic Sea in realistic river basin management scenarios, to estimate cost functions for load reductions and improvements in ecological indicators, and to suggest cost allocation schemes for countries within the Baltic Sea catchment. A nested hierarchical approach is applied to simulate nutrient loads to the Baltic Sea in combination with abatement costs for the various measures ranging from farm scale over regional meso-scale river basin representing EU water districts. Thus, RECOCA promises a crucial input for implementation of EU Water- and EU Marine Strategy Framework Directives. RECOCA approach has

already been utilized by HELCOM to determine country-specific nutrient reduction quotas within the Baltic Sea Action Plan.

RECOCA has created a data base with 10 km^2 resolution relating major anthropogenic and economic drivers to diffusive and point sources for the entire Baltic Sea catchment. Projects has also created a NANI toolbox allowing users to calculate nutrient budgets, estimates of nutrient leakage and retention and creating maps of nutrient sensitive watersheds of for all major 117 watersheds in the Baltic Sea. According to the report, this is the most comprehensive data base of its kind. Access to more detailed data allowed the project team to expand the work on the model estimates of diffusive nitrogen leaching as well on the regional model that runs the cost minimization on a 10 km^2 grid cell resolution for the entire Baltic Sea catchment. The CSIM model has been re-coded in a modular setup allowing *i.a.* easy calibration by forcing data from the other more detailed models NANI, DAISY and SWAT as well as from climate models. Enhanced knowledge on nutrient retention will be used by the regional and large-scale economic models, since retention is of outmost importance for the cost estimates. With these results in hand RECOCA has set out to construct a more ambitious regionalized cost-efficiency model than the one described in the proposal. This model will utilize data on effectiveness, potential and costs of measures in each region and will combine it with retention coefficients of this region to come up with an optimal solution for the entire Baltic Sea region. Thus, the efforts of WP7 and WP8 have been combined, as the new model will be able to perform all tasks that were expected from the cost minimization model.
In 2010 the RECOCA team has continued very effective communication with the potential knowledge users. Projects has consulted EU MSFD task force group for GES descriptor 5 (eutrophication). Model tolls and data by this project will be the basis for redistribution of nutrient reduction targets by individual HELCOM countries implementing BSAP.
Two courses organized encompassed the hydrological- biogeochemical tools and economic tools developed. Senior scientists, postdocs and PhD students from RECOCA and from other related projects participated.
Some adaptation on the research plan and schedule of deliverables was necessary, which mainly results from the down prioritizing of WP4 (SWAT models) at the expanse of WP3 (DAISY modelling), the reversing structure of WP 7 and the late start of partner 6 due to the delay in contract preparation with the Norwegian partner. Deliverables 4.3 and 4.4. are only slightly delayed until month 29; Deliverable 6. 3 will be delivered when all four hydrological- biogeochemical model tools are ready and will be compared (month 30). Deliverables 7.1 (draft version available) and 7.3 will come in month 33. Never the less it seems that the overall research plan of project will be fulfilled successfully.

RISKGOV aims to improve our understanding of the structures and processes that shape the governance of environmental risks and to suggest a normative framework for improving environmental risk governance in the Baltic Sea. Project's main focus is on analysis of the situation with the governance structures and governance processes, as well as the stakeholder communication.

RISKGOV research plan is subdivided into four research stages of which the second and third partly occurred during the report:

- the **second research stage** (Month 7-15) when each of case study research teams, based on previously elaborated analytical and methodological framework, conduct a review of secondary material (existing literature, documents and data bases) on risk governance structures, risk assessment and stakeholder communication processes in their respective area, and
- the **third research stage** (Month 16-26), when each case study research team conducts complementary investigations to collect and process primary data. During this phase each team

will conduct complementary text analysis and interviews – approx. 15 per case – of key experts representing governmental and non-governmental actors surrounding governance structures and processes in the respective risk area.

Thus, for Year 2 (this reporting period) the aims were to finish and publish five case study reports, submit peer-reviewed scientific articles linked to these case studies, and to arrange two roundtable discussions with external experts and stakeholders. Finally, the aim was to initiate cross-case comparisons within the work packages 1, 2 and 3. Implementing this plan RISKGOV team has (*i*) published five case study reports, (*ii*) written three peer-reviewed scientific articles that have been accepted for publication in the journal AMBIO in March 2011 (two additional articles linked to the eutrophication and invasive species case studies will be submitted by June 2011), (*iii*) arranged two roundtable discussions on March 8, 2010 and January 13, 2011, and (*iv*) commenced work on cross-case comparisons. Furthermore, the project has resulted in a large number of additional dissemination activities in the form of scientific articles and conference presentations as well as popular science articles and workshops.

Altogether seven peer-reviewed papers by RISKGOV scientists have been submitted and 12 reports at scientific conferences presented in oral and poster form. Following the conference with RISKGOV team in the core, an AMBIO special issue "Coping with complexity in Baltic Sea risk governance" has been issued in March 2011 with RISKGOV coordinator and two other researchers as guest editors. Project has run a PhD course 'Environmental Risk Governance of the Baltic Sea, Asko laboratory, Sweden, August 2010, with nine students from Sweden, Poland and Norway.

The following tabular material presents an overview of some kinds of activities of the whole BONUS Programme in 2010.

Table 1

MAJOR BONUS+ TRAINING ACTIVITIES IN 2010

Course Title	Place	Time	BONUS Project(s) arranging the course	Number of trainees	Comment
Course on cost minimisation models	Copenhagen	15-17 February 2010	RECOCA	n/i	Senior researchers and PhD students from RECOCA and several related projects
Ecological, economical and institutional challenges for spatial planning in the Baltic – a multidisciplinary course on ecological mapping and economic valuation of coastal areas.	Husö biological station, Sweden	22 February – 3 March 2010	PREHAB	16	Co-funded by BONUS, Abo Academi and Gothenburg University
Seismo-acoustic imaging of sediments and gas-related features in	Szczecin, r/v Navigator XXI	15-27 July 2010	Baltic Gas	20	Course was attended by students involved in the Baltic Gas, INFLOW and HYPER projects.

the Baltic Sea					
Environmental risk governance of the Baltic Sea	Askö research station, Sweden	August 2010	RISKGOV	9	PhD students of Sweden, Norway and Poland
Course on RECOCA river basin models	Warsaw	9-10 September 2010	RECOCA	n/i	Senior researchers and PhD students from RECOCA and several related projects
Stable isotope analysis in biogeochemistry with focus on the Baltic Sea and its catchment	Stockholm	15-23 September 2010	AMBER	12	School was sponsored by ESF Nitrogen in Europe research networking programme.
Climate modelling school	Norrkoping , Sweden	13 October 2010	AMBER, ECOSUPORT	19	Broad amplitude of attendance: from senior researchers to undergraduate students

Table 2

JOINT USE OF MAJOR RESEARCH INFRASTRUCTURES

PROJECT	Description	Purpose	Amount	Estimated value (EUR)
AMBER	Murska Supercluster at CSC - IT Center for Science Ltd. Finland	time series modelling	5000 cpuh	50000
AMBER	r/v Maria S. Merian	Observations at sea	14 days	350000
AMBER	r/v Professor Albrecht Penck	Observations at sea	21 days	168000
AMBER	Supercomputer at the Swedish National Supercomputer Centre	Scenario simulation	500,000 cpuh	50000
AMBER	Supercomputer HLRN Berlin	Scenario simulation	44 kNPL	30800
Baltic Gas	Askö Marine Research Station (Stockholm University) incl. RV Limada	Himmerfjärden: Sediment and water column + laboratory experiments. 12-18.6, 09-15.8, 06-12.9, 2010	6 days cruise days / 12 laboratory days	3300
Baltic Gas	Askö Marine Research Station (Stockholm University) incl. RV Limada	Himmerfjärden: Sediment and water column incl. laboratory experiments. 12-17.5, 2009	2 days cruise days / 4 laboratory days	1100
Baltic Gas	RV Alkor Atlas fansweep multibeam EK60 echosounder multichannel streamer boomer GI gun magnetometer heat flow probe data acquisition equipment	Mecklenburg and Arkona Bays: mapping and quantification of gas in sediment and water column	7 days	100000
Baltic Gas	RV Alkor Atlas fansweep multibeam EK60 echosounder multichannel streamer boomer GI gun magnetometer heat flow probe data acquisition equipment	Mecklenburg and Arkona Bays: mapping and quantification of gas in sediment and water column	10 days	140000
Baltic Gas	RV Ladoga	Finland Gulf (Vyborg Bay): Crater-like structures and gas-saturated sediments. 30.06-03.07.2009	4 days, 6 scientists	5500
Baltic Gas	RV Maria S Merian Cruise 16/1	Western Baltic Sea, Gulf of Bothnia: CH4 distribution in sediments and water column. 31.7-21.8, 2010	24 days, 23 scientists	528000

Baltic Gas	RV Nawigator XXI geophysical data acquisition systems shallow water multichannel streamer GI gun side scan sonar	Western Baltic: Mapping and quantification of gas in sediment and water column. 15-27.7, 2010	7 days	35000
Baltic Gas	RV Oceania Chirp echo sounder 'nonlinear acoustic' echo sounder	Gulf of Gdansk: gas-saturated sediments. 08-13.4, 2010	6 days, 5 scientist,	18000
Baltic Gas	RV Oceania Chirp echo sounder 'nonlinear acoustic' echo sounder	Southern Baltic: gas-saturated sediments and gaseous structures (e.g. pockmarks). 17-30.4 2010	2 days allocated for 2 BALTIC GAS scientists	6000
Baltic Gas	RV Poseidon (cruise 392)	Baltic Sea: shallow gas and methane distribution in sediments and water column. 27.11.-17.12, 2009	19 days, 11 scientists	180000
Baltic Gas	RV Professor Shtockmann	Russian Sector of Gdansk Basin and Gotland Deep: Gas-saturated deposits. 20-27.06.2010	8 days, 25 scientists	30000
Baltic Gas	RV Safira Chirp echo sounder 'nonlinear acoustic' echo sounder	Gulf of Gdansk: Gas-saturated sediments. 16-19.10, 2010	1 day allocated for 1 BALTIC GAS scientist	500
Baltic Gas	RV Shelf	Russian sector of Gdansk Basin: Pockmarks and gas-bearing sediments. 04-10.09, 2009	7 days, 9 scientists	10000
Baltic Gas	RV Susanne A	Sediment sampling Aarhus Bay. 04.5, 2010	1 day, 5 scientists	10000
Baltic Gas	RV Susanne A	Sediment sampling Aarhus Bay. 5.10, 2009	1 day, 5 scientists	10000
Baltic Way	3-D Graphics Workstation	Three-dimensional visualisation of simulation results	200 working hours	2000
Baltic Way	HPC facilities at Kiel University, NEC SX9	Performing of model runs of the general circulation model of the Baltic Sea, running Lagrangian drif	240 CPU hours (2009)	2000
Baltic Way	IoC Cluster of 98 Opteron CPU	Performing calculation of Lagrangian trajectories with the use of the TRACMASS code, intermediate st	10 000 CPU hours (2009),5 000 hours (2010)	7500
Baltic Way	LDI lidar system	Remote measurements of dissolved organic matter and surface pollution in sea water	40 hours	10000

Baltic Way	Swedish Supercomputer Centre; NSC, Linköping University and at the Centre for High Performance Computing PDC, Royal Institute of Technology	Production and storage of forcing data sets and RCO model	1 100 000 CPU hours (2009); 600 000 (2010), 1.5MEUR total	1500000
BEAST	Biological laboratory	To measure biomarkers in mussels	14 days	5600
BEAST	RV Aranda	Field sampling and "in situ" experiments	19 days	285000
BEAST	RV Walther Herwig III	Field sampling of fish and hydrographic measurements as well as training in the framework of the BEA	20 days	260000
ECOSUPPORT	HLRN Supercomputing Service	Production and storage of scenario simulations	600 NPL (Y1)+50kNPL (Y2)	42000
ECOSUPPORT	Linux cluster at Marine Systems Institute	To perform model runs (cpu time and disk storage)	15000 cpu hours(Y1)+ 61000 (Y2)	15000
ECOSUPPORT	Supercomputer at German Climate Computer Centre	Statistical analysis of RCAO climate runs to reconstruct past forcing fields 1850-2000	5000 CPU-hours on an IBM Power-6 (Y1) + 5000 CPU hours (Y2)	50000
ECOSUPPORT	Supercomputers at Swedish Infrastructure for Computing, Linköping Uni. and Centre for High Performance Computing, Royal Institute of Tech., Stockholm.	Production and storage of forcing data sets (cpu time, disk and tape storage).	2200000 cpu hours(Y1)+4000000 cpu hours (Y2)	200000
HYPER	r/v Prof. A. Penck	Combined AMBER/HYPER cruise. Nitrogen losses were measured. Sediment sampling in Arkona Sea for isotope pairing measurements.	12 days cruise, HYPER share 4-5 days	1
HYPER	rv Heincke	HYPER cruise with rv Heincke to measure redoxcline profiles of NO3 & NH4 isotopes in the western, northern, & eastern Gotland Sea & the Gdansk Deep.	12 days	100
HYPER	R/V Aranda cruise	Joint cruise for HYPER with HELCOM monitoring in May-June 2009 (25.5.-17.6.2009); all sub-basins of	20 days	200
INFLOW	HLRL Supercomputing Service was used	Production and storage of scenario simulations	40 kNPL	80000

INFLOW	Ion Beam laboratory, ETH-Zurich, Switzerland	14C dating	10 days	1000
INFLOW	Stable isotope mass spectrometry laboratory, BCCR, Norway	Stable isotope measurements for assessing temperature and salinity	1 month	5000
Total estimated value of in-kind contribution				4191601
Value of contributed ship time				2136301

Table 3

MEASURABLE PERFORMANCE INDICATORS: 2010

			AMBER	BALCOFISH	BALTIC GAS	BAZOOCA	BEAST	BaltGene	BALTIC-C	BalticWay	ECOSUPPORT	HYPER	IBAM	INFLOW	PREHAB	PROBALT	RECOCA	RISKGOV	TOTAL
1. Number of times your project has contributed to consultations carried out by European Commission.		2009	0	0	0	0	5	0	0	1	0	0		0	0	0	1	0	
		2010	0	0	0	0	2	0	0	0	1	0		0	0	0	1	0	
		total	0	0	0	0	7	0	0	1	1	0	1	0	0	0	2	0	**12**
2. Number of times the scientists working in your Project have served as members or observers in stakeholder and scientific committees.		2009	9	12	9	0	41	5	0	16	15	10		0	19	12	7	1	
		2010	3	7	11	0	46	18	16	26	21	6		11	22	3	3	0	
		total	12	19	20	0	87	23	16	42	36	16	5	11	41	15	10	1	**354**
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).		2009	0	0	0	0	3	0	0	2	0	3		0	1	0	1	0	
		2010	0	0	0	0	1	3	0	0	2	0		0	3	1	2	0	
		total	0	0	0	0	4	3	0	2	2	3	1	0	4	1	3	0	**12**
4. Number of suggestions for designing, implementing and evaluating the efficacy of pertinent public policies and governance originating from the work of your Project.		2009	1	1	0	0	10	2	0	6	6	7		0	11	3	2	0	
		2010	1	1	0	0	2	10	0	2	3	0		0	17	4	1	0	
		total	2	2	0	0	12	12	0	8	9	7	2	0	28	7	3	0	**92**
5. Number of persons and working days spent by foreign scientists on research vessels participating in the cruises arranged by your Project.	persons	2009	5	0	2	9	15	0	0	0	0	27		17	0	0	0	0	
		2010	0	1	42	2	23	2	3	0	0	10		2	0	0	0	0	
		total	5	1	44	11	38	2	3	0	0	37	0	19	0	0	0	0	**160**
	work days	2009	25	0	16	113	177	0	0	0	0	278		93	0	0	0	0	
		2010	0	6	290	7	233	6	42	0	0	34		22	0	0	0	0	
		total	25	6	306	120	410	6	42	0	0	312	0	115	0	0	0	0	**1342**

			AMBER	BALCOFISH	BALTIC GAS	BAZOOCA	BEAST	BaltGene	BALTIC-C	BalticWay	ECOSUPPORT	HYPER	IBAM	INFLOW	PREHAB	PROBALT	RECOCA	RISKGOV	TOTAL
6. Number of persons (above) and working days (below) spent by foreign scientists using other major facilities involved in your Project.	persons	2009	0	2	0	8	13	9	0	1	1	4		0	0	0	0	0	
		2010	6	0	6	3	29	3	0	1	0	2		5	0	0	0	0	
		total	6	2	6	11	42	12	0	2	1	6	1	5	0	0	0	0	**94**
	work days	2009	0	54	0	103	169	112	0	3	30	14		0	0	0	0	0	
		2010	156	0	23	27	90	10	0	6	0	35		55	0	0	0	0	
		total	156	54	23	130	259	122	0	9	30	49	90	55	0	0	0	0	**977**
7. Number of popular science papers produced by your Project.		2009	4	0	0	3	6	5	1	6	3	3		3	3	3	0	1	
		2010	4	5	1	2	5	0	5	6	5	0		3	3	3	0	2	
		total	8	5	1	5	11	5	6	12	8	3	18	6	6	6	0	3	**98**
8. Number of interviews to media given by members of your Project's consortium.		2009	15	16	1	5	19	17	1	19	11	18		3	8	11	2	0	
		2010	17	1	19	25	16	22	2	15	17	9		3	16	3	2	1	
		total	32	17	20	30	35	39	3	34	28	27	4	6	24	14	4	1	**318**
9. Number of multi-media products and TV episodes produced by your Project with dissemination purpose.		2009	0	0	0	1	0	1	0	0	0	5		0	1	0	1	0	
		2010	0	0	5	0	6	0	0	0	1	7		1	1	0	1	0	
		total	0	0	5	1	6	1	0	0	1	12	0	1	2	0	2	0	**31**
10. Number of other dissemination products produced by your Project.		2009	4	0	0	4	2	3	0	0	23	16		22	9	13	0	6	
		2010	18	6	7	0	7	5	0	0	85	8		37	13	2	0	27	
		total	22	6	7	4	9	8	0	0	108	24	2	59	22	15	0	33	**319**
11. Number of times your Project team has issued a recommendation how to improve general public's comprehension and priorities regarding the Baltic Sea.		2009	0	0	0	0	18	1	0	0	0	2		0	1	2	2	0	
		2010	20	0	3	0	6	10	0	0	3	1		1	3	0	1	0	
		total	20	0	3	0	24	11	0	0	3	3	0	1	4	2	3	0	**74**

			AMBER	BALCOFISH	BALTIC GAS	BAZOOCA	BEAST	BaltGene	BALTIC-C	BalticWay	ECOSUPPORT	HYPER	IBAM	INFLOW	PREHAB	PROBALT	RECOCA	RISKGOV	TOTAL
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.		2009	9	0	0	0	8	4	0	10	1	14		0	4	16	1	0	
		2010	21	3	8	3	5	6	0	13	38	22		3	5	0	2	0	
		total	30	3	8	3	13	10	0	23	39	36	3	3	9	16	3	0	**199**
13. Number of datasets your project has delivered to the common metadata base of the Programme.		2009	4	0	0	0	1	0	0	3	0	2		0	0	0	4	0	
		2010	37	6	4	0	4	0	13	0	12	6		2	1	0	3	0	
		total	41	6	4	0	5	0	13	3	12	8	0	2	1	0	7	0	**102**
14. Number of scientists that attended international workshops, WG meetings, conferences, intercalibration exercises etc. paid by BONUS+		2009	24	34	52	5	39	41	0	18	28	27		79	13	8	6	13	
		2010	14	19	33	3	54	20	10	36	54	37		16	14	2	7	12	
		total	38	53	85	8	93	61	10	54	82	64	10	95	27	10	13	25	**728**
15. Number of PhD courses (above) organized by your Project and persons participating (below).	courses	2009	1	1	0	0	3	2	1	0	1	1		0	0	0	0	0	
		2010	2	0	4	0	0	2	0	0	1	0		0	0	0	0	1	
		total	3	1	4	0	3	4	1	0	2	1	0	0	0	0	0	1	**20**
	participants	2009	23	10	0	0	8	34	0	0	20	18		0	0	0	0	0	
		2010	47	0	43	0	0	26	0	0	20	0		0	0	0	0	9	
		total	70	10	43	0	8	60	0	0	40	18	0	0	0	0	0	9	**198**

			AMBER	BALCOFISH	BALTIC GAS	BAZOOCA	BEAST	BaltGene	BALTIC-C	BalticWay	ECOSUPPORT	HYPER	IBAM	INFLOW	PREHAB	PROBALT	RECOCA	RISKGOV	TOTAL
16. Number of modifications made to current PhD course programmes that resulted from the work of your Project.		2009	0	0	0	0	2	5	0	0	0	1		0	2	0	0	1	
		2010	1	0	2	0	3	0	0	0	1	0		0	3	0	0	0	
		total	1	0	2	0	5	5	0	0	1	1	1	0	5	0	0	1	**22**
17. Number of student visits (persons above, visit days below) from your Project to other BONUS projects.	visits	2009	3	1	0	0	4	0	0	0	2	1		0	1	1	1	0	
		2010	0	1	6	0	1	0	3	0	1	3		0	0	0	0	0	
		total	3	2	6	0	5	0	3	0	3	4	0	0	1	1	1	0	**28**
	days	2009	23	4	0	0	17	0	0	0	12	5		0	1	0	60	0	
		2010	0	8	52	0	6	0	3	0	2	23		0	0	0	50	0	
		total	23	12	52	0	23	0	3	0	14	28	0	0	1	0	110	0	**266**