Implementation of the Polish National Maritime Safety System – stage I and II

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Abstract

The European Commission, European Maritime Safety Agency (EMSA) and Member States of the European Union have expanded the scope of operation of the Vessel Traffic Monitoring and Information System (VT-MIS). This project was established in accordance with the requirements of the Directive 2002/59/EC of 27 June 2002. Part of these measures are currently implemented in Poland and are co-financed by the European Union (EU) project entitled "National Maritime Safety System – KSBM". It is implemented with a time delay in two stages: KSBM-I and KSBM-II. KSBM-I was located on the main list of individual projects of the Operational Programme "Infrastructure and Environment" for 2007–2013. The project is realised with the support of EU funds financed in the Priority VII "Environmentally-friendly Transport" under Measure 7.2 "Development of Maritime Transport". The works were and are based on contracts signed 28.02.2011 (Stage I – KSBN-I) and 20.12.2012 (Stage II – KSBN-II). The first stage involved the purchase and installation of radar, computer and radio equipment and construction of radio communication network. The second was related mainly to the wire communication network. The system covers Polish coastal waters and seaports from Szczecin and Świnoujście to the border with the Kaliningrad Region. This paper presents concept of the system and the state of its implementation.

Introduction – KSBM – reason and principle of implementation

The European Commission, European Maritime Safety Agency (EMSA) and Member States of the European Union have expanded the scope of operation of the Vessel Traffic Monitoring and Information System (VTMIS) that was originally established in accordance with the requirements of the Directive 2002/59/EC of the European Parliament and of the Council of 27 June 2002. This directive established a Community vessel traffic monitoring and information system that repealed Council Directive 93/75/EEC, as amended by the Directives 2009/17/EC of 23 April 2009, 2011/15/EU of 23 February 2011 and 2014/100/EU of 28 October 2014

using new means of observation and data exchange (Directive, 2002; 2009; Commission Directive, 2011; 2014). Part of these measures are currently implemented in Poland and co-financed by a European Union project entitled "National Maritime Safety System – KSBM".

The direct beneficiary and the applicant of the project is the Maritime Office in Gdynia. This project is a collaboration with the Maritime Offices in Słupsk, Szczecin and the Polish Maritime Search and Rescue Service. The Maritime Office in Gdynia is doing its job based on the agreements of 29 January 2008 and 25 February 2010. These agreements were signed by the Directors of three Polish Maritime Offices and by the Polish Maritime Search and Rescue Service (SAR Service). The project is implemented with

a time delay in two stages: KSBM-I and KSBM-II. The project KSBM-I (No OPI & E 7.2-6) was placed on the main list of individual projects of the Operational Programme "Infrastructure and Environment" for 2007–2013. The project is realised with the support of EU funds and financed in the Priority VII "Environmentally-friendly transport" under Measure 7.2 "Development of Maritime Transport". The amount of co-financing from EU funds is up to 85%. The works were and are based on contracts signed 28.02.2011 (Stage I – KSBN-I) and 20.12.2012 (Stage II – KSBN-II).

Implementation of the project was, and is, done in a system called "design and build". This means that the investor requires the contractor to develop and submit the project for approval in accordance with the description of the object that is laid out in the contract. Approval is subject to compliance with applicable Polish and European standards and regulations. The conditions specified are made in agreement with the General Conditions of Contract (HVAC). They are based on the Contractual Conditions for Devices and Design, the Construction for Electrical and Mechanical Equipment, the Engineering and Construction Works Designed by the Contractor (FIDIC 1999, 4th edition, 2008) and also the Special Conditions of Contract (SCC).

The national system of maritime safety encompasses areas of responsibility of the Directors of Maritime Offices in Gdynia, Słupsk and Szczecin. In particular, their responsibility extends to approaches to ports, their roadstead, anchorages and coastal areas. Each of the regional authorities of Polish maritime administration, for the management of its territory, has a local centre which is subordinated to the national maritime safety centre. These local centres cooperate with domestic and foreign institutions, services and authorities, including HELCOM and EU institutions.

Main tasks of the project

The main goal of the project is to establish a monitoring and control system for unified management of safety and security in the maritime areas of Poland. This will be implemented by the Polish maritime administration. The exchange of information concerning the safety and security of shipping and environmental protection will be conducted in collaboration with national and international institutions and services.

Implementation of the project is to enable inter alia:

- adaptation of measures and actions of the maritime administration to the regulations under national and international laws (requirements, guidelines and recommendations). Adaptation to these regulations is essential for the safety and security of shipping, security of ports and marine environmental protection;
- establishing a system for monitoring and analysis of the situation. This system provides a warning about dangers and provides important information relating to maritime safety and security. It also warns about potential pollution threats in order to prevent maritime accidents and pollution of marine environment and coast line. It allows the maritime administration to take efficient action in the event of such an occurrence, including: supporting search and rescue and combating pollution actions, supporting the decision making process for granting place of refuge, responding to custom threats, supporting safety and security management. It would also facilitate assisting in the accident investigation and detection of polluters through the use of identification, tracking and data archiving systems.

The main tasks of the project are:
- increasing the level of safety, security and environmental protection in Polish maritime areas;
- establishing a system for monitoring and managing maritime traffic in sensitive areas (Marine Traffic Surveillance and Monitoring System) based on: modern radars, VTS, VTMS, AIS, LRIT, system of video cameras and VHF radio communication;
- modernisation and integration of the data archiving and exchange systems;
- modernisation of the Polish DGPS shore stations infrastructure;
- building a system of operational communication for the Polish Maritime Search and Rescue (SAR) Service;
- construction of the Pomeranian Telecommunications Bus between Gdynia and Świnoujście.

Stage I of the project

Stage I of the project comprised:
- completion of the national network of AIS shore-based stations and a national network of marine DGPS;
- establishing a system for monitoring and managing maritime traffic along the Polish coast. In addition, monitoring traffic to and from Polish ports, particularly in sensitive areas (Marine Traffic Surveillance and Monitoring System – SMRM);
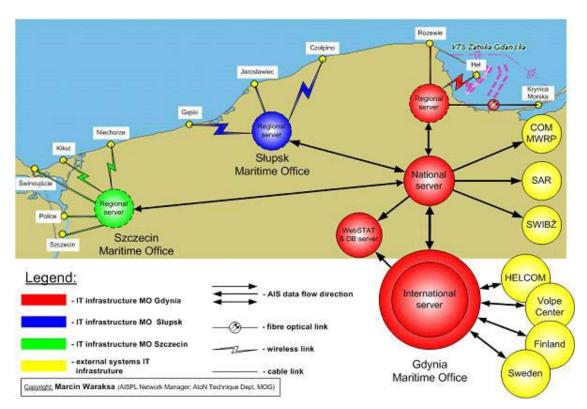
Figure 1. Architecture of the Polish network of the shore-based AIS stations before its modernisation (Urząd Morski w Gdyni, 2015)

- building a system of operational communications for the Polish Maritime Search and Rescue (SAR) Service;
- establishment of the Early Warning System (EWS) for marine areas of Poland.

Completion of the National Network of AIS base stations and a national network of marine DGPS

The national network of the AIS shore-based station (AIS-PL) consists of three subnets of these stations managed by the Maritime Offices in Gdynia, Słupsk and Szczecin. Each station is connected to one national network with its centre in Maritime Office in Gdynia. The Polish AIS system is an element of the regional Baltic AIS monitoring system. It was introduced in accordance with the requirements set out in the Declaration on the Safety of Navigation and Emergency Capacity in the Baltic Sea (HELCOM Copenhagen Declaration). The system was adopted on 10 September 2001 in Copenhagen by the HELCOM Extraordinary Ministerial Meeting and was working, as required by the Directive 2002/59/EC, as a part of the European Vessel Traffic Monitoring and Information System (VTMIS). Its modernisation and expansion covers:
- increasing the coverage of the vessel traffic monitoring by installation of five additional AIS base stations, including one on the Lotos Petrobaltic SA platform "Baltic Beta";

- ensuring homogeneity of the AIS-PL network and monitoring capabilities of the system through the exchange of base stations in the western Polish coastal area.

The architecture of the Polish national network of the AIS shore base station (AIS-PL) and areas monitored by these stations after modernisation and expansion of their net are presented in Figures 1 and 2 (Urząd Morski w Gdyni, 2015).

A national network of maritime DGPS serves as the main Polish marine radio navigation system. The network consists of two modernised in the project shore stations located in Rozewie and Dziwnów, the main control station in Gdynia, and also remote monitoring stations of the radio signal. The actual

Figure 2. Areas monitored by the Polish network of the shore-based AIS stations after its modernisation and expansion (Urząd Morski w Gdyni, 2015)

Figure 3. The actual range of DGPS stations in Rozewie and Dziwnów (Urząd Morski w Gdyni, 2015)

ranges of stations in Rozewie and Dziwnów are shown in Figure 3 (Urząd Morski w Gdyni, 2015).

The needs of hydrographic and land surveying (and in the future pilot operations and docking of ships) require the use of GPS Real Time Kinematic (RTK) technique. In a further phase of KSBM implementation is planned to install fixed and mobile reference stations which will enable this technique to be effectively implemented.

Establishing a system for monitoring and managing maritime traffic along the Polish coast in sensitive areas (Marine Traffic Surveillance and Monitoring System – SMRM)

Marine Traffic Surveillance and Monitoring System is an essential part of the KSBM. The system enables an efficient realisation of tasks related to ensuring the safety and security of maritime traffic and emergency response. The system consists

of operating in the Polish waters vessel traffic service "VTS Zatoka Gdańska" and vessel traffic management service "VTMS Szczecin – Świnoujście". The system operates along with their technical equipment (current and installed within the investment KSBM-I) and new central and auxiliary KSBM centres. These centres are located, respectively, in the Maritime Office in Gdynia – national centre cooperating with the European VTMIS and regional centres located in Gdynia, Słupsk and Szczecin.

In the scope of the project were installed (Maritime Office, 2015; Urząd Morski w Gdyni, 2015):
- 28 shore-based radars with tracking facilities, installed as VTS, VTMS, port and shore remote controlled sensors;
- 26 video cameras;
- 5 radio direction finders (FDR) working in the VHF band;
- 12 VHF shore stations;
- 14 hydro-meteorological stations.

Areas covered by radar surveillance (calculated using program CARPET) and ranges of VHF coastal stations are presented in Figure 4 (Maritime Office, 2015). More detailed information about installed radars may be found in the paper "New radar system along the Polish coast and inside the Polish ports" presented at this conference.

Building a system of operational radio communications for the Maritime Search and Rescue (SAR) Service

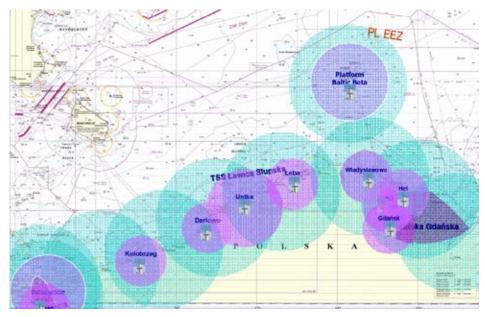In this task were installed 8 shore remote controlled VHF DSC stations connected to the Maritime

Figure 4. Areas covered by radar surveillance (dark circles) and ranges of VHF coastal stations (light circles) (Maritime Office, 2015)
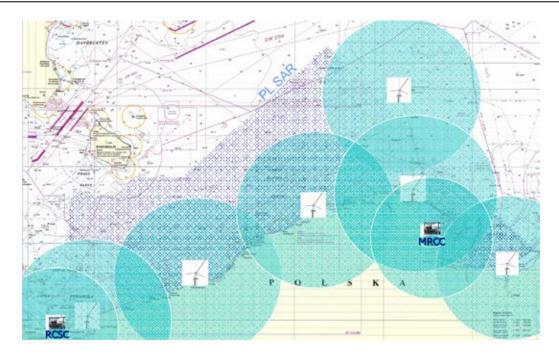
Figure 5. Locations and communication ranges of the new shore-based VHF DSC stations (Maritime Office, 2015)

Rescue Coordination Centre in Gdynia and Maritime Rescue Coordination Sub-centre in Świnoujście as presented in Figure 5.

Establishment of Early Warning System (EWS) for marine areas of Poland

As part of the construction of the Early Warning System (EWS), technical and investment works have been undertaken, including:

- development of innovative applications of the Exchange System of Information on Safety of Navigation (SWIBŻ) to ensure its functionality. As a tool, its function is to continuously monitor the situation, conduct risk assessment and act as an operating platform for cooperation between the institutions and services responsible for maritime safety, security and environmental protection;
- ensuring an efficient system of communication (data transmission) along the Polish coast. This allows communication between coastal stations, KSBM centres, and the traffic control department of the maritime offices. It also facilitates operational communication for the Polish maritime SAR service;
- modernisation of the telecommunications network of maritime offices;
- delivery and assembly of network security systems;
- modernisation of radio communication systems;
- preparing the infrastructure of crisis management centres in three maritime offices and developing

systems and applications supporting safety and security management. This infrastructure includes the Polish Harbours Information and Control System (PHICS), SWIBŻ. It is also extended to the database of results relating to inspections done on ships under the Polish flag (so called e-inspection).

According to the agreements of 29 January 2008 and 25 February 2010, and signed by the directors of three Polish Maritime Offices and the Polish Maritime Search and Rescue Service, the following were established: one national maritime safety centre located in Gdynia, two such sub-centres in Szczecin and Słupsk or Ustka and four VTS centres located in Gdynia, Szczecin, Świnoujście and Ustka. The harbour masters offices in Darłowo, Dziwnów, Elbląg, Gdańsk, Gdynia, Hel, Kołobrzeg, Łeba, Ustka and Władysławowo were equipped with new port radar stations (Figure 6).

The National maritime safety centre and sub-centres are responsible for: risk assessment, early warning, crisis management and exchange of information concerning safety and security of shipping and environmental protection (ISPS, SafeSeaNet, CleanSeaNet, etc.). They are equipped with Exchange System of Information on Safety of Navigation (SWIBŻ) realising following functions:

1. Presentations of:
   - data received from KSBM inner sensors: VTS, VTMS, port radars, AIS-PL, hydro-meteorological sensors, RDF, database of vessels, e-inspection, etc.;
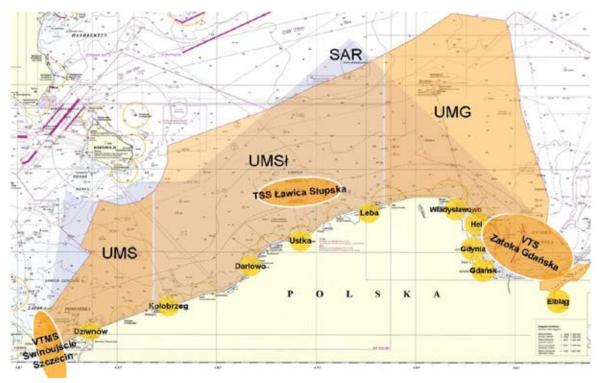
Figure 6. Area of responsibility of particular Directors of three Polish Maritime Offices and Polish Maritime Search and Rescue Service and VTMS Szczecin – Świnoujście, VTS "Zatoka Gdańska" and harbour masters offices equipped with new installed radars (Maritime Office, 2015)

- data from outer AIS systems (HELCOM, EMSA, NATO);
- data from outer radars (Polish Coast Guard and Polish Navy);
- weather forecasts and navigational and hydro--meteorological warnings.
2. SafeSeaNet notifications.
3. Modelling the drift of oil pollution.
4. Risk assessment.
5. Support crisis management and exchange of information.

The main SWIBŻ users are:
- the minister responsible for maritime economy and maritime offices;
- Polish Maritime Search and Rescue Service;
- Maritime Department of the Polish Border Guard (Polish Coast Guard);
- Maritime Operations Centre of the Polish Navy;
- Governmental Crisis Management Centre and its regional branches;
- Customs and Police;
- Hydrographic Office of the Polish Navy;
- Maritime Branch of the Institute of Meteorology and Water Management;
- port authorities;
- sanitary and veterinary services.

The system is also available for the European Maritime Safety Agency (EMSA in Lisbon) and NATO Management Centre in Northwood (UK).

Stage II of the project

The main tasks of the second stage of the project are:
- providing a reliable and secured transmission medium for Maritime Offices in Gdynia, Szczecin and Słupsk, for the Polish Maritime Border Guard, Polish Navy and Polish Maritime Search and Rescue Service;
- adoption of the standards for marine supervision and monitoring to the objectives set out, among others, in the Communication from European Commission on an integrated maritime policy for the European Union (the "Blue Book"). These objectives were adopted by the European Council on 14 December 2007 and the Communication from the Commission to the Council and the European Parliament, the European Economic – Social Committee and the Committee of the Regions "Towards the integration of maritime surveillance: A common information sharing environment for the EU maritime domain" of 15 October 2009;
- ecological safety of maritime operations and, if necessary, support action involving the liquidation of consequences of natural disasters and accidents and disasters at sea.

The specific objectives of the second stage concern to support the implementation of the KSBM

functions by providing links with adequate bandwidth for the National Maritime Safety System (KSBM) and Automated Radar Surveillance System (ZSRN) in the Polish marine areas. Specific objectives include:
- increasing the EU's external border security at sea;
- increasing the capacity of the environmental protection;
- more efficient monitoring of maritime traffic;
- ensuring adequate transmission medium for the supervision of the exploitation of the Polish marine areas and compliance with vessels regulations in force in those areas;
- more effective protection of the economic interests of Poland in Polish maritime areas;
- combating of poaching at sea.

As part of KSBM II is expected to be realised the following tasks:
- construction of telecommunications infrastructure for maritime safety and monitoring systems and exchange of information, so-called Pomeranian Telecommunications Bus (Figure 7);
- completion of the GMDSS modernisation;
- designation and construction of places of refuge together with their necessary infrastructure for ships in distress and threatening an ecological disaster;
- modernisation of the shore and floating aids to navigation on routes and approaches to seaports and harbours;
- modernisation of the floating stock of the maritime offices;
- modernisation of the VTS "Zatoka Gdańska".

The second stage of the KSBM project is divided into a few parts. Stage II A provides design and construction of the Pomeranian Telecommunications Bus line in the form of fibre optic cable between Gdynia and Świnoujście. This infrastructure is to provide the ability to transmit voice and data to remote locations. The investment includes:
- construction of the cable pipeline 3xRHDPE 40 mm and the system micro duct 1xDB7 in relation Świnoujście–Hel;
- construction of main fibre optic cable with a capacity of 144 G.657 fibres, and taps into additional locations in the form of fibre optic cable with a capacity of 24 fibres;
- the construction of the offshore cable section in relation Hel–Gdynia with a capacity of 24 fibres G.657;
- delivery and installation of DWDM system for the relation Hel–Gdynia–Gdańsk;
- supply and construction of IP/MPLS network with speeds of 10 Gbps between nodes and endpoints;
- delivery and installation of optical fibre fault detection system with fixed reflectometers and optical switches;
- the construction of 19 containers for nodes and installation of network terminations in 22 endpoints;
- delivery and installation of NMS network management system.

Shown in Figure 7 Pomeranian Telecommunications Bus will have over 600 km of new fibre-optic cable and 21 km of new submarine cables.

Efficient communication and exchange of data between entities benefiting from the Pomeranian Telecommunications Bus (Pomeranian ICT Bus) will provide an integrated communication system. Currently in development is a system management centre that will be located in the Maritime Safety
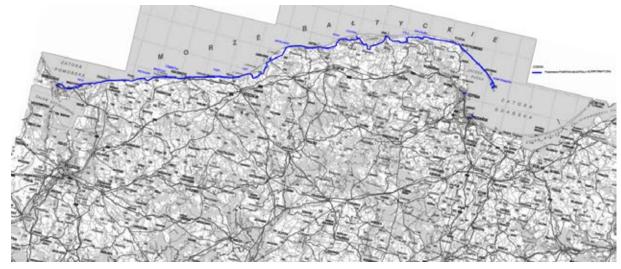

Figure 7. Pomeranian Telecommunications Bus course (Maritime Office, 2015)

Centre of Maritime Office in Gdynia. Its core network will be equipped with devices to manage ships and their monitoring. As a result, the integrated communications system will provide efficient communication and exchange of data between entities participating in the National Maritime Safety System. In addition, it will be part of a communications system for the purpose of:

- data transfer between locations serving operational communication for Maritime Search and Rescue Service;
- system of integrated wired digital communication;
- a national network of VHF marine radio communication;
- data transmission from KSBM sensors: (radar, AIS, hydro-meteorological and CCTV systems).

Conclusions

Polish National Maritime Safety System (KSBM), as described in this paper, after completion of the work and passing SAT procedures, will meet all requirements for the Vessel Traffic Monitoring and Information System (VTMIS) presented in the Directive 2002/59/EC of the European Parliament and of the Council of 27 June 2002. This directive established a Community vessel traffic monitoring and information system and repealed Council Directive 93/75/EEC, as amended. Its implementation will provide for the needs of the Polish maritime administration in the scope of safety and security of shipping, protection of the environment, and protection of economic interests of Poland in Polish maritime areas. It will implement this through the effective monitoring and control of maritime traffic and economic activities in these areas. It will provide information necessary to make decisions regarding granting place of refuge and help to improve the efficiency of the search and rescue operation. It also extends to protection of the environment and action involving the liquidation of consequences of natural disasters, accidents and disasters at sea. Data obtained from the system will be useful to other services and institutions related to maritime safety, security, border protection, maritime economy and port activities.

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