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Editorial

Spatial Data Infrastructures Data, services, discussions

Spatial Data Infrastructures (SDI) - an enigmatic term which considerably affects a wide range of technical disciplines, places high demands on scientific and technical expertise, has a considerable dynamism often influenced by technical possibilities, and also has far-reaching consequences in financial terms. Although these already take shape during the SDI development phase, their influence is even greater if these structures are dispensed with. What potential lies behind the data, the structures and the technology?

The development of spatial data infrastructures, i.e. structures embodying defined (meta) data bases and quality demands, harmonized interfaces and standards, communication structures as well as agreements on the access and use of data and services, is presently the focal point of activities in numerous specialist disciplines and is the subject-matter of harmonization efforts on all administrative levels. In the year of its centenary in 2006, the governmental nature conservation agency is becoming dynamically involved in this activity. Nature conservation without spatial referencing is hardly conceivable. As long ago as 1998, the federal administration recognized the potential of spatial information. After examining the limitations of spatial information in daily practice, however, these were generally found to closely match existing administrative structures. Through the work of the Interministerial Committee for Spatial Information (IMAGI) of the German government it has been possible to considerably improve cooperation between the federal authorities. Since then, the coordination of data transfer conditions and utilization agreements have simplified data exchange. The merging of meta information systems such as the Environmental Data Catalogue (UDK) or the North Sea and Baltic Sea Coastal Information System (NOKIS) in the Federal Geoportal facilitates navigation across the divides between different disciplines. These efforts were given new impetus by a European initiative to develop a spatial data infrastructure (INSPIRE), which has attempted to regulate the interaction of a SDI by way of a Europe-wide binding framework directive since 2001. Whether the arbitration process relating to this framework directive is successful will only be decided following the publication of this article. Because your first opportunity to read the KFKI Newsletter will coincide with the conclusion of the European arbitration process on November 21, 2006, we suggest that you inform yourself of the outcome.

INSPIRE will not only have implications on the European level. In accordance with the concept of distributed data management in the respective institutions responsible, INSPIRE will operate decentrally in both technical and administrative terms and will also have consequences right down to the municipal level. For this reason, leading municipal organizations as well as federal and state authorities will be involved in the SDI-DE steering committee, which is the third platform mentioned here for developing SDI. The SDI Steering Committee coordinates all activities on an interdisciplinary and interstructural level.

The opening question raises discussion on the potential of spatial data infrastructures. So what is the answer? This is by no means obvious, but rather rests with us. So let us use the existing structures and mechanisms to develop the structures we require! Let's also become involved in European national or regional initiatives and help to shape them. For example, besides questions concerning coastal zone management or the physical conditions of seas and oceans, aspects of coastal engineering are also addressed in the appendices of the INSPIRE framework directive. It will only be possible to arrive at a problem-oriented solution through the participation of all competent technical institutions. There are already enough solutions to non-existent problems.

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English translation by Dr. Ian Westwood, Burgwedel

Improvement of the accuracy of digital terrain models using airborne laser scanner measurements over intertidal flats and the coastalzone

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For many years, laser scanner measurements over the North and East Frisian islands as well as over foreshore and tidal flat areas have been made in order to describe the terrain in detail and determine morphological changes. Examples of this are variable terrain structures (scarps, the shifting of tidal creeks and tidal ditch systems etc.) as well as erosion and sedimentation phenomena. The changes mentioned are highly relevant, as they directly affect the loading and functionality of coastal protection structures on different time scales and hence pose a possible risk to the affected areas and their inhabitants. For this reason, the timely and high-quality measurement and documentation of such changes is an important task area in coastal protection. Moreover, these changes have a direct effect on the safeguarding of shipping traffic, especially in areas comprised of intertidal flats. The original raw data generated in airborne laser scanning are unsuitable for the standard end-user. It is thus necessary to transform the raw data into a Digital Terrain Model (DTM) in several processing stages, i.e. removal of large measurement errors, matching of aerial scanner strips, filtering and interpolation. Almost all analyses as well as the derived results are based on this DTM. Due to different effects such as vegetation, trapped water bodies on intertidal flats and the irregular distribution of measuring points, the accuracy of the DTM is lower than that of the original laser scanner data. The aim of the KFKI project LaserScan is hence to improve the accuracy of a DTM generated from laser scanner data. For this purpose it was proposed to investigate various factors such as vegetation, trapped water bodies, and scarps and structure lines regarding their influence on the accuracy of the DTM. The development and implementation of strategies and algorithms for an a priori estimation and improvement of the accuracy of digital terrain models are dealt with in the following. This involves the creation of software tools which incorporate the developed algorithms.

Classification of water surfaces in laser scanner data

Laser scanner aerial surveys over intertidal flats are generally carried out at low tide in order to ensure that almost the entire investigation area has fallen dry. Despite this, bodies of water often still remain in tidal creeks and hollows. Because the laser scanner beam is unable to penetrate the latter, the measured laser scanner points in areas covered by water represent the level of the water surface. As these points do not belong to the terrain surface being sought, they must be classified and removed. On the basis of training areas covering water and land, the laser scanner data per aerial strip are analyzed according to the parameters: surface elevation, intensity and point density. Subsequently, the parameters necessary for fuzzy classification are automatically derived from the training areas. Once all points on the scanner strips have been classified, additional tests are carried out to check and improve the classification. An example of a classification result is shown in Fig. 1.

Different types of vegetation typical of the coastal zone, which vary considerably in terms of density and height, affect the laser beam transmitted from the aircraft in such a way that a large proportion of the radiated energy is reflected before reaching the actual terrain surface. Depending on the type of vegetation concerned, this results in considerable differences

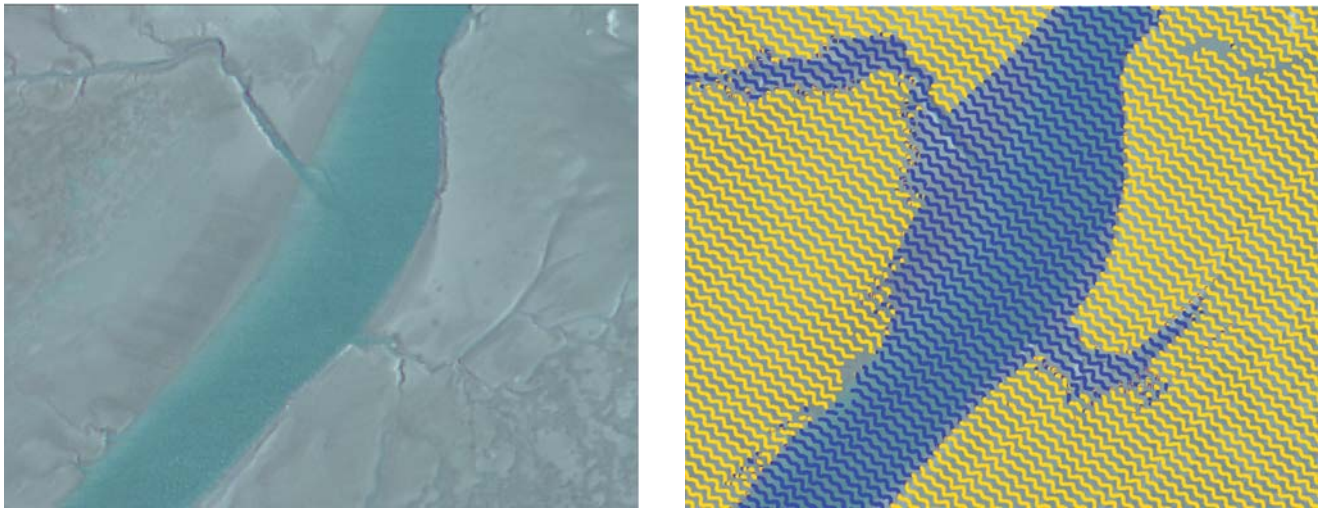

Figure 1: Classification of laser scanner data according to water and land points

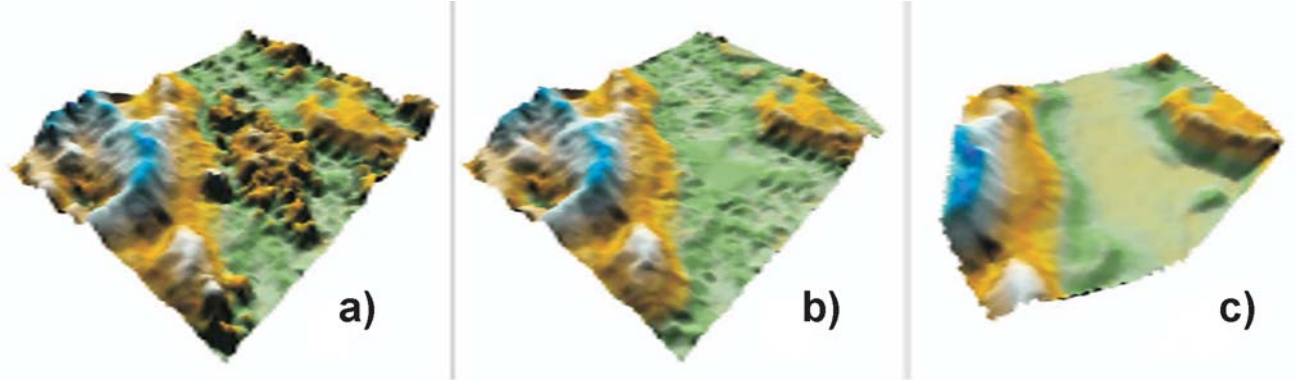

Figure 2: a) Laser DSM b) DTM c) Reference DTM

regarding the degree of reflection and penetration rate of the laser pulse. In the case of certain types of vegetation such as, e.g. creeping willow, dense and matted layers comprised of plant material lead to considerable inaccuracies in the generated DTM. These vegetation-related errors may be reduced by means of different filter algorithms. Owing to the low density of points on the ground and the small level differences between the vegetation surface and the ground surface (vegetation is often present in dune slacks), filtering is difficult, and residual vegetation points still exist when the DTM is generated (Fig. 2). This leads to residual errors which are currently being investigated in the project for certain types of vegetation. The major aim of this sub-project is to automatically classify low accuracy areas resulting from the effects of vegetation in the remote sensing data.

Based on a comparison between terrestrial reference data and laser scanner measurements, problem areas characterized by inaccuracies in the datasets are first identified and documented. Besides the effects of vegetation type on level errors in the laser DTM, relationships regarding vegetation heights and vegetation density are also investigated. In the next step the particular vegetation attributes which affect the accuracy of terrain levels in the laser DTM are cross-referenced with special features in the remote sensing data. These features are subsequently used in order to chart the different accuracy domains in the data by means of a monitored classification process, thereby permitting an assessment of the reliability of the levels derived from laser scanner measurements.

Extraction of structure lines and scarps

Many morphological objects in mudflat and foreshore areas contain structure lines and scarps. A tidal creak, for example, is described in detail by two points marking the top edge of the embankment and two points marking the toe of the embankment. Morphological changes in objects may be optimally described with the aid of derived structure lines and scarps. Moreover, the accuracy of the derived DTM may also be increased by the insertion of scarps. The method developed at the Institute of Photogrammetry and GeoInformation (IPI) is based on a combination of a digital picture processing and surface reconstruction for deriving 3-D scarps. Based on a level grid interpolated from the laser scanner data, line-oriented approximation solutions are derived by means of scarp operators. The approximation solutions are subsequently used in order to initialize the parameters

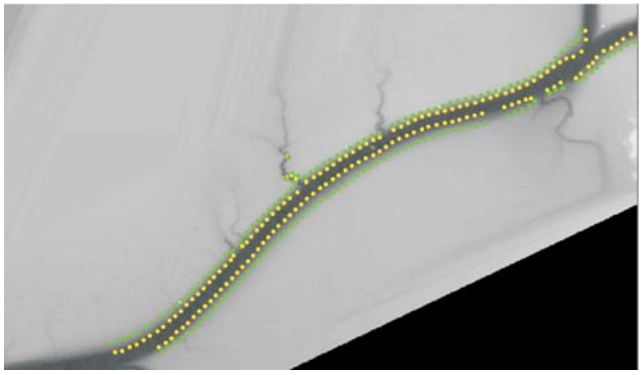

Figure 3: Derivation of scarps from laser scanner data for a tidal creek

necessary for the surface reconstruction. By estimating suitable mathematical functions in the laser scatter plot it is then possible to extract the scarps to be identified (see Fig. 3).

Acknowledgements

We wish to thank the following partner authorities for their technical and infrastructural support throughout the project, namely, the Regional State Office for Rural Areas (ALR) in Husum, the Lower Saxony Water Management and Coastal Defence and Nature Conversation Agency (NLWKN) in Norden, as well as the Federal Waterways and Navigation Administration - Directorate Northwest (WSD-NW). This KFKI research project was funded by the German Federal Ministry of Education and Research (BMBF) under the reference number 03KIS050.

The use of metadata in coastal engineering and the protection of coastal waters

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Frank Simmering (planGIS GmbH)
Dr.-Ing. Frank Sellerhoff (smileconsult GmbH)

The basis for working with metadata as a means of systematically describing and documenting data inventories, maps, drawings, literature, research projects etc. was developed within the scope of the KFKI project NOKIS (03KIS027) during the period 2001 to 2004. This work led to the creation of the basic version of an information system providing a focal point of communication for user groups concerned with the coastal zone. Using standardized metadata, standard logging tools and a common internet portal nokis.baw.de, this information system provides an efficient and economic support facility for accessing information in the distributed documentations of the project partners. By way of the National Spatial Data Infrastructure (SDI-DE) geoportal.bkg.bund.de and the associated spatial data infrastructures of the federal states, internet portals are now being developed throughout Germany which operate interactively by way of the common implementation of the ISO 19115 standard for metadata. By this means, information flow is also guaranteed internationally within the framework of the European Infrastructure for Geoinformation INSPIRE, which is intended to provide an integrated overview of all national spatial inventories in Europe. The metadata used in NOKIS contain all information required for the vertical flow of information in the SDI-DE and INSPIRE. This means that all departments which record the metadata for horizontal information flow on the administrative level using NOKIS tools have implicitly satisfied the requirements imposed by higher-ranking information systems. In NOKIS, metadata are generated and managed for the following task areas in particular:

- Surveying, maps, aerial photographs, and series of measurements which arise in the documentation of monitoring tasks,
- Projects in the coastal zone that are documented on behalf of the BMBF,
- Literature relating to projects and the research journal *Die Küste* published by the KFKI,
- Numerical models including scenarios (from 2007 onwards)

These so-called metadata profiles are further developments resulting from international research projects, which are implemented in NOKIS on the basis of the generally binding ISO 19115 standard.

The BMBF-funded research project *NOKIS++ Information infrastructures for the North Sea and Baltic Sea coasts* , which is due to expire in 2008, focuses as a contribution towards integrated coastal zone management on the two key themes *Integrated coastal hydrography* (03 KIS 049) and *Integrated protection of coastal waters* (03 F0412B).

This involves the definition of properly structured metadata profiles for different user groups concerned with the coastal zone as well as the development of online tools, which are made available for practical applications. These tools permit the manual input of metadata using a special editor and also provide a

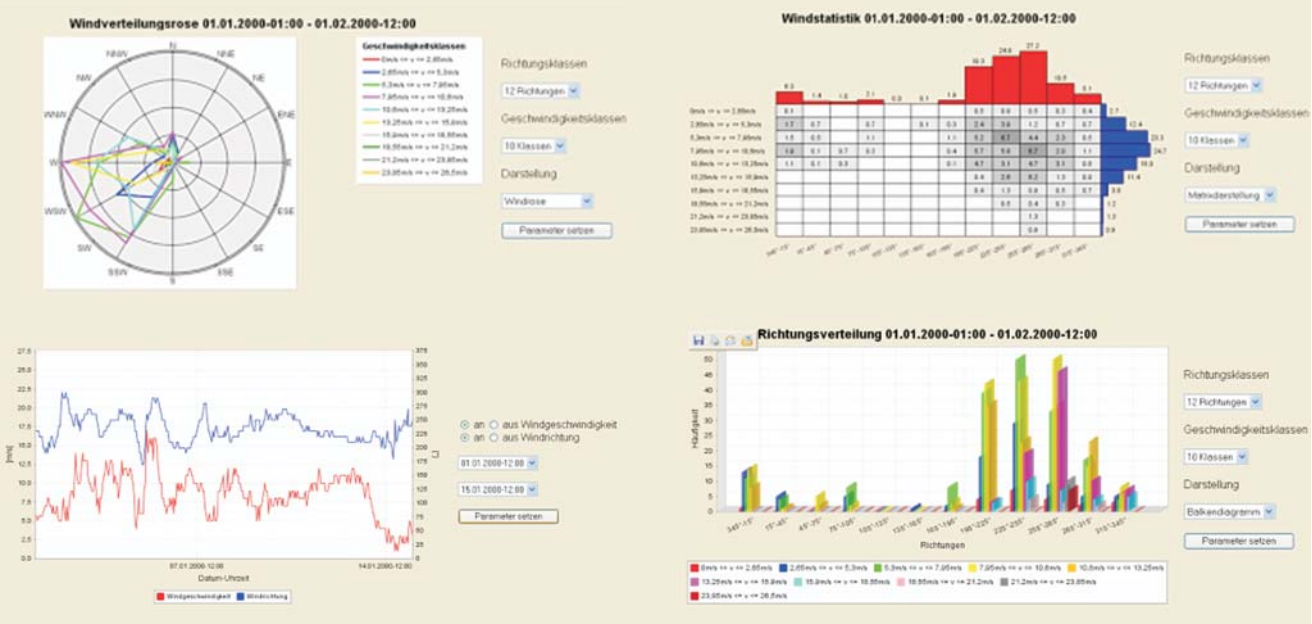

Figure 1: Online services for distributed data inventories

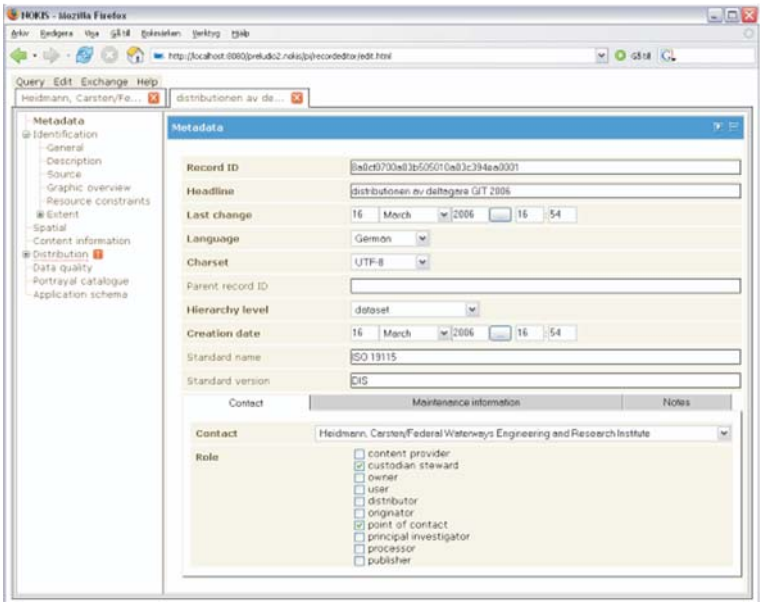

Figure 2: A metadata editor for handling NOKIS metadata profiles for the coastal zone

means of filtering out metadata from existing data inventories using extraction methods. These are then used for the intersectoral search for information in the shared NOKIS portal as well as in other internet portals such as GeoPortal, BMBF and KFKI via so-called services (CS-W).

In this type of networked information infrastructure the targeted search for data inventories is followed in the next step by information access, or at least a preview or visualization of the results obtained. Possibly in combination with a payment service, the data may either be downloaded from an online source or additional internet services may be provided in order to extract information from the data.

Considering the example of wind time series in Arkona, possibilities for representing and analyzing measurements are demonstrated which range from the simple analogue representation of wind speed and direction to their spectral representation. This clearly illustrates how internet services with a defined mode for accessing distributed data inventories permit standardized evaluations which may be easily integrated into other documents such as, e.g. obligations to report.

The results of numerical model computations for selected scenarios, which are available in NOKIS in the form of digital wind or wave atlases, are a further example of the online provision of information. By means of different web technologies, simulation results are here offered via a user interface which permits a variation of parameters within the limits of the model simulation.

Via the KFKI portal kfki.baw.de, data from completed projects are gradually being provided on a permanent basis under the link hosted-by-kfki. Owing to their standardized documentation using NOKIS metadata the user may search through these data online and obtain different representations with the aid of NOKIS services. This is an important contribution to the interoperability of data from distributed sources, which was formulated as the central idea behind the implementation of the water framework directive.

A central objective of NOKIS is to support data managers in the generation of metadata. For this purpose a browser-based editor has been developed and tested in practice. This editor provides input sheets with help functions geared to the metadata standard. Additional services provided by the NOKIS server such as coordinate transformation, a gazetteer and a thesaurus are also integrated into the latter. The standardized metadata are also intended to provide preview pictures and links to the data. This means that the editor may be used to create a detailed documentation for on-the-spot use by data holders as well as for making available metadata for higher-ranking information systems without redundancy or extra work.

In collaboration with the Federal Office for Cartography and Geodesy (BKG) a gazetteer service for the German coastal regions of the North Sea and Baltic Sea is currently being developed in NOKIS. The starting point for the latter is the recently published compilation of charts containing geographic names. Each geographical name in the coastal zone is thereby assigned a positional coordinate and a polygon for describing its spatial limits of applicability, which may subsequently be evaluated in the automated search. The use of different names (e.g. Hamburg/Hamborg/Hambourg/…) as well as the administration of the history of migrating objects (e.g. the island of Trischen) are also taken into account.

The information infrastructure of NOKIS is also used in other projects funded by the BMBF and the European Union:

- Research on integrated coastal zone management at the mouth of the Oder estuary (IKZM-Oder: www.ikzm-oder.de) and on the west coast of Schleswig-Holstein - Coastal Futures: www.coastal-futures.org)
- WTZ Brazil - Sustainable environmental management in Brazilian harbours www.harbours.wtz-brasilien.org
- Integrated Flood Risk Analysis and Management Methodologies - FLOODsite www.floodsite.net

Planning tool for integrated coastal hydrography and the monitoring of coastal waters

Dr.-Ing. Frank Sellerhoff (smile consult GmbH, Hanover)

Dr. Hans-Christian Reimers (Schleswig-Holstein State Agency for Nature Conservation and the Environment, Flintbek)

The planning tool is an application which is being developed and introduced for integrated coastal hydrography and also in the future for the integrated protection of coastal waters within the framework of the research project NOKIS/NOKIS++ (03 KIS 049 and 03F0412B). The planning tool is designed to support the departments responsible as well as other involved institutions in their work in the field of hydrographic surveying and monitoring of the coastal foreshore. For example, the planning tool may be advantageously used for planning measurement grids and surveying campaigns as well as for coordinating these tasks. The accomplishment of such planning tasks in the German coastal zone is mainly the responsibility of the staff of the following institutions: the Regional State Office for Rural Areas, the Federal Maritime and Hydrographic Agency, the Schleswig-Holstein State Agency for Nature Conservation and the Environment, the State Agency for the Environment, Nature Conservation and Geology in Mecklenburg-Western Pomerania, the Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency, as well as the North and North West Directorates of the Federal Waterways and Navigation Administration. In the Spring of 2006, a prototype was handed over to the planning staff of the various agencies. Regular meetings involving the planning groups are scheduled in order to coordinate application tests as well as the maintenance, management and further development of the system.

The planning tool is a graphical application implemented in the Java programming language which is modelled on conventional CAD and GIS applications. Besides the basic function of map representation, a total of three modules are currently implemented, which, depending on the task in question, are referred to as the planning module, the search module and the polygon editor. In order to optimally support the work of planning staff it is possible to represent the planning geometries in a variety of coordinate systems with additional coordinate transformation capability. During the development of the planning tool a great deal of importance was attached to the utilization of the existing NOKIS infrastructure. As a consequence of these considerations, a concept was developed which makes use of the already familiar NOKIS server with its CS-W interface and import and export tools, and also adds an additional component to the similarly familiar clients, i.e. the NOKIS editor and the portal search, which makes use of the infrastructure for the generation, processing and archiving of metadata in a recognized standard.

In order to create a new planning information file, the user first selects the coordinate system he intends to use and then advances to the planning module. By selecting a profile, the user is now able to generate a new planning information file. The profile sea surveying is only available at the present time. The profiles measurement grid and aerial surveying are presently being prepared. The user is then in a position to spatially demarcate the area affected by the planning measures on the map interactively using the mouse (see Fig. 1). A planning domain may thereby decompose into several relational components and may contain holes as well as islands. An alternative possibility open to users is to import an existing geometry via an interface conformal with conventional CAD or GIS formats. Various functions are available in the polygon editor module in order to match this imported geometry in terms of quality structure and resolution to the problem in question.

Once the range of validity has been defined, the remaining part of the planning information may also be specified in different input dialogues. This includes, e.g. information regarding time schedules, information relating to the client and the contractor as well as diverse information on the sensors to be used. In the broader sense, appropriate functions should also be developed for planning the measurement grid. In a subsequent planning process, this information may be

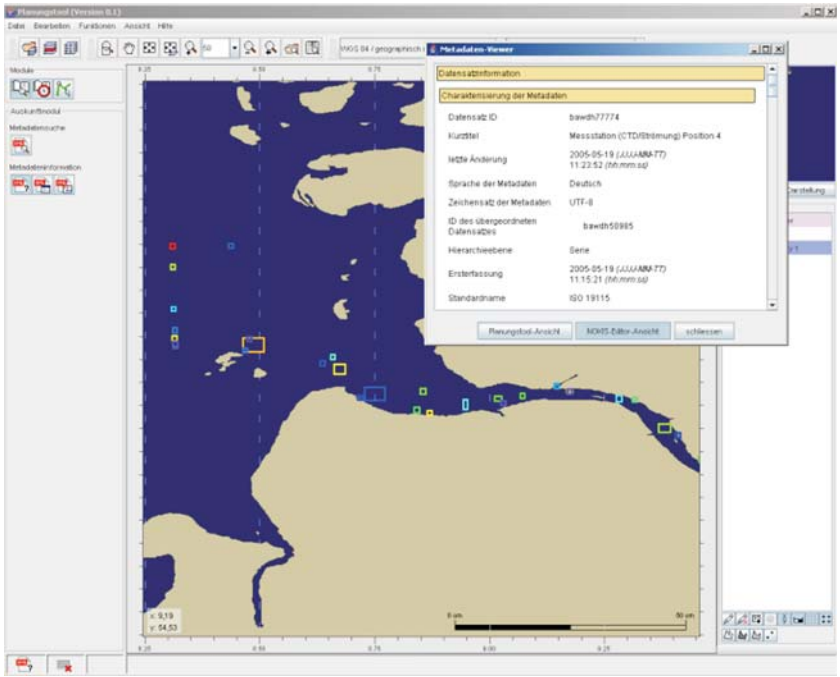

Figure 1: Combined representation of different planning domains in a single map

made available to all those involved in planning work by an upload on the planning tool server. The planning tool server is a special feature of the NOKIS editor (nokis.baw.de(planungstool) which is specifically used to archive the planning information, and where necessary, to make various applications available via the interfaces.

Among other things, the planning tool may also be used in the near future to search for already published planning information as well as existing measuring points. Three different ways of finding planning information are available in the search module for this purpose. By means of the *search assistant* a precise enquiry may be formulated by specifying spatial and temporal conditions. The *keyword search* permits the search for planning information by the submission of a free text which should be included in the planning information. The option *overall inventory* provides the user with a display of all currently stored planning information. At the end of each of these search paths a large amount of planning information is still available which may be selected or deselected individually for integration into a cartographic representation. If the user interactively selects an item of planning information in the map, the full set of planning information is then available in corresponding dialogues. The planning information inventory may either be evaluated by matching the legend and hence the cartographic representation thematically in relation to particular subjects or by generating a Gantt diagram to clarify the chronology.

The advantage of the underlying concept of using the NOKIS infrastructure is clearly illustrated by two major aspects:

Firstly, the portal search including the associated services may be used to also provide public users with information on planning projects. Secondly, the analysis functionality of the planning tool is also suitable for analyzing and representing the conventional NOKIS metadata. These may be used to advantage in the generation and assessment of planning information insofar as, e.g. information from past surveys may be integrated into cartographic representations. The same applies to the planning of the measurement grid, in which information on conservation areas and other land utilizations must be included.

In summarizing, the current version of the planning tool enables users to describe hydrographic surveys in the planning phase and to make this information available to others involved in planning work. Moreover, it is already possible to find a required item of information very conveniently by the precise formulation of a search enquiry. This will be even simpler to realize in the future following the integration of the NOKIS gazetteers, which will also permit the use of place names in the information search. For example, the place descriptor Dithmarsch Bight would appear in a suitably bounding box. Moreover, the introduction of additional profiles is also planned in future development work. For example, the previously-mentioned development of a profile for planning measurement grids is included in the list of extension suggestions. Moreover, the implementation of the planning tool for future management planning is also being considered as a further step towards the realization of the Water Framework Directive (WFD) in the marine sector.

With regard to the topic “Implementation of the sediment classification tool Jedi for monitoring coastal waters” the reader is referred to the contribution by the above-mentioned authors in the KFKI Newsletter 1/2006.

Scope of activities of the water level forecasting service of the BSH

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According to § 1 of the Federal Maritime Responsibilities Act (SeeaufG), the Federal Government shall be responsible for “[with regard to maritime shipping (...)], the nautical and hydrographic services, especially (...) the tide, water level, and storm surge warning service, (...) oceanographic investigations, including the monitoring of changes in the marine environment (...)”.

The prediction of water levels in the shallow and diversely structured coastal waters of the North Sea and Baltic Sea as well as in the estuaries is extremely complex, and the increased demands, e.g. in relation to maritime shipping, can only be met if the forecasting services are understood to be scientifically-based. The BSH and its predecessor institutions the “German Hydrographic Office” and the “Naval Observatory” have therefore been involved in applied research for more than 100 years as well as in KFKI projects in the recent past.

Tides

The service with the longest tradition is the tidal service, which issued the first comprehensive German tide table in 1878 for the subsequent year, and since then, has uninterruptedly provided important basic information for German maritime shipping in a variety of forms. A further successful product, namely the Tide Calendar, has existed since 1945. In order to produce these publications with the required accuracy and care, extensive preparatory work is necessary each year. Tide gauge data from the previous year must be obtained from the offices responsible, stored in the tidal database, and finally analyzed. The computational method is based on the so-called *harmonic representation of inequalities*, which yields the best results for the harbours along the German North Sea coast.

Because the tides gradually change from day to day, it is important that accurate tide gauge data with sufficient spatial resolution are available in the BSH as quickly as

possible in order to guarantee high-quality predictions. Due to staff reductions in the offices responsible for the operation of tide gauges, various problems have arisen in this respect during recent years. The author feels it is important and appropriate to draw the reader's attention to this problem at this juncture.

Without tidal information it is also impossible to adjust depth measurements obtained from hydrographic surveys. For this purpose the BSH produces so-called water level adjustment charts, which enable the water level at an arbitrary position in the German Bight to be computed from data recorded by tide gauges along the coastline.

Besides providing a wide range of information on the science and theory of tides, the Hydrographic Division also organizes instruction courses for surveyors, as the temporal variation in gravity must always be accounted for in surveyed parameters.

Water level predictions

On the basis of the tidal prediction computations continuous water predictions for the entire German coast are possible provided additional meteorological and hydrological data as well as (model) forecasts are taken into consideration. Four times a day, all available data also including the results of an operational model system are viewed and computer-supported water level predictions are calculated for the next 24 h. On the part of the German National Meteorological Service the model chain is comprised of the global atmospheric model GMI and the local model LMI, and on the part of the BSH is comprised of a North Sea and Baltic Sea model and a coastal model. Since the beginning of 2007, the resolution of the latter will be about 900 m, which is sufficient for water level predictions in the richly structured German coastal areas. Although hydrodynamic numerical models have increasingly replaced empirical prediction methods in the past 15 years, the latter should not be dispensed with totally, as a computer-supported may fail in individual cases for a variety of reasons. The North Sea water level prediction service in Hamburg is manned daily, available at all times with on-call duty provided from 0.30 am to 6 am. During storm surges, the service is manned around the clock with at least one scientist. The Baltic Sea Water Level Service has recently been organizationally affiliated to the Ice Service of the BSH in Rostock and is manned on weekdays at least from 6.30 am to 3 pm. If water levels in excess of 0.75 m above mean water level are expected, the service is manned around the clock.

All water level predictions are available in the internet under www.bsh.de.

Storm surge warning service

By pure coincidence, a very severe storm surge occurred in the Ems Estuary in the morning of the day of the presentation, which led to water levels as high as those experienced on 13.03.1906. According to the reports of chroniclers from early times, the occurrence of storm surges is unusually high on All Saints Day (1.11.): “Frisia may have reason to lament on All Saints Day” (Gerardus Outhofs, 1720).

The only difference between the storm surge warning service and the routine work of the water level prediction service is that the predictions are especially difficult to make and that warnings must be issued. The reason why these predictions are so difficult to make is that most storms surges are generated by a storm depression crossing the North Sea whose path and speed cannot always be forecasted with sufficient accuracy by current models of the atmosphere. The time of occurrence of the maximum wind speed and the astronomical high water must correspond closely, however, in order to generate a severe storm surge in the German Bight, with a lea way of about one to two hours. This means that a certain time window is available for empirical and strategic measures governing the decision as to which warning level applies to the individual stretches of the coast. The synoptic capabilities are especially important in this respect and are only implementable if the necessary measured data are available for the open sea. With regard to the latter, there is an unfortunate trend towards bringing observation stations out of service for financial reasons. The most blatant example of this in the past is the Elbe lightship.

In the event of severe storm surges, warnings are issued to more than 200 recipients at the present time on the German North Sea Coast (Health Resort Administrations, Fire Brigades, Flood Barrier Operators, Dyke Associations, Container Terminals, Town Drainage Departments, Nuclear Power Stations, Traffic Control Centres, the Navy, Police and Harbour Authorities and Local Warning Services such as the Hamburg Warning Service (WADI-Hamburg, etc.), whereby most of these act as multipliers. Other channels for issuing warnings include radio services and the internet. Many of those affected also call the BSH directly under 040-3190-3190 in order to obtain specific information for their area.

Applied research on extreme storm surges

Scientifically-based services can only exist if applied research is also carried out in conjunction with routine operations. Details of the MUSE Projects (Model-backed investigations of storm surges with very low probabilities of occurrence, duration time: 2002-2005) have already been reported in the KFKI Newsletter 2/2005. A summary of the results will appear in Volume 71 of Die Küste. Subsequent to the success of this project for forecasting the probability of occurrence of extreme storm surges, which have not yet occurred but are nevertheless physically possible, a similar project for the Baltic Sea was initiated in 2005. It has already been confirmed that conditions in the Baltic Sea, at least as far as extreme storm surges are concerned, are in fact somewhat more complex than in the North Sea.

Climate change

Enquiries addressed to the BSH often concern climatic changes and their effect on storm surges. It has been established that although a certain increase in the frequency of storm surges occurred at the beginning of the 1990s, the number of storm surges over the past

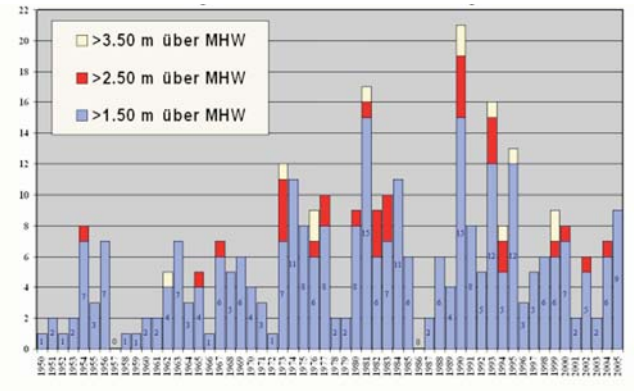

Figure 1: Frequency of storm surges in Hamburg

ten years has tended to drop. Owing to the considerable importance attached to the question as to whether global warming will affect the storm surge climate in the North Sea and the role that the (accelerated rise in sea level will play, the BSH will place greater emphasis on this problem in the future. Because the developments forecasted by the climate models of other institutions vary considerably depending on the scenario concerned, the narrowing down of the latter by means of thorough water level analyses at an early stage should be the focal point of the investigations. Only by this means is it possible to provide reliable basic data for coastal protection purposes.

Operational model of the Elbe

The mouths of German estuaries are geometrically complicated and variable. The tidal wave entering the estuary mouth, which may be enhanced by wind setup, can only be measured on a point to point basis by means of tide gauges. This means that the characteristics of a tidal wave moving upstream are difficult to compute in any given case, especially under storm surge conditions. Assistance in this respect may be offered by the development of an operational model of the Elbe, coupled with a model of the North Sea. In collaboration with the Hamburg Port Authority (HPA) and the Federal Waterways Engineering and Research Institute, Hamburg Division (BAW-DH), the BSH is currently planning a research project in order to determine which type of model is most suitable for forecasting purposes. Methods presently under consideration include those of the BSH, the BAW-DH and possibly others as well. Within the scope of the project, the HPA will be responsible for verification of the models and an empirical investigation of the developments of wind setup along the Elbe. It is intended to present the project in detail at the next meeting of the KFKI advisory group in April 2007. Assuming that the proposal is successful, the planned duration of the project is 2007-2010. Following a verification of the successful implementation of such an operational forecasting model, the model may also be applied to other estuaries and for other purposes besides the computation of the development of wind setup, e.g. for nautical purposes or as a source of hydrodynamic information for environmental

Report on the 30th International Confernece on Coastal Engineering (ICCE 2006) in San Diego

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The 30th International Conference on Coastal Engineering (ICCE) took place from 3 - 8 September 2006, in San Diego, California. 985 participants from 40 different countries took part in this very well-attended conference. The largest contingent of participants consisting of 385 delegates came from the USA itself. This was followed by Japan with 108 participants, and then the Netherlands with 73 participants. 33 coastal engineering specialists from Germany embarked on their long journey to Southern California, placing Germany at position 7 in the list of countries between Italy (35) and Denmark (34). The interest of the participants was captured by a total of 513 presentations and 50 posters dealing with a wide variety of coastal engineering themes.

The Port Engineering Society (HTG) and the German Coastal Engineering Research Council (KFKI) will organize the next ICCE in Hamburg in collaboration with other national institutions and institutes at the beginning of September 2008. The opportunity was thus taken at this conference to represent the next conference venue in Hamburg, to look over the shoulders of the local organizers and gather experiences, as well as to announce the official invitation to the ICCE 2008 in Hamburg during the conference dinner. For this reason the conference was also attended by the Chairman of the ICCE 2008, the HTG Chairman, Dr.-Ing. Hans P. Dücker, the Managing Director of the KFKI Dr.-Ing. R. Lehfeldt as well as an additional 4 members of the Local Organizing Committee (LOC), who, besides their activities in the LOC of the ICCE 2008, also presented papers within the framework of the conference programme.

In order to present the next conference venue of Hamburg as well as the ICCE 2008 an exhibition stand was erected and decorated with symbols typical of the Hanseatic city of Hamburg (Fig. 1). The conference participants showed a great interest in the ICCE 2008 conference stand. Alongside this stand a further 31 exhibitors were represented in San Diego, especially international consultants, manufacturers of construction materials and measuring devices, international publishers of scientific material, etc.

At the closing event, which took place in the open on the aircraft carrier USS Midway, the HTG Chairman then announced the invitation to Hamburg from 31 August to 5 September 2008 to an audience of a 1000 guests. He also took the opportunity at this early stage to

Figure 1: Hamburg presentation stand at the ICCE 2006 in San Diego

encourage all members of the coastal engineering community to actively participate in the ICCE 2008.

The keynote themes of the conference were:

- Coastal oceanography and meteorology
- Sediment processes in the coastal zone
- Coastal structures
- Harbours
- The coastal environment
- Hazards in the coastal zone and flood risk management
- Sustainable coastal development
- Coastal protection

An overview of the contributions of German authors is included at the end of this conference report.

Wednesday afternoons are always reserved for excursions at the ICCE. Four different tours were offered in San Diego. A roundtrip was offered through the Bay of San Diego, taking in the US Naval Harbour (Fig. 2) as well as a visit to the Scripps Institute of Oceanography. A trip relating to the topic of coastal protection was also organized along the Californian beaches as well as a trip to the Wetlands South of San Diego. These excursions also offered the conference participants an opportunity to learn more about the surroundings of the conference venue.

Further highlights of the week included the ice-breaker party in the Manchester Grand Hyatt Hotel at the beginning of the conference, a visit to an evening meal in the famous Sea World including a performance by killer whales as well as the closing dinner on the last evening on the decommissioned aircraft carrier USS Midway accompanied by excellent musical entertainment consisting of a medley of American Rock and Pop music combined with dance and show performances.

The excellent organization of the ICCE by the LOC

Figure 2: A view of San Diego from the water

2006 in San Diego has set extremely high standards for future conferences. The LOC 2008 are ready to meet this challenge, and as already explained in detail in the last issue of the KFKI Newsletter, will be provided with professional support by the company Interplan as well as the Hamburg Conference Centre (CCH). The LOC is keen on winning over all those with an interest in coastal engineering in order to ensure a successful and sustainable conference in 2008. At this point the reader is again reminded of the first bulletin as well as the Call for Papers, which is available as a download file on the conference internet homepage. The final date for submitting paper abstracts is 15 July 2007. All necessary information regarding the submission of abstracts may be found at icce2008.hamburg.baw.de. Your contact partner for information on all aspects of the conference is Dr.-Ing. Holger Schüttrumpf.

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German contributions to the ICCE 2006 in San Diego (first authors only)

List of Authors

Müller, G.; Wolters, G.: Confinement effects in solid fluid contact experiments

Newe, J.; Oumeraci, H.: Simulation of beach profile evolution under storm surge conditions in large wave flumes

Nasner, H.; Pieper, R.; Torn, P; Kuhlenkamp, H.: Prevention of sedimentation in brackish water harbours

Mudersbach, C; Jensen, J.: Recent sea level variations at the north sea and Baltic sea coastlines

Ladage, F.; Stephan, H.-J.; Niemeyer, H.D.: Interactions of large-scale groyne and tidal inlet migration

Schüttrumpf, H.; Kortenhaus, A.; Peters, K.; Fröhle, P: Expert judgement of uncertainties in coastal structure design.

Muttray, M.; Oumeraci, H.; ten Oever, E.: Wave reflection and wave run-up at rubble mound breakwaters

Oumeraci, H.; Schüttrumpf, H.; Lehfeldt, R.: Scale and model effects on wave run-up and wave overtopping of seadikes

Daemrich, K.F.; Meyering, J.; Ohle, N.; Zimmermann,

C.: Irregular wave overtopping at vertical walls - learning from regular wave tests

Schmidt-Koppenhagen, R.; Grüne, J.; Oumeraci, H.: Tsunami wave decay in near and onshore areas

Schimmels, S.; Zhang, Z.; Schlurmann, T.: Turbulent features beneath breaking waves

Kudella, M.; Oumeraci, H.: Development of residual pore pressure in the sandbed beneath a caisson breakwater

Jensen, J.; Mudersbach, C.; Müller-Navarra, S.; Bork, I.: Estimation of extreme water levels as a tool for disaster management

Piontkowitz, T.; Kortenhaus, A.; Oumeraci, H.; Munk-Nielsen, C.-C.: Risk analyses of coastal flood defence systems: experiences and research challenges from two case studies

Müller, J.-M.; Stive, M.; Zitman, T.; Niemeyer, H.: Long-term morphological evolution of the tidal inlet "Norderneyer Seegat"

D'Eliso, C.; Oumeraci, H.; Kortenhaus, A.: Breaching of coastal dikes induced by wave overtopping

Stanczak, G.; Oumeraci, H.; Kortenhaus, A.: Breaching of sea dikes initiated by breaking wave impacts

Goethel, O.; Zielke, W.: Numerical modelling of scour at offshore wind turbines

Recio, J; Oumeraci, H.: Processes affecting the stability of revetments made with geotextile sand containers

Grüne, J; Sparboom, U.; Schmidt-Koppenhagen, R.; Wang, Z.; Oumeraci, H.: Stability tests of geotextile sandcontainers for monopile scour protection

Sparboom, U.; Oumeraci, H.: Group interaction effects of slender cylinders under wave attack

Kaiser, R.; Niemeyer, H.D.: Effect of barrier island morphology on tidal basin wave climate

Herman, A.; Kaiser, R.; Niemeyer, H.D.: Medium term wave and current modelling for a mesotidal wadden sea coast

Mewis, P: Nearshore morphodynamic-numerical computation of the influence of harbour jetties

Irschik, K.; Oumeraci, H.: Effect of breaker types on breaking wave loads on a slender vertical and inclined pile

Schupiloff, N.; Schimmels, S.: Numerical Modeling of Tsunami Runup with different Approaches

Penchev, V.; Scheffermann, J.; Zimmermann, C.: CFD Added Design of reef breakwaters

Strategies for forecasting medium-term changes in coastal morphodynamics within the framework of the BMBF project PROMORPH

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Westcoast Research and Technology Centre University of Kiel

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A compiled overview of the most important results of the research and development activities undertaken between 2000 and 2002 within the framework of the joint project PROMORPH is documented in 18 articles published in Volume 69 of *Die Küste*

The project participants were comprised of scientists at the Institute of Flow Dynamics and Meteorology of the University of Hanover, the West Coast Research and Technology Centre of the University of Kiel in Husum as well as the Federal and State Departments responsible for the coastal zones. The research work concentrated on the numerical modelling of morphodynamic processes in the Dithmarsch Bight for a medium term of forecasts. The central objective was to develop a process-oriented model for simulating medium-term morphodynamics with the aid of existing modular systems, and to calibrate and verify this model using field measurements.

In this respect, special emphasis was placed on a combination of field measurements at hydro-dynamically important key positions in the Dithmarschen Bight with numerical simulations. The purpose of this was to gain a better understanding of the morphodynamic processes in the study area as well as to check the predictive capability of the model with regard to changes in bathymetry resulting from dynamic sediment transport. The good agreements obtained from comparisons between measured and simulated developments confirmed the potential of the model as a valuable decision-making tool for coastal engineers in routine planning work.

The 11th KFKI Seminar on 1 November 2006 in Bremerhaven dealt with applied measurement techniques, data analysis and the development of numerical models. The coupling of individual models for simulating flow, waves, sediment transport and morphological development were explained in detail, and different application possibilities were presented. All presentations at the seminar may be accessed on the homepage kfki.baw.de under the menu item Topical -->KFKI Seminars.

Events

31. 1. 2007	Navigation and the EU Water Framework Directive PIANC Workshop Brüssel, Belgien www.pianc-aipcn.org/wfd2007
20.-22. 3. 2007	German-Polish Coastal Dialogues in the Baltic Framework Miedzyzdroje, POLAND, www.ikzm-oder.de/kuestendialoge_misdroy_2007.html
26.-28. 4. 2007	25. Jahrestagung des Arbeitskreises "Geographie der Meere und Küsten" Hamburg www.EUCC-D.de/amk2007/
4.-5. 6. 2007	17. Meeresumwelt-Symposium BSH Hamburg www.bsh.de/de/Das%20BSH/Veranstaltungen/index.jsp
1.-6. 7. 2007	ISOPE-2007 International Offshore (Ocean) and Polar Engineering & Exhibition Lissabon, Portugal www.isope.org
1.-6. 7. 2007	32nd IAHR Congress in Venice Venedig www.iahr2007.corila.it
2.-4. 7. 2007	Coastal Structures 2007 Venedig, Italien www.cstr07.corila.it
12.-15. 9. 2007	HTG Kongress 2007 Dresden www.htg-online.de
20. 9. 2007	Wasserstraßen: Verkehrsweg und Lebensraum in der Kulturlandschaft BAW/BfG Kolloquium Karlsruhe www.baw.de
25.-28. 9. 2007	PDCE 2007: Fourth International Conference on Port Development and Coastal Environment Varna, Bulgarien www.bsca.bg
26. 9. 2007	Aufbau einer Geodateninfrastruktur der WSV BAW Ilmenau www.baw.de
31. 10.-02. 11. 2007	International Conference on Coastal Management 2007 Cardiff, UK www.coastalmanagement2007.com/
08. 11. 2007	Ausbau der Seeschifffahrtsstraßen Weser und Elbe BAW Hamburg www.baw.de
24.-28. 2. 2008	COPEDEC VII - 7th International Conference on Coastal and Port Engineering in Developing Countries Dubai, United Arab Emirates www.pianc-copedecdubai.com
31.8.-5. 9. 2008	31. ICCE 2008 Hamburg icce2008.hamburg.baw.de