STRUCTURE AND TRANSFORMATIONS OF THE ENVIRONMENTAL PROTECTION SYSTEM IN WEST POMERANIA REGION

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Abstract:

The environmental protection system of West-Pomerania Region (North-western Voivodeship of Poland) is presented. Especially focused on water resources management and protection.

The features of strategy of Voivodship development were specified. The aims of strategy are intented to reach improvement the level of life quality, economy standards and approaching the "philosophy" of sustainable development. with engaged institutons were specified. The importance of information technology (IT) solutions for assesments of environment condition and reporting were emphasised. The examples of graphical charts, maps and assesments of water quality of Odra river estuary and selected environment components in West-Pomerania region attached.

Keywords:

water quality, Odra estuary, West-Pomerania region, information technology

1. Introduction

The purpose of the paper is sketching the environmental protection system with its changes in West Pomerania region. Especially the problems of water resources management and water quality monitoring with supporting by information technology applications were depicted.

2. The short characteristics of West Pomerania

The West Pomerania region is one of sixteen Polish administrative voivodeship established after reform in 1999. The region situated in North West part of state is divided into smaller divisions (Figure 1).

The region is inhabitted by above 1,7 million persons inhabitants on area about 23 000 km^2 (7,3 % of Poland). Land use: 34,6% forests, 48,7 % agriculture area, 6% water surfaces. Structure of agricultural area: arable land 38,4 %, leys 6,6 %, pastures 3,4%, orchards 0,3%.

Main economy branches: industry, trade and transport incuding sea transport.

North border of the region is Baltic Sea Shoreline of 184,9 km length. The region is an neighbour of lands Meclenburg-Vorpommern of Federal Republic of Germany. The Polish West Pomerania Region is an part of Euroregion POMERANIA (Figure 2).

The capital of region is Szczecin (population near 400 thousends persons), residence of governmental (Urzad Wojewodzki) and self-govenrnmental authorities (Urzad Marszalkowski).

The Szczecin is also main industrial center: chemistry, shipping, sip-building, trade and transport. In the Szczecin there are situated universities (University of Szczecin, Technical University of Szczecin, Agricultural University, Medical University and Marine School - and some other colleges. The number of students (from Szczecin and incoming from all of region) exeeds 80 thousands.

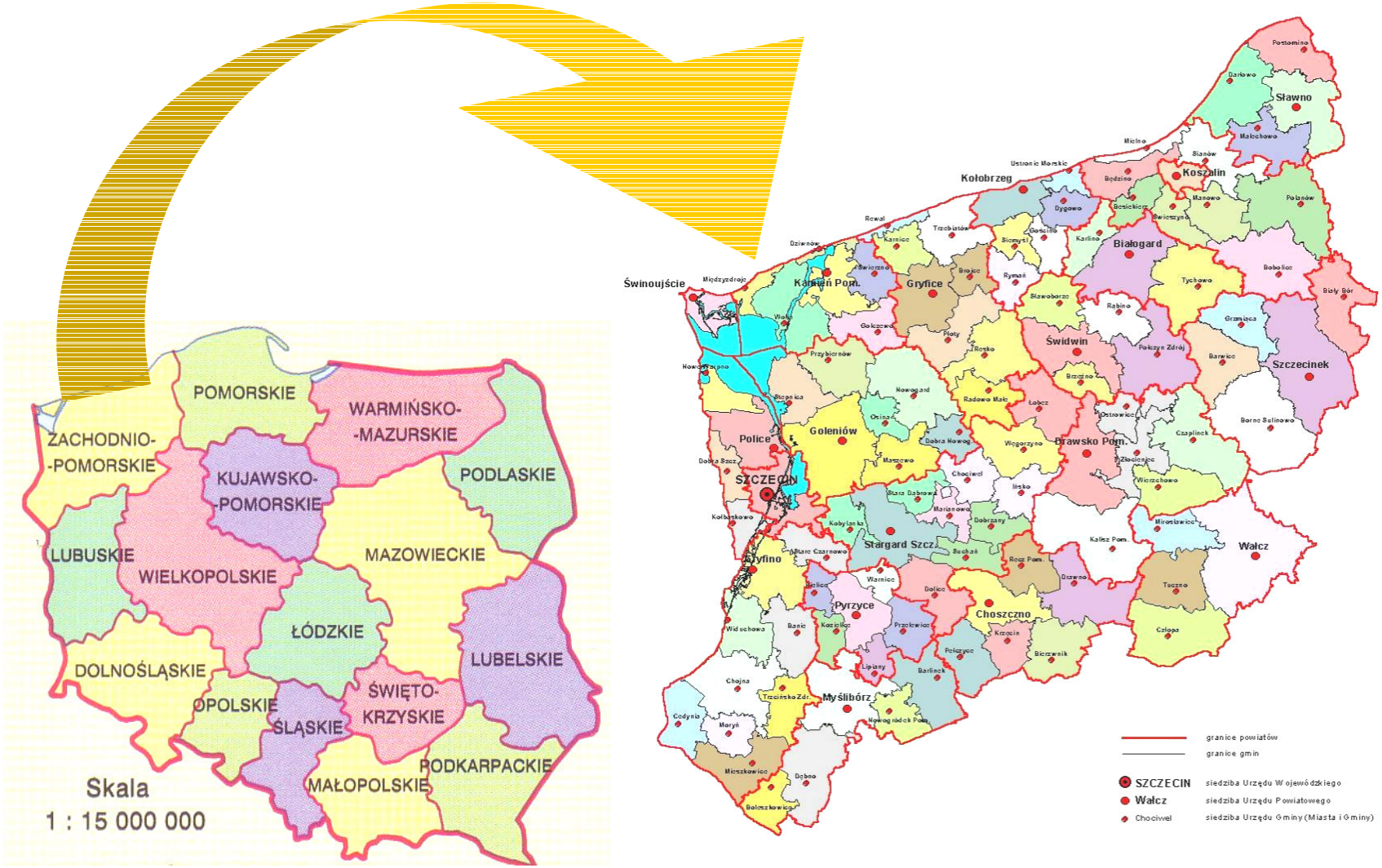


Figure 1 The reformed administration structure of Poland (from 1999) and delimitation of zachodniopomorskie voivodeship (West-Pomerania)

Figure 2 Euroregion Pomerania (red colour)

2.1 The Water supply and monitoring in West Pomerania

The water consumption in Poland and West – Pomerania for agro-forestal economy stays on stable level (table 1). However it is important for rational water management for development and sustainable agriculture in West Pomerania.

Table 1 The water consumption for agricultural and forestal economy needs

	West Pomerania					Poland			
Year	1998	1999	2000	2001		1998	1999	2000	2001
/ hm^3 /	13,4	20,3	22,8	11,7		999,2	1045	1060,6	1033,3
Percent of total consumption	0,8	1,2	1,4	0,7		9,1	9,8	10,2	10,2

Source: Environmental Protection Yearbooks of Polish Central Statistical Office (GUS)(1999 - 2002)

Table 2 Irrigated area (in hectares) of agricultural and forest land

West Pomerania	(ha)
1998	6710
2000	4903
2001	4542
Poland	
1998	121024
2000	99089
2001	89283

Source: Environmental Protection Yearbooks of Polish Central Statistical Office (GUS)(1999 - 2002)

It is observed decreasing amount od wastes (table 3) discharged into surface water and ground.

Table 3 Industrial and municipal waste water discharged to surface water and ground in hm^3

	1998	1999	2000	2001
Poland	9843,5	9492,2	9160,7	8948,2
West Pomerania	1691,5	1640,4	1628,3	1531,2

Source: Environmental Protection Yearbooks of Polish Central Statistical Office (GUS)(1999 - 2002)

Aglomeration of Szczecin is one of the greatest source of industrial and municipal waste water discharges into Odra river (Figure 3).

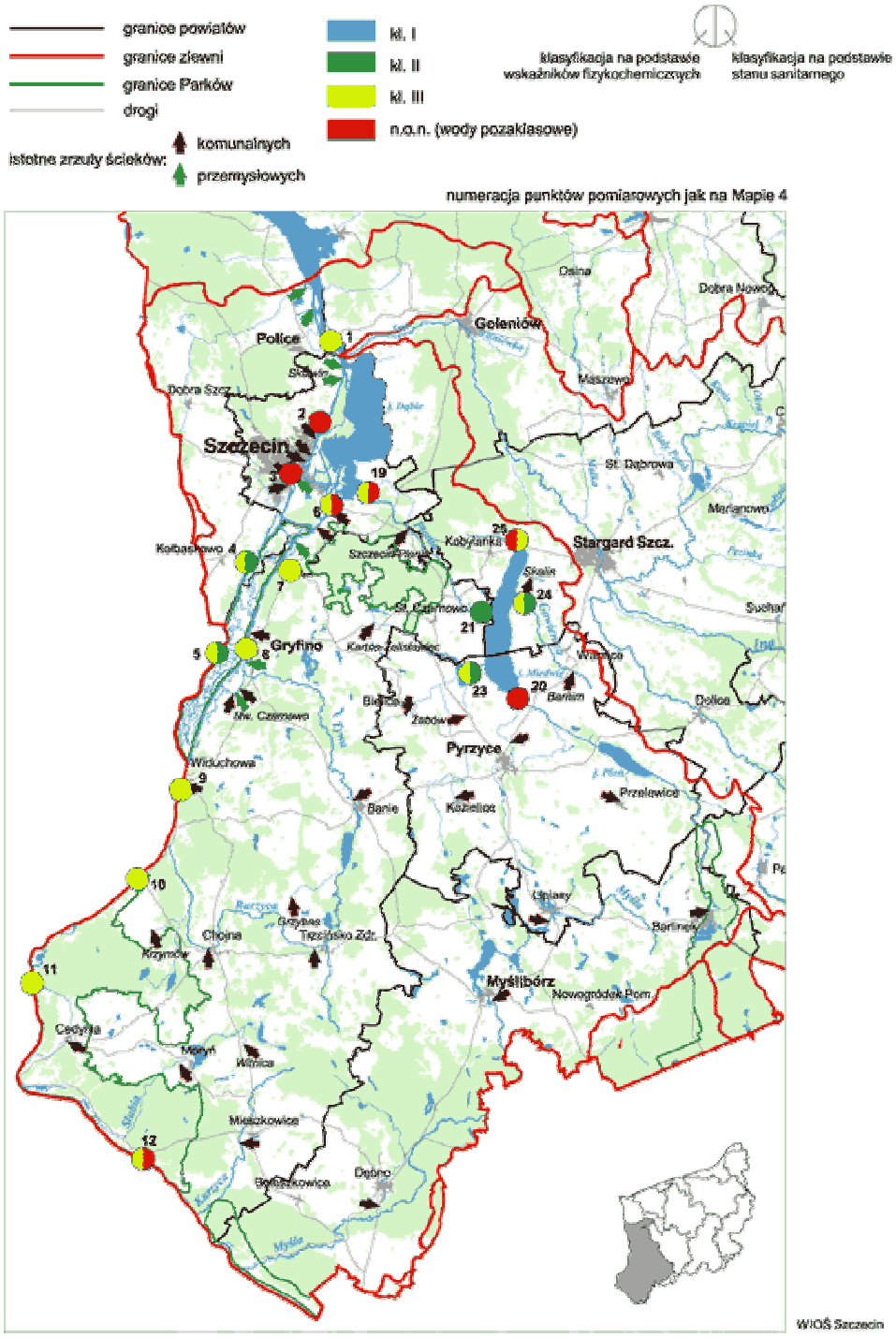


Figure 3 Map of monitoring and discharges sites of waste water near Szczecin aglomeration

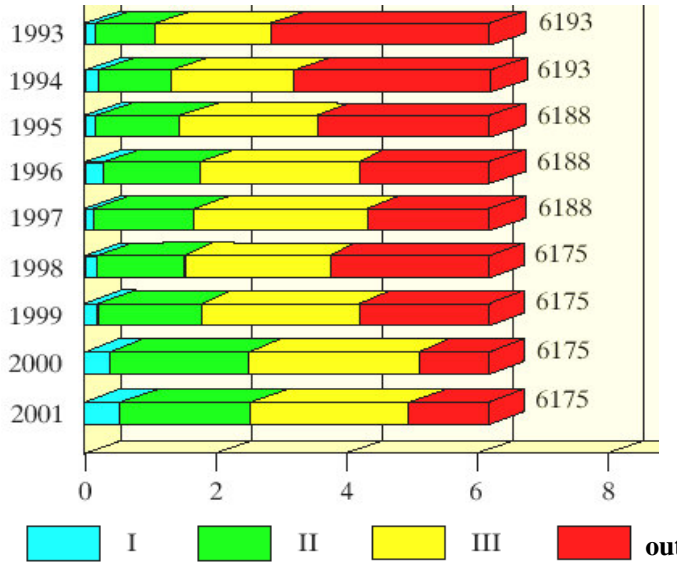
Explanation of marks on Figure 3 (black lines – administrative division borders, red lines - river basin borders, green line - nature protection parks borders, grey line – roads, black arrows - municipal discharges sites, industrial - green arrows, colour circles - Assesment of water water (class I,II,III, non) in monitoring sites, left semicircle – according to physical and chemical indicators, right semicircle – sanitary assesment)
Source: Voivode Inspectorate of Environmental Protection in Szczecin (WIOŚ Szczecin)

The increasing number of treatment plants (table 4) correlates with improving water quality in both in Poland (figure 4) and West Pomerania region (figure 5).

Table 4 Number of waste water treatment plants

	Year	Industrial	Municipal
West Pomerania	1998	97	256
	1999	117	287
	2000	134	302
	2001	123	293
Poland	1998	1698	1923
	1999	1675	2209
	2000	1626	2417
	2001	1546	2558

Source: Environmental Protection Yearbooks of Polish Central Statistical Office (GUS)(1999 - 2002)



Thousand kilometers of assesed river

Figure. 4 Results of quality water assesment in Poland according to physical and chemical indicators
Source: Environmental Protection Yearbooks of Polish Central Statistical Office GUS 2002

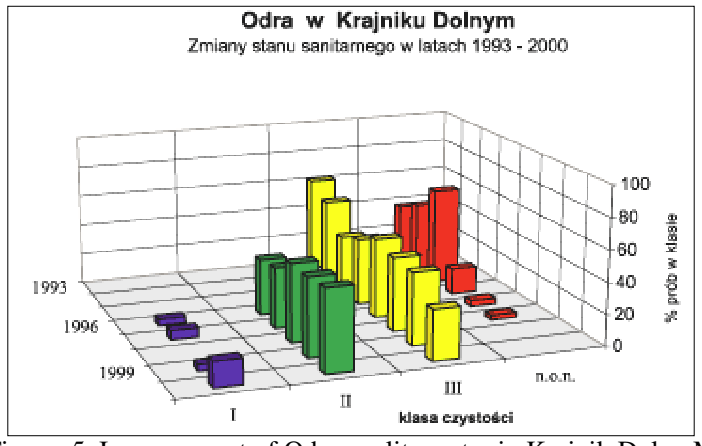


Figure 5 Improvement of Odra quality water in Krajnik Dolny Monitoring site according to sanitary indicators
Source: Voivode Inspectorate of Environmental Protection in Szczecin (WIOŚ Szczecin)

3. The strategy of development features

Strategy of the sustainable region development is the plan of rational, effective management and development of West Pomerania region. The strategy was elaborated by branch expert workgroups on request of local authorities - Self-governmental West Pomeranian Management Office.

The plan comprise important fields of region management and development e.g.:
- spatial development and landuse planning,
- agriculture and rural areas development,
- economy and sea transport and ports (especially Complex of Sea Ports Szczecin-Swinoujscie),
- environmental protection and water management (with anti-flood protection),
- tourism and recreation,
- social aspect as decreasing the unemployment,
- promoting the region and international and transboundary cooperation.

The main features of the west-pomeranian strategy for sustainable development and environmental protection are following:
- supply the coherence between the economic development of the region and protection the environment, naturalness and biodiversity
- maintaining the important sea ports Szczecin-Świnoujscie with safe navigation (e.g. by radar tracing system of the ships),
- reaching the anti-flood safety of agricultural areas,
- development of transborder, international cooperation, especially at spatial planning and environmental monitoring and protection.

The strategy should also take into account the another aspects:
- supplying the proper amounts of water with suitable quality for habbitants and industry etc.
- improving the level of life quality, by mproving health protection system, increasing number of cultural institutions etc.

The programme Odra 2005/06 is the plan of adaptation and modernization of Odra river for:
- filling requirements of European transport line river (e.g. achievement of international depth standard of 2 meter),.
- enhancing anti-flood protection, and better attraction - suitability for tourism, recreation. protection of biodiversity.

The Odra river isrunning along three countries: Poland Germany and Tschech Republic. Area of Odra river basin is 120 thousand square kilometers (106 in Poland). It is intended in the plan Odra 2005, improving the hydrotechnic infrastructure. It is also neccessary increasing number of back-water objects to raise and maintain the water level for proper, all-year barges shipping. Building more new sewage water plants should be useful to improve water quality of natural features. All these activity will be enhancing for anti flood protection, and better attraction for tourism and recreation.

The Odra river as shipping route may be considered as North - South and East-West connection by river canals network and complementory transport means (esp.railway). Odra may be an element of TRANSLOGIS - project of integrated transport system of Poland, Germany, Denmark and Sweden.

3.1 Extraordinary danger for environment in West Pomerania

The extraordinary danger for environment may be transport of oils and chemicals on szczecin Lagoon and Baltic Sea.

The oils/chemicals are transported by sea on tankers, and specialized ships as chemical and gas carriers. The sea transport is regulated by international SOLAS and MARPOL Conventions. Chemicals may be carried in bulk or in packages. The example of the liquid chemicals and gases transported by Baltic Sea and Szczecin Lagoon (figure 6) are LPG - liquid petroleum gas (UN number 1075, ammonia UN No: 1005, Butane - propane mixtures: UN No:1011/1978) (based on HELCOM data).

Figure 6 Map of fairway for shipping between Szczecin-Swinoujscie ports on Odra estuary (West pomerania)
explanation for fig. 6, red outline – port area under Marine Office (UMS) management, light violet wide line - fairway

Safe transport and prevention of accidents is supported by delivering the detailed informations on cargo:
- identification of substances,
- physical and chemical properties of the substance,
- risk of fire and explosion with delimitation the zones of danger,
- assesment danger to health,
- checking category of sea environment pollution,
- risk of danger according to GESAMP assesment (Joint Group of Experts on the Scientific Aspects of Marine Pollution),
- selection the pollution combatting methods,
- means engaged in potential rescue action.

The mentioned requirements are neccessary for organization the effective information system about pollution and accidents. The additional data are needed for safety of personnel participating in rescue and combatting pollution action as:
- personal protective means,
- immediate measurements of physical and chemical parameters (e.g. concentration of released, harmful gases etc.).

4. Information Technology in supporting the environmental assesments

The some specialized information solutions are use for supporting the water quality assesments and protection. The thematic information system JAWO stores the records of monitoring data from sites situated on rivers. Complementary to JAWO system is the computers application DBlistec for graphical visualisation the results of assesments.
The water quality assesment may be performed in according to some of implemented standards with European directives among them as: 75/440 EEC - suitable for drinking water supplies, 78/659 EEC - water for fishes existence (salmonae and cyprinids), 76/160 EEC, 90/656 - suitable for bathing.
The example of tabulogram of Odra water quality assesment is presented on Figure 7.

The effective, information system about environment is neccessary to provide rational management of environment resources. This developed system should be useful in aproaching the sustainable development of the region and state and the assesments of quantitative and qualitive condition of every environment components and performing the measures are obligatory tasks of governmental administrative units.

The Information system of region environment should be able to support:
- making predictions on antropogenic impacts on environment,
- perfoming Environment Impact Assesments of planned entrepreneurial projects,
- reporting about air emmisions, surface water contamination, waste discharges, etc.
- performing predictions and simulations of changing environmental condition,
- visualising level and range of pollution on cartographic compositions,
- easy data interchange with other computer systems,
- informing the society,
- monitoring of industrial plants with possibility of assesment the risk of potential damages.

The system should be also helpful in executing the "Polluter Pays Principle" .The system should supply the data fast, generate reports and predictions of environment condition for decision centers. System is to make available data gathered by many organisations engaged in environment research as: Regional State Forest Department (RDLP), State Geological Institute (PIG), Institue of Meteorology ang Water Resources Management (IMGW), Regional Water Resources Department (RZGW), Voivod Epidemiology Station (San-Epid), Marine Office, State Sanitary Inspection (PIS), Voivod Nature Conservator and universities in Szczecin.

The system comprise elements as: Environment Information Database with measurement data, Databases about environment economy and resources management, Reporting and prediction preparation subsystem with Geographical information subsystem (GIS technology).

The Environment Information Database elements placed in Voivod Inspectorate of Environment Protection WIOS is specialised for storing the monitoring measurement data of contamination all environment components (water, air etc)

Economy Resoures Management Database stores data about industrial plants, enterprises, permissions for environment resources usage (e.g wastes discharging), amounts of entered pollutants (e.g. air emissions) and environment contamination standards, protecting installations (e.g. waste-water treatment plants).

The monitoring data processing subsystem is to prepare assesment and predictions of environment components, reporting and graphical presentations.

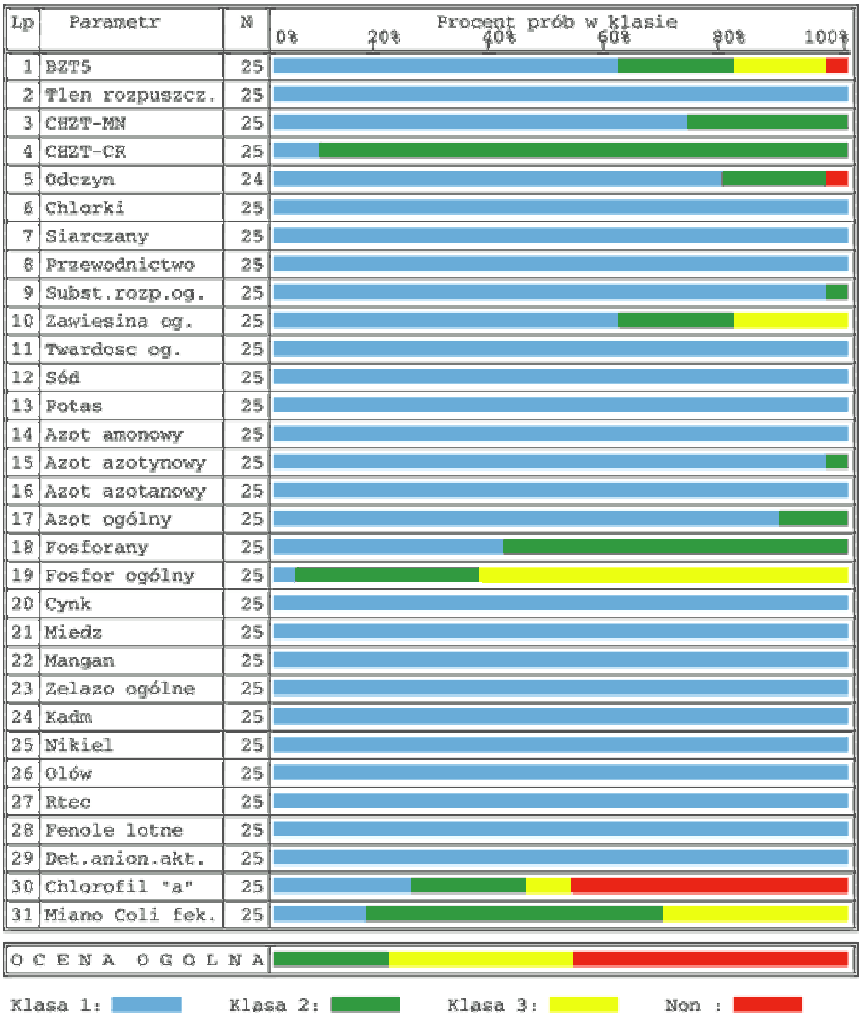


Figure 7 Assesment of Odra water quality in Krajnik Dolny monitoring site (Poland) in 2000
Source: Voivode Inspectorate of Environmental Protection in Szczecin (WIOŚ Szczecin)

Legend for names of parameters shown in Figure 7:
BZT5 - BOD5 Biochemical Oxygen Demand, tlen rozpuszczony - dissolved oxygen,
CHZT - Chemical Oxygen Demand (Mn i Cr method), odczyn - pH, barwa - colour,
chlorki - chlorides, siarczany - sulphates, przewodnictwo – conductivity, subst. rozp.og. – disolved substances total, zawiesina - , twardosc – hardness, azot amonowy - ammonia nitrogen,
azotany – nitrates, Azot ogolny – nitrogen total, fosforany – phosphates, fosfor ogolny – Phosfor total,
cynk (Zn) - zinc, chrom (Cr) - chromium, miedz (Cu) - copper, mangan Mn, zelazo og.(Fe) - iron total,
kadm (Cd) - cadmium, nikiel -Ni, olow (Pb) - lead, rtec (Hg) - mercury, fenole lotne - phenols, det. - detergents, chlorofil - chorophyll „a”, Ocena ogolna - general assesment

The Geographical Information Subsystem is generating the spatial presentations of pollutions with GIS applications usage (Arc Info/Arc View). It is also suitable to integrate the main spatial layers as: landuse, administration divisions, urban areas, agriculture, industry, soils, hydrography, water resources etc. and other specialized thematic layers (pollution range and level, discharge sites, monitoring stations, protective installations etc.).

The results of common Polish and German measures of water parameters on Szczecin Lagoon are stored and processed in WIOS Szczecin in information system WSKAZ. The cooperation is based on measures on 12 monitoring sites.

5. Conclusions

There were presented main features of Environmental protection in West Pomerania with being implemented regional strategy of development.

The structures of the system and main state and semi-governmental institutons were specified.

The used information technology solutions, databases, thematic subsystems and specialised computer applications assure effective gathering, maintainence and processing data on monitorng measures, entrepreneurial, industrial plants, landuse and landcover and data provided by many organizations engaged in regional management and nnvironmental research. The examples of emmitted results of assesment and reporting subsystem with cartographic compositions were also presented.

All these elements are helpful for achievement the of sustainable development philosophy of the West Pomerania by following:

- preparing cartographic compositions and maps to visualise the range and level of contamination,
- performing simulations of potential extraordinary danger for environment as storing dangerous chemicals (e.g. ammonia, chlorine in industrial plant),
- supporting the risk management e.g. by monitoring the tankers with hazardous cargo entering the Szczecin and Police Port,
- supporting scientific research programmes as project of assesment the impact of environment contamination into agricultural economy and tourism in selected studial area,
- supporting assesment of potential damages and losses caused by industrial plants or the others for executing the "Polluter Pays Principle".

It seems that the final implementation of the strategy will be helpful in approaching sustainable development and environmental protection at the Odra estuary, Baltic Sea and seaside area.

References

Environmental Protection Yearbooks of Polish Central Statistical Office (Roczniki Ochrony Środowiska GUS Warszawa 1999 - 2002)

Reports on environment condition in Westpomerania Voivodeship (Raporty o stanie środowiska w wojewodztwie zachodniopomorskim 2000-2002), Polish State Inspection of Environmental Protection, Szczecin

Siemianowski, L. (2004). Information technology application in transborder water protection system of Odra river estuary ("Zastosowania technologii informatycznych w ochronie wód granicznych estuarium Odry) In: Problems of enerpreneury development on rural areas in aspect of sustainable development (Problemy rozwoju przedsiębiorczości na obszarach wiejskich i małych miast w aspekcie zrównoważonego rozwoju), Agricultural University of Szczecin (Akademia Rolnicza w Szczecinie) and Belarussian Agricultural University Gorki (Białoruska Akademia Rolnicza w Gorkach), 591-596.

Siemianowski, L., (2003). Information technologies in transformations of environmental protection system of Odra estuary, (Technologie informatyczne w przekształceniach systemu ochrony środowiska ujścia Odry) - Folia Universitatis Agriculturae Stetinensis 2003, Oeconomica 232 (42), 491-496

Siemianowski, R. ,Siemianowski L., (2002). Prevention of oils and chemicals pollution of Odra estuary and Baltic Sea, (Zapobieganie zanieczyszczaniu Ujścia Odry i obszarów przybrzeżnych Bałtyku olejami/chemikaliami), In: Physio-chemical Problems of ecology of natural water (Problemy Fizyko-Chemiczne Ekologii Wód Naturalnych), University of Szczecin

Siemianowski L., (2001). The Information Technology Support In Assesment of Impact of Surface Water Contamination On Agriculture In West Pomerania Region In Poland, Paper at Seminar on Sustainable Agriculture in Central and Eastern European Countries: Environmental Effects of Transition and Needs of Change, 10th – 16th September 2001, Agricultural University in Nitra, Slovakia, CEESA programme of Humboldt University in Berlin, http://www.ceesa.de/NitraPapers/Siemianowski.pdf

SOLAS Convention: International Convention for the Safety of Life at Sea - Międzynarodowa Konwencja o Bezpieczenstwie Życia na Morzu, Jednolity tekst, edition of Polish Register of Ships, PRS Gdańsk 2002.

www.minrol.gov.pl - Polish Ministry of Agriculture (Ministerstwo Rolnictwa)

www.mos.gov.pl - Polish Ministry of Environment (Ministerstwo Ochrony Środowiska)

www.stat.gov.pl - Polish Central Statistical Office (Główny Urząd Statystyczny - GUS)

www.um-zachodniopomorskie.pl - Polish Self-governmental West Pomeranian Management Office (Zachodniopomorski Urząd Marszałkowski)

www.wios.szczecin.pl - Voivode Inspectorate of Environmental Protection in Szczecin, (WIOŚ Szczecin)