OVERVIEW OF THE BONUS + IMPLEMENTATION: THE 1st YEAR OF WORK.

Summary

All sixteen research projects selected for funding within the BONUS+ call have started vigorously in the first year of implementation. Logically, the emphasis has been on establishing the consortia, and gathering the initial data – both from the field and by experiments, data mining, contingent queries, and initial model runs. The first results were shared during the Annual BONUS Conference in January 2010, and are reflected in the annual reports that are delivered through the Programme's web-based reporting system. In certain contrast to the FP programmes, BONUS has from the very beginning achieved a lively collaboration among the various projects through forming the free-geometry clusters to approach specific research issues, cooperative usage of sophisticated and expensive research infrastructures (e.g. research ship time and advanced computing facilities). In 2009, altogether 25 research cruises in the Baltic, five of them manned by the researchers of two or more BONUS+ projects have been undertaken (Table 1). Another distinctive feature of the BONUS+ projects is their clear inclination towards practically useful outcomes that will qualitatively advance the whole system of the Baltic Sea protection policy and the collective effort to make its resources sustainable. Projects have commenced an active stake-holder work and dissemination from the very beginning of their implementation. Within the BONUS human capacity building program, projects have actively engaged in pedagogic activities. Altogether 11 various courses are referred in the first annual reports (Table 2). Two of the held courses were supported from the central BONUS EEIG budget. The target audience of BONUS teaching activities was not constrained by the PhD students, but involved also, e.g. science journalists. Conclusion: the potential of BONUS projects to contribute to the human capacity building is enormous, and shall in future be backed by more support from the centralized Programme sources.

Delays with some tasks have been explained by the necessary budget cuts, slow process of formal paperwork (GA with NFA, signing of CA), and late arrival of national funding. Although no research plan was re-opened after negotiations caused by budget cuts, some projects had to modify the sequence of tasks and deliverables, to ensure timely information supply from one work package to another.

Not all projects provided data on the jointly used major research infrastructures. Also, the valuation of task was in number of cases doubtful. Still, according, to this rather incomplete information, projects already received at least 778 kEUR in-kind contribution from other national sources in terms of access to the shiptime, and at least 400 kEUR contribution enabling access to the advanced computing facilities (Table 3). As seen in the Projects input to the overall performance statistics (Table 4), some of the included metrics are interpretable (e.g. 3, 4, and 11); therefore the figures vary greatly from project to project. It would be a good idea to revisit the list of indicators before the next reporting campaign.

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

AMBER is one of the most ambitious BONUS+ projects. It 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. During the first year of implementation project gathered an impressive collection of data sets and analysed multitude of time series. A specialized training on time series analysis was conducted by the project. Field data collection campaign of this project included three specialized research cruises: one investigated the processes and gradients in two larger river plumes – Oder and Nemunas, another, studied the impact of groundwater on the sediment bio-geo-chemistry, and the third focused on the elements of nitrogen turnover. In spring of 2009 a unique land-based sampling activity was undertaken to collect data on the groundwater seepage off the Polish coast of the Baltic. In addition, the nitrogen removal processes in the water column and sediments were studied by the members of the Finnish team of AMBER consortium during the July cruise of German r/v 'Prof. Albrecht Penck'. Meanwhile the AMBER modelling segment has produced a series of model-derived datasets and thematic maps on various key parameters of the sea and its drainage area.
Two German groups of the project experienced difficulties with opening the PhD positions due to transfer from Diploma to Bachelor/Master curricula in German universities. Still according to the coordinator's statement, project in general follows the original research and financing 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. Together with the BONUS BEAST project, BALCOFISH has created the format and the input manual of the specialized BonusHAZ database. Significant progress has been made in development of the gene expression assays to analyze eelpout from various coastal localities in the Baltic. Two large sampling campaigns to monitor biomarker responses in eelpout covering the waters of Sweden, Denmark and Germany have been undertaken in May and November of 2009. The eelpout micronucleotide micro array has been applied in the first large-scale gene expression analysis comparing the reference site with the polluted site. This methodology will be further applied for the other sampled sites. In addition to several project internal meetings, BALCOFISH has arranged a joint methodological seminar with BEAST where issues of standardized sampling, dissection, assessing the reproductive success, and data processing were discussed in detail. Fulfilling its commitment to bridge the gap between the scientists and environmental management, BALCOFISH contributed to the 'Eelpout Monitoring Worksop' by German Federal Environmental Agency, as well to the number of events within the networks of HELCOM, ICES and other international entities. According to coordinator's judgement BALCOFISH follows very well the original research and financial plan.

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 first year of the BaltGene work, the data base on genetic structure of key Baltic species has been substantially amended and is now ready for rendering of the genetic maps. This information will be used to identify the optimal management units for conservation and sustainable harvest. Production of the DNA library of the *Mytilus spp.* mussels living in the Baltic shows good progress. An experimental study to assess the linkages between individual genetic variation and stress tolerance has been performed using the newly identified Baltic

dwarf species *Fucus radicans* as a model. A large database consisting of morphological and DNA characteristics of the Baltic whitefish has been completed. This database will serve to identify the relative roles natural selection and neutral evolutionary forces in shaping the whitefish genome. Building of prerequisites to monitor and protect genetic diversity of several other economically valuable Baltic Sea fish populations is underway. Simultaneously, as the societal component of this project, the capacity of governance structures to incorporate genetic biodiversity in the management policies is being investigated. Project has been very active in submitting manuscripts to the high quality journals – partly based on the earlier results. According to coordinator, the BaltGene work proceeds with only minor alterations from the original plan. It seems, that the proposal has been slightly too ambitious – the tasks. Thus measuring of the rate of evolution of the Baltic populations, in addition to already delivered for publication speciation rate in *Fucus radicans,* would require discovery of new mutations specific for the Baltic populations. Also elaboration of biologically sound management and conservation practices including sustainable stocking programmes, taking into account genetic variability and differentiation in salinity tolerance (deliverable 2.2.) will require more time than originally expected 24 months.

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.

BALTIC GAS implemented an extremely busy field data collection campaign during the first year of its work. Eight research cruises in the Baltic involved seismic-acoustic profiling and core sampling. GIS-mapping of the obtained information progresses well. Biogeochemical properties of the sediments were studied experimentally in several field-work campaigns. During the German r/v Poseidon cruise in November-December 2009, a prototype of a water column imaging multi-beam system (ELAC) was applied for the first time to monitor the free gas bubbles escaping from the seep structures below the sea bottom. All BALTIC GAS WPs and tasks advance according to the original plan. The work on modelling and data integration (Dutch team of Utrecht University) even overtakes the planned schedule.

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. During the first Baltic-C year two scientific meetings have been organized with the first oriented towards weathering of minerals influencing the C budget, and the second towards marine observations and research cruise design. Project implementation started already in October 2009. Three research cruises to determine the concentrations of carbon compounds and alkalinity of the seawater were performed in 2008 and 2009. The investigations covered all major sub-basins of the Baltic Sea between the Kattegat and the Bothnian Bay. The data together with surface water CO_2 and O_2 partial pressure measurements from a fully automated measurement system deployed on cargo ferry "FINNMAID" commuting between Helsinki and Travemünde form a unique database for research and model validation. River input data for the following parameters: river flow, alkalinity, total inorganic carbon, total organic carbon, pH, temperature, concentrations of Na+, K+, Ca2+, Mg2+, Cl-, SO42- ions has been collected as well and will also serve for model development and validation. Sediment cores have been taken and analyzed. Large efforts have also contributed to collect and analyze meteorological forcing data for present and possible future developments. The first year has also been successful in developing and preparing of models for the Baltic Sea drainage basin and the Baltic Sea itself that includes the CO_2 dynamics. Project implementation does not deviate from the original plan. Project's 3rd WP "Inventory of river runoff data" reported of difficulties with obtaining the input data of the Neva River – in spite of several approaches to RU authorities of different organizational level. Baltic-C follows the original plan.

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. The BalticWay consortium has been very active in dissemination of the first findings and project has already attracted much of interest in the public space as well on the governmental level – mainly due to its team's involvement with the EIA of the projected 'North Stream' underwater gas line. During the first year of implementation the project team was busy mostly with evaluation and validation of the model-generated wind fields over the Baltic Sea and long-term calculation of the wave fields. Based on this input, the circulation simulations with 2 nm resolution for 1971 – 2007 were performed, and preparation of high – resolution model runs with the latest updates of atmospheric forcing completed. Code of TRACMASS – the model calculating trajectories of particles in the sea (e.g. distribution of an oil spill) – has been updated, and a 10 day intensive course for newly recruited personnel and the PhD students was held. Several new dynamic patterns of the current-induced transport have been indentified and numerical methods to analyse large pools of particle trajectories have been developed. In order to validate the model-derived results BalticWay has completed preparations for an in-situ drifter experiment. Although execution of some tasks runs ahead of the original schedule, there are delays in some WPs. According to the Coordinator's assessment, the overall project implementation reached 80% of the planned for this year. This is explained by unclear contract and payment situation, and funding delays especially with Institute of Cybernetics and Laser Diagnostics Instruments (Estonia), and Danish Meteorological Institute. Full planned staff was hired only by the middle of year after resolving of the financing issues. There is also a delay with implementation of the TRACMASS at GKSS Institute of Coastal Research (Germany). Never the lass, the consortium seems to be strongly committed to catch up during the second year and implement the original research plan in its fullness.

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. During the first year of activity, BAZOOCA has collected data on distribution of gelatinous zooplankton by applying a specific sampling programme during the monitoring cruises on Swedish, Danish and Finnish research vessels. New information on the role of *Mnemiopsis* in functioning of the pelagic system was collected during a specialized expedition in the Baltic Sea, Kattegat and Skagerrak. These results were supplemented by the new data on *Mnemiopsis* eco-physiology and cascading food-web effects collected during a mesocosm experiment conducted in the Kalmar mesocosm facility (Sweden). Project seems to be progressing very successfully – in full accordance with the original 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. The first year of the work was devoted for establishing of the broad network and collecting the field data. Four research cruises have been undertaken in various parts of the Baltic, of which one was arranged as a joint operation of a German and Finnish research vessels - one specializing in fish sampling and the other in the water column sampling. In the course of standardization and validation of the methods, Project produced the first draft of handbook of standard operational procedures for integrated monitoring and assessment of the biological effects. Project has organized five methodological training and intercallibration workshops. BEAST together with the BALCOFISH project has established a joint BonusHAZ database. BonusHAZ is compatible with the ICES database, and it is planned to assimilate the former EC FP5 BEEP project database on biological effects into it. BEAST scientists have contributed actively to various ICES and HELCOM working groups. In general the BEAST project reached all of its milestones and produced all deliverables planned for this year. However, some modifications to the sampling and analysis plan had to be made to adjust the originally very ambitious research plan with the reduced budget: the number of analyses, target species and parameters had to be reduced. Project also met some coordination challenges, mostly associated with the broadness of its consortium (9 countries, 16 participating institutions). Never the less, these were efficiently and timely solved by the BEAST management and the steering committee.

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. The success of ECOSUPPORT is critically dependant on the skills of a set of the state-of-the-art models; therefore the first year of work was mostly devoted to improving of the models, compiling the sets for forcing and validation and testing of the model skills. New advanced simulation runs have been executed applying ERGOM, BALTSEM, and RCO-SCOBI models. Impact on socioeconomic and regional development was studied by use of three cases: the Gulf of Finland, The Vistula Lagoon mad Polish Exclusive Economic Zone in the Baltic. The first year of implementation proofed that in some parts the commitment was too ambitious – project management group had to decide more realistic alternatives. Thus, the planned reconstruction of daily temperature fields had to be changed to monthly mean fields, it was decided to repeat the scenario simulations of atmospheric variables, river- and airborne nutrient loads and CO2 emissions in order to improve the output quality. These modifications, however, do not affect the fulfillment of the overall ECOSUPPORT work 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. In summer 2009 HYPER team has completed a successful research cruise. During this cruise, twenty-six 6m-long gravity cores covering the postglacial period and additional multi-cores were retrieved from the Baltic Proper, Bothnian Sea and Bothnian Bay. The analysis of these cores is now in progress; it will bring new fresh information on the trends of hypoxia in the Baltic. Studying the biogeochemical processes, HYPER team has quantified natural nitrogen removal rate on 5 cruises (more than originally planned), covering Gulf of Finland, Baltic Proper and Southern Baltic Sea, both on sediments and in the water column, while the effects of short and long-term oxygen deficiency and benthic fauna loss on nitrogen processes was studied in the coastal area. The initial results indicate that nutrient fluxes across the sediment-water interface are highly variable between basins and closely dependent on near-bottom oxygen conditions and the diversity and condition of the benthic macrofaunal communities. A large-scale manipulative field experiment was conducted at Tvärminne Zoological Station (Finland). Preliminary results indicate that already short periods of hypoxia may alter ecosystem functioning, highlighting the importance of mitigating the problem of hypoxia in the Baltic Sea. The physical part of the BALTSEM model with a simplified oxygen sub-model, has been used to investigate causes of variations in hypoxia during the past 2000 years. The reactive transport model has been developed and implemented for Baltic Sea sediments. Validation of this model is on-going using geochemical data from Arkona and Baltic proper. Analysing the proposed engineering solutions to mitigate hypoxia in the Baltic Sea, HYPER scientists came to a conclusion that these measures are mostly unrealistic in practice or that the consequences of their full scale implementation are unknown and cannot be assessed at present. Thus bubbling the bottom waters with oxygen may be ruled out as unrealistic considering the amount of oxygen needed every year; increase the inflow of salt water over the sills will have the opposite effect of the intended, i.e. strengthening stratification and worsening hypoxia; reducing stratification by turning the Baltic Sea into a Baltic Lake would completely alter the whole ecosystem, mixing across the pycnocline using energy from wind mills might be a solution but more calculations are needed to determine if this is realistic in practice, and adding of chemicals to precipitate phosphate would require grandiose amount of aluminium apatite and rock flour, and potential toxicity and binding capacity in brackish water need to be addressed. HYPER has connected to HYPOX, a FP7 project aiming at improved monitoring of hypoxia and related processes across European seas. Several partners in HYPER were involved in SCOR WG128 on “Natural and human-induced hypoxia and consequences for coastal areas”. Although, some operational adjustments had to be done, mostly in order to improve data quality, and more logical sequencing of tasks, all WPs of the project progressed according to the 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 first year of work, analyzing the spread of the common reed in the Gulf of Finland, IBAM team concentrated on collection of the existing data: satellite maps and aerial photographs taken at different times were transferred to GIS, and reed areas were digitized from them. Two locations in the Gulf of Finland - Svartbäck and Espoonlahti - were used as model areas in the further analysis. Reed ecology was thoroughly investigated by literature reviews and meetings with experts. A number of factors, including water depth, proximity to the main river mouths, openness and wave exposure index, distance to shore, bottom type, and water nutrient level, were proposed to serve as the "explanatory variables" of the distribution of reed. Some of these factors will be incorporated in the simulation model. Performing herring fisheries analysis by Bayesian quotas and by stakeholder specific risk models, a Document Database has been compiled on the Baltic herring catches, fishing mortality, spawning stock biomass, recruitment, and weight-at-age using several sources. Based on that information the key parameters of the recent fisheries management system for the Baltic herring are determined. It has been discovered that there is a significant negative density-dependence of spawning stock biomass (SSB) on number of recruits in the following year. Hence, there is at least theoretically a SSB at which the population is at its maximum production. This should also be a target SSB for "maximum sustainable yield" (MSY) in fisheries. The target herring populations size for the Main Basin has been obtained by building a population model. The model is subsequently used for evaluating Bayesian Quota. A GIS map layer presenting the bladder wrack *Fucus vesiculosus* (the essential spawning substrate of the herring) distribution along the Estonian coast of the Gulf of Finland is developed. Central modules of the web-based decision support system (DSS) for efficient participatory process of consensus-building are developed and will be used in the course of the project implementation. Some adjustments in the sequence of tasks have been made to use team's capacity more efficiently: data updating and supplementing within WP4 (Finish Environmental Institute and Helsinki University of Technology) was postponed to the second year due to necessity to focus on WP1 (Geographical analysis of the spread of common reed in the GoF) tasks. Data from this WP are needed for further implementation of the project. Titles of two deliverables of this WP were re-defined to make them more specific.

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 2009 INFLOW project concentrated on field sampling over the whole project study area: on a transect from the marine Skagerrak to the freshwater dominated northern Baltic Sea. Altogether five cruises onboard German, Finnish and Russian research vessels were performed. In addition, INFLOW scientists participated in the cruises organized by BONUS HYPER and BALTIC GAS projects. Altogether, more than 50 sediment cores were successfully recovered. The high sedimentation rates (approximately 1-2 mm/year) at all selected sites provide an excellent opportunity to reconstruct ecosystem variability through time at decadal to centennial time scales. A number of sophisticated techniques are being applied to date the sediment strata with fine resolution and use various sediment properties as proxies to reconstruct past environmental conditions. In another INFLOW work package hydrographical and biogeochemical conditions for historical, contemporary and future scenarios will be simulated. The ecosystem models will be forced with climate of extreme conditions from the past 6000 years. These model experiments will give insight into the extent the ecosystem responds to past natural climate variability and environmental change. The preparation and preliminary testing for a full-scale modelling exercise progresses well. During its April 2009 cruise on Finnish r/v ARANDA, INFLOW carried out a hands-on training activity – the “Floating University” involving 11 trainees. This educational activity proved to be extremely successful. INFLOW activities received broad coverage in Finnish and Russian media. Due to prolonged negotiations between BONUS EEIG and German and Danish NFAs, some INFLOW activities suffered a delay. Thus, official start of work by Geological Survey of Denmark and Greenland (GEUS) was delayed until September 2009, and the originally scheduled work for 2009 underwent major revision which will have an impact on the 2010 work plan of GEUS as well. This implies, amongst others, a c. 8 months delay for the appointment of the (dinoflagellate) post-doc researcher, who originally should have started by January 1st 2010. Despite these obstacles project started as planned in the Full Research Plan.

PREHAB is another BONUS+ project 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 & services and net social benefits associated with alternative management options. During the first year of work the existing and available biological and environmental data from all three PREHAB case-study regions have been reviewed and summarised into a meta-data table including 54 individual data sets of spatially explicit biological and environmental variables. Explanatory variables and the predictability of benthic habitat types have been reviewed in order to compile existing published evidence on empirical relationships between explanatory and response variables. This effort covers peer-reviewed field studies covering three decades and six sub-regions from the Gulf f Bothnia to the Kattegat and involves three response groups, fish, macroinvertebrates and macrophytes, on 17 explanatory variables identified in the studies. In order to develop the methods for spatial prediction of bentic habitats, sets of data suitable for modelling scale-dependence are established, and development of MATLAB-scripts for Monte Carlo simulations of precision and empirical limits of regression models is ongoing. Overview of more than forty methodologies of different statistical techniques for spatial prediction was performed and a workshop was organized in Klaipeda (October 2009) in order to agree on the most appropriate state-of-the-art species habitat modelling methods. Five modelling methods where finally selected and the responsible party for developing the model script identified. Seven broad groups of predictors were defined and recommended for use within all case study areas. These groups were defined as variables to do with location, topography, substrate, exposure, hydrography, biological interactions and human pressures. The predictors inside the groups varied according to the methods they are going to be calculated and/or derived due to specific conditions of the study areas. Developing tools for valuation of benthic habitat goods & services, the broad literature review resulted in a specific data base. The greatest coverage was found to exist on the value of the habitat service and the provision of food, recreation and aesthetic benefits. Some studies exist about the diversity ecosystem service, cultural heritage and the legacy of nature. An approach towards solving the valuation task according to the PREHAB work plan is suggested. According to the coordinator's report, a post doc at GU was hired 6 months later than originally intended; this would however leave no consequences for projects ability to comply with the plan for deliverables.

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. During the first year of its work PROBALT team focused on analysing the societal conditions for the effective protection of the Baltic Sea though various case studies, examining nutrient trading as a potential instrument for more effective protection and search of the ways to increasing awareness about the state of the Baltic Sea in individual countries. The Finnish case study was launched with a survey of the linkage between scientific knowledge and decision-making from the viewpoint of scientists and experts. Different features of knowledge that have implications on the science-policy interface in the case of eutrophication were analysed. In another case study the major outcome was a survey, which specifies the German contribution to Baltic Sea eutrophication by relating German nutrient loads to those of other coastal states and specifying various German emission sources. Helsinki University group of the PROBALT consortium collected the documented information on the waste water treatment process in order to formulate cost functions. This information will form the basis for the next steps in the project. The St Petersburg group focused on a general policy analysis in the environmental sphere in Russia on both federal and regional levels, especially in example of Kaliningrad oblast. The main part of this work is related to the analysis of the policymaking on environmental issues on the Russian federal level in the 1990-2000s and mechanisms of public participation in the environmental policy in Russia. Project organised the journalist training on the Baltic Sea eutrophication issues in Gdansk, September 2009,

bringing together 20 journalists and 12 guest speakers. The training was arranged in cooperation between PROBALT and Media21 Global Journalism Network in Geneva.

In 2009 project suffered a change of Coordinator, and the kick-off was delayed until the beginning of March, hence some changes in the schedule. The original research plan has been rearranged to more logical order: case studies on Germany and the European level are now conducted in a reverse order. It is anticipated that starting with the case study on the European level should enable an improved utilization of its results in the national and regional level case studies. Still, this imply no changes to the overall content of the research plan. Project also reports of some difficulties in the work of its Russian partner's – European University, St Petersburg, due to nearly 30% budget cuts by Russian NFA. Never the less, there is a commitment to keep the content of the research carried out by the Russian partner unchanged.

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. During the first year of activity RECOCA has established an extensive data base holding all necessary statistical data for the coupled hydrological-biogeochemical models and the economic models. Model set-ups and parameterizations of the coupled hydrological-biogeochemical models CSIM, SWAT and DAISY as well the economical models COST and the regional economical models have been performed and the models are currently calibrated for type watersheds of the various spatial scales. As a first major result, Net Anthropogenic Nitrogen Inputs have been calculated for all major watersheds around the Baltic Sea. The RECOCA results suggest that i) N fluxes have increased by a factor of 2-4 compared to pristine loads ii) between 60-80% of all N loading to the watersheds is retained in the catchments before reaching the Baltic Sea and finally iii) the sensitive watersheds are those with high specific discharge and low lakes area in their watersheds such as at the western Swedish Coast, in Germany and Denmark and the small costal watersheds in south-western Finland, i.e. all these watersheds have a naturally low nutrient retention. It is anticipated that RECOCA will allow decision makers to evaluate how changes in land use will affect nutrient loads to the Baltic Sea. Most importantly the CSIM model that will be developed and supported by the SWAT, DAISY and NANI models will be used during the update of the eutrophication section of the Baltic Sea Action Plan; the COST model further developed in RECOCA and supported by the regional economical models is a cornerstone of the "Baltic Stern" Initiative as initiated by the Swedish Finnish and Danish EPAs. Both platforms (HELCOM, Baltic Stern) will allow that RECOCA results will be disseminated and applied in an optimal way. According to the Coordinator's report, no adaptation on the research plan and schedule of deliverables were necessary, except that the deliverable D 6.2 (Assessment of retention and uncertainty) will be late by about 6 month. This can be explained by the later start of the responsible partner (Bioforsk, Norway) due to a delay in the contract negotiations. Deliverable D 7.2 (Report on cost estimates for different measures, regions and locations) will be ready in month 24 instead of in month 12 due to change of the sequence of tasks in WP 7. This change was necessary to develop in time the cost minimization model needed for WP8.

Environmental risk governance in the Baltic Sea is still unable to fully support the implementation of the ecosystem approach to management. **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. During 2009 RISKGOV has progressed in full accordance with its original research plan:

a joint analytical and methodological framework that defines main research questions and methodological challenges and solutions has been defined, and five case studies focusing on eutrophication, overfishing, hazardous chemicals, oil spills and invasive species have been initiated. Among the most remarkable 2009 accomplishments of the RSKGOV project stands organizing of the International Conference 'Coping with Uncertainty', November 2009, Stockholm. This conference attracted 90 researchers and practitioners from 13 countries to discuss challenges connected with uncertainty, complexity and ambiguity in environmental risks. Several of the presentations were related with RISKGOV and other BONUS+ projects. A subset of the participants will be invited to write articles for a special issue in the AMBIO – the Journal on Human Environment by Swedish Royal Academy of Sciences. Although no deviations from the original research plan are envisioned, some RISKGOV partners experienced complications in allocating person-months to researchers. The main reasons are explained as slow recruitment of PhD students and late arrival of Polish funding (November 2009). As the result, there is a delay with the case studies, which will be caught in the beginning of 2010.

Following tabular material presents an overview of some kinds of activities of the whole BONUS Programme in 2009.

BONUS+ RESEACH CRUISES: 2009

Extracted from the BONUS Cruise Calendar and Y1 reports by projects

SHIP (Country)	PROJECT	CRUISE AREA	TIME	MAIN PARAMETRES TO BE SAMPLED
Aranda (FI)	**Baltic-C**	Kattegatt-Bothnian Bay	January 12-February 6, 2009	pCO2, tCO2, orgC, alk, Ca, pH + nutrients
Oceania (PL)	**BALTIC GAS**	Gdansk Basin Polish EEZ	February 20-26, 2009	Seismic measurements
Alkor (DE)	**IOW w. HYPER scientist**	Gotland deep	3-16 March 2009	Nitrogen processes in water column
Prof. Albrecht Penck (DE)	**AMBER**	Oder Bight and Lithuanian coastal waters	March 6-18, 2009	Denitrification, DOM
Aranda (FI)	**INFLOW/BALTIC GAS**	Northern Baltic Sea	April 20-27, 2009	Long sediment cores, surface sediment cores
local small ship (SE)	**BALTIC GAS**	Himmerfjarden (Sweden)	May/June, 2009 day trips	Water column & sediment
Oceania (PL)	**Baltic-C**	Baltic Proper	May-June,2009	Sediments, water for DOC/POC
Aranda (FI)	**HYPER**	Baltic Proper, Bornholm and Arkona basins	25 May-5 June, 2009	Water and sediment biogeochemistry, benthic fauna and pigments, sediment cores
Aranda (FI)	**HYPER/BALTIC GAS**	Gotland Basin, Bothnian Sea, Bothnian Bay	4-17 June, 2009	Water and sediment biogeochemistry, benthic fauna and pigments, sediment cores
Ladoga (RU)	**INFLOW**	Baltic Sea (Russian EEZ)	June, 2009	Long sediment cores, surface sediment cores
Ladoga (RU)	**BALTIC GAS**	Baltic Sea (Russian EEZ)	30 June-3 July, 2009	Seismic measurements, surface sediment cores
Prof. Albrecht Penck (DE)	**AMBER**	Gdansk Bay, southern Baltic Sea	23-30 June, 2009	Impact of groundwater on geochemical cycles of coastal ecosystems in the southern Baltic Sea.
Prof. Albrecht Penck (DE)	**IOW with AMBER and HYPER scientists**	Gotland Sea	July 7-17,2009	Nitrate isotopes, sediments
Aranda (FI)	**INFLOW**	Eastern Gulf of Finland	August, 2009	Long sediment cores, surface sediment cores
Aranda (FI)	**BEAST**	Gulf of Finland	August-September, 2009	GOF Integrated EH Assessment
Maria S. Merian (DE)	**Baltic-C/AMBER/INFLOW/BALTIC GAS**	Kattegatt-Bothnian Bay	August 27-September 9, 2009	CO2 system and dentrification between the Kattegat and the Gulf of Bothnia, Long sediment cores, surface sediment cores
Maria S.	**AMBER**	Baltic Sea /	August 25–	stable isotopes, DON uptake,

Merian (DE)		North Sea	September 7, 2009	DIN uptake, DOM concentration
Walter Herwig III (DE)	**BEAST**	Gulf of Finland	August-September, 2009	GOF Integrated EH Assessment
Professor Stockman (RU)	**BALTIC GAS**	Baltic Sea (Russian EEZ)	4-6 days in July and September, 2009	Near bottom water & surface sediment
Maria S. Merian (DE)	**IOW w. HYPER scientist**	Landsort Deep, Gotland Deep	9-24 September 2009	Nitrogen processes in water column
Skagerak (SE)	**BAZOOCA**	Southern Baltic, Kattegat, Skagerrak	October, 2009	Water biogeochemistry, virus, bacteria, phytoplankton and zooplankton
Alcor (DE)	**BALTIC GAS**	Arcona Basin	October 9-18,2009	Seismic measurements
Oceania (PL)	**BALTIC GAS**	Gdansk Basin, Stolpe Channel, Bornholm Basin	November 5-16,2009	Seismic measurements, surface sediment cores
Poseidon (DE)	**BALTIC GAS**	Bornholm basin, Arcona Basin, Mecklenburg Bay	November 27-December 21, 2009	Seismic measurements, Long sediment cores, surface sediment cores, water column
Walter Herwig III (DE)	**BEAST**	Gulf of Gdansk, Gulf of Riga	December, 2009	Collecting material for biomarker and fish pathology tests
KVB 005 (FI)	**BEAST**	Bothnian Bay, Bothnian Sea	December, 2009	Sampling *Monoporeia* for biomarker tests

Table 2

BONUS+ TRAINING ACTIVITIES IN 2009

Course Title	Place	Time	BONUS Project(s) arranging the course	Number of trainees	Comment
Training and intercalibration of methods for field sampling for biomarkers and fish disease studies;	Onboard r/w Walther Herwig III	17 August – 8 September 2009, and 3-21 December 2009	BEAST	14	PhD and MSc students and lab technicians from Germany, Estonia, Latvia, Lithuania and Russia
Workshop on reproduction and development disorders in crustaceans/ amphipods;	Department of Applied Environmental Research, Stockholm University, Stockholm	15-17 June 2009	BEAST	7	Scientists and PhD students
Workshop on measurement of enzymatic biomarker in bivalves.	Finnish Environment Research Institute, Helsinki, Finland	9-11 November, 2009	BEAST	9	Scientists and PhD students from Finland and Latvia
International Advanced PhD Course on Climate Impacts on the Baltic Sea: From Science to Policy	Nexø, Bornholm, Denmark	27 July - 5 August 2009	ECOSUPPORT/BALTIC-C	15	
Practical workshop on eelpout sampling and examinations	Roskinlde University Field Station, Søminestationen, Holbæk, Denmark	19-20 October, 2009	BEAST/BALCOFISH	17	PhD students and technicians from institutes in Denmark, Sweden, Germany and Finland
Time Series Analysis and Modelling of Environmental Data	Island of Seili, Finnish Archipelago	September 13–17, 2009	AMBER	23	
INFLOW "Floating University"	r/v ARANDA, Baltic Sea	22-29 April, 2009	INFLOW	11	Practical training on core-sampling marine sediments and handling the samples.
Journalist training on the Baltic Sea eutrophication matters.	Gdansk, Poland	September 14-16th 2009	PROBALT	20	Very informative & popular (AA) presentations of this seminar can be downloaded from http://www.probalt.fi/en/info/18/
From unsequenced species to analyzed gene expression microarray.	Gothenburg	31 May, 2009	BALCOFISH	10	During the 19th SETAC Europe meeting, 31 May – 4 June
Conservation Genetics of Baltic	Tjarno, Strömstad,	17-20 November,	BaltGene	12	

Sea organisms	Sweden (Former Tjärnö Marine Biological Laboratory)	2008			
SNP discovery & analysis in Atlantic salmon	Aas, Norway	30 November – 11 December, 2009	BaltGene	24	
The Baltic Sea - yesterday, today and tomorrow	Lund, Sweden	19-24 April 2009	HYPER	18	Nine students were from Lund University, others from other universities. Several HYPER PhD students participated.
"TRACMASS – A Lagrangian Trajectory code"	Tallinn	14-24 July, 2009	BalticWay	5	Intensive course for new personnel and graduate students. Focus on individual work with trainees.

JOINT USE OF MAJOR RESEARCH INFRASTRUCTURES: 2009

Information gathered from EPSS

Project	Description of infrastructure	Purpose	Amount of use	Valuation of in-kind contribution	Comment
AMBER	Supercomputer HLRN Berlin	Scenario simulation	44 kNPL	30800 EUR	
AMBER	Supercomputer at the Swedish National Supercomputer Centre	Scenario simulation	500,000 cpuh	50000 EUR	
AMBER	r/v Maria S. Merian	Observations at sea	14 days	350000 EUR	
AMBER	r/v Professor Albrecht Penck	Observations at sea	21 days	168000 EUR	
BALTIC GAS	Research vessel OCEANIA Research vessel "Himmerfjärden"	Sediment sampling, seismic studies	15 days	120 EUR	Valuation daubtful
BalticWay	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 EUR	
BalticWay	IoC Cluster of 98 Opteron CPU	Performing calculation of Lagrangian trajectories with the use of the TRACMASS code, intermediate st	10 000 CPU hours	5000 EUR	
BalticWay	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)	100 EUR	Valuation daubtful
ECOSUPPORT	HLRN Supercomputing Service	Production and storage of scenario simulations	600 NPL	42000 EUR	

ECOSUPPORT	Linux cluster at Marine Systems Institute	To perform model runs (cpu time and disk storage)	15000 cpu hours	15000 EUR	
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	50000 EUR	
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	200000 EUR	
AMBER/HYPER	Combined AMBER/HYPER cruise with rv Prof. A. Penck. Nitrogen losses were measured. Sediment sampling in Arkona Sea for isotope pairing measurements.	To evaluate N losses in sediments	12 days cruise, HYPER share 4-5 days	1 EUR	Valuation daubtful
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 EUR	Valuation daubtful

Table 4

MEASURABLE PERFORMANCE INDICATORS: 2009 (IBAM & INFLOW data missing)

	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.	0	0	0	0	5	0	0	1	0	0	0	0	0	0	1	0	7
2. Number of times the scientists working in your Project have served as members or observers in stakeholder and scientific committees.	9	12	0	0	41	5	0	16	15	10	0	0	19	12	7	1	147
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).	0	0	0	0	3	0	0	2	0	3	0	0	1	0	1	0	10
4. Number of suggestions for designing, implementing and evaluating the efficacy of pertinent public policies and governance originating from the work of your Project.	1	1	0	0	10	2	0	6	6	7	0	0	11	3	2	0	49

	AMBER	BALCOFISH	BALTIC GAS	BAZOOCA	BEAST	BaltGene	BALTIC-C	BalticWay	ECOSUPPORT	HYPER	IBAM	INFLOW	PREHAB	PROBALT	RECOCA	RISKGOV	TOTAL
5. Number of persons (above) and working days (below) spent by foreign scientists on research vessels participating in the cruises arranged by your Project.	5 25	0 0	2 16	12 252	15 177	0 0	0 0	0 0	0 0	27 278	0 0	0 0	0 0	0 0	0 0	0 0	61 748
6. Number of persons (above) and working days (below) spent by foreign scientists using other major facilities involved in your Project.	0 0	2 54	0 0	6 100	13 169	9 112	0 0	1 3	1 30	4 14	0 0	0 0	0 0	0 0	0 0	0 0	36 482
7. Number of popular science papers produced by your Project.	4	0	0	3	6	5	1	6	3	3	0	0	3	3	0	1	38
8. Number of interviews to media given by members of your Project's consortium.	15	16	1	5	19	17	1	19	11	18	0	0	8	11	2	0	143
9. Number of multi-media products and TV episodes produced by your Project with dissemination purpose.	0	0	0	1	0	1	0	0	0	5	0	0	1	0	1	0	9
10. Number of other dissemination products produced by your Project.	4	0	0	4	2	3	0	0	23	16	0	0	9	13	0	6	80
11. Number of times your Project team has issued a recommendation how to improve general public's comprehension and priorities regarding the Baltic Sea.	0	0	0	0	18	1	0	0	0	2	0	0	1	2	2	0	26

	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.	9	0	0	0	8	4	0	10	1	14	0	0	4	16	1	0	67
13. Number of datasets your project has delivered to the common metadata base of the Programme.	4	0	0	0	1	0	0	3	0	2	0	0	0	0	4	0	14
14. Number of scientists that attended international workshops, WG meetings, conferences, intercalibration exercises etc. paid by BONUS+	24	34	52	5	39	41	0	18	28	27	0	0	13	8	6	13	308
15. Number of PhD courses (above) organized by your Project and persons participating (below).	1 23	1 10	0 0	0 0	3 8	2 34	1 0	0 0	1 20	1 18	0 0	0 0	1 2	0 0	0 0	0 0	11 115
16. Number of modifications made to current PhD course programmes that resulted from the work of your Project.	0	0	0	0	2	5	0	0	0	1	0	0	2	0	0	1	11
17. Number of student visits (persons above, visit days below) from your Project to other BONUS projects.	3 23	1 4	0 0	0 0	4 17	0 0	0 0	0 0	2 12	1 5	0 0	0 0	1 1	1 0	1 60	0 0	14 122