REPORT on

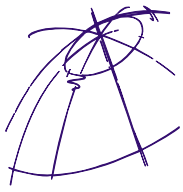
BULGARIAN CARTOGRAPHIC ASSOCIATION

2007-2011

25TH International Cartographic Conference

Paris, 2011

Contents



1. BULGARIAN CARTOGRAPHIC ASSOCIATION (BCA)

was established on 8th of April, 2011

40 Bulgarian cartographers and specialist connected to cartography field met in Sofia for establishment of Bulgarian Cartographic Association.

The main tasks of the associations are:

1. To consolidate and legitimize its members to the public, state and municipal administration and institutions;
2. To represent and protect the interests of its members to the public administration and provide support for its activities;
3. To offer motivated and reasoned opinions about changes in legislation on cartographic activities;
4. To collect and disseminate information on the development of cartographic activities in Bulgaria;
5. To promote and disseminate information on international cartographic activities;
6. To assist in further training and to stimulate young cartographers;
7. To participate in and organize national and international events and conferences;
8. To organize a network of institutions to take joint decisions on the development of cartography in Bulgaria;
9. To represent the Bulgarian cartographic society to the international organizations.

The executive board consists 7 members: ***Dr.* Angelov, *A.***- manager of *Geodetect* Ltd.; ***Prof. Bandrova, T.*** – president BCA, head of Laboratory of Cartography, UACEG; ***Col. Gladkov, G.*** – vice-president BCA, General Director Military Geographic Service of Bulgarian Army; ***Ms. Karadjova, E.*** – General Manager ESRI-Bulgaria, ***Ms. Silviya Marinova*** – Secretary BCA, KartGeo Ltd.; ***Prof. Penev, P.*** – vice-rector University of Architecture, Civil Engineering and Geodesy; ***Prof. Vatseva, R.*** – vice-president BCA, Head of Department of Geography, NIGGG, Bulgarian Academy of Science.

The establishment of BCA is already approved by Bulgarian law-court and strongly supported by the Agency for Geodesy, Cartography and Cadastre, Association for Geospatial Information in South-East Europe, many private GIS and cartographic companies, different institutions of Bulgarian Academy of Science and several Universities.

Temenoujka Bandrova,
President, Bulgarian Cartographic Association
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2. 3RD INTERNATIONAL CONFERENCE ON CARTOGRAPHY AND GIS, 15-20 JUNE 2010, NESSEBAR, BULGARIA

l. to r. - Paul Hardy, ESRI and Milan Konecny, vice president of ISDE in Welcome Reception; Martin Klepetko, the ambassador of the Czech Republic and Dobrin Denev, Rector, UACEG; Alessandro Annoni, EC, JRC and David Wortley. UK

From 15th to 20th of June, 2010 the 3rd International Conference on Cartography and GIS took place. The event was supported by the Rector of the UACEG Prof. Dobrin Denev. The conference was held incorporating the International Cartographic Association Regional Symposium for Central and Eastern Europe.

A very important part of this conference was The Seminar with EU cooperation on early warning and disaster/crisis management under the auspices of the Czech ambassador to Bulgaria His Excellency Mr. Martin Klepetko. Another important event Workshop ICCG3 on theme “Infrastructure of spatial data: an opportunity for data exchange in South East Europe” was organized by Dr. Ulrich Boes.

Participants in the Workshop ICCG3

After two successful conferences held in Borovets in 2006 and 2008, the third edition of this series showed growth not only on historical but also on geographical level: 6 keynote speeches, 110 presentations, 190 authors from 32 countries. For the first time in the history of the conference, the reports from Bulgaria were the most – 26. Other reports were presented by scientists from the Czech Republic (10), China (9), Iran (8), Russia (7), Greece(6) and Turkey(6). Three reports from Albania, Macedonia, Germany, Hungary, Netherlands and Spain, 2 from Australia, Belgium, Egypt, Croatia, Romania, 1 from Argentina, Austria, India, Malaysia, Mexico, Nigeria, Poland, Switzerland, UAE and Kosovo were also a part of the conference programme. Some of the reports were not presented in Nessebar, due to the deny for visas from various Bulgarian embassies.

The keynote speeches were presented in special sessions by:

1. Dr. Paul Hardy, ESRI: Scaling-up Cartography - Cloud Computing and Multi-scale Content for Tomorrow's Mapping;
2. Dr. Miklos Gross, Eurosense: The Mission of Cartography in the Modern Information Sociality;
3. Dr. Athina Trakas, OGC: Interoperability from a global perspective;
4. Prof. Joachim Rix, Germany: Spatial Data Infrastructures: The Subnational Dimension in the European Context;

5. Assoc. Prof. Dr. Temenoujka Bandrova, Bulgaria: Bulgarian Cartography: from Paper to Virtual Reality;
6. Prof. William Cartwright, Australia, President MKA: Maps, Sketches and Annotations: Representations of the Geography of Conflict - Gallipoli 1915.

15 years old Daniela Karaivanova received an International award by past ICA President M. Konecny and ICA co-chair Commission on Cartography and Children T. Bandrova

During the opening ceremony, the 15 years old Daniela Karaivanova received her international award for best children's drawing from the International Competition "Barbara Petchenik". The award was given during the 24th International Cartographic Conference in Santiago, Chile, 2009. The Diploma was bestowed by the past President of ICA, Prof. Milan Konecny.

Two commissions and a working group form ICA held their annual meetings during the conference:

1. Commission on cartography and children with chairs: Jesus Nunez, and Temenoujka Bandrova
2. Commission on planetary cartography, chaired by: Kira Shingareva
3. Working Group on cartography and early warning and crisis management with Chair: Milan Konecny.

During the meetings the upcoming tasks and the common projects of the commissions were discussed.

The next annual meetings will be held in Paris during the forthcoming 25th International Cartographic Conference, 2011.

Special thanks to sponsors of both events ESRI, Eurosense, Intergraph, GEODIS and Datamap-Europe! More information about the ICA and the presented reports can be found at www.cartography-gis.com.

l. to r. - Participants in a meeting of ICA Commission on Cartography and Children; Participants in a meeting of ICA Commission on Planetary Cartography; and Participants in the Seminar on Early Warning and Crisis Management

l. to r. - ICA President William Cartwright presented a keynote speech; Elena Toteva, PhD Student and Assoc. Prof. Borislav Marinov in poster session; and the staff, university students took care for the participants of both events

Representatives of the Bulgarian government have also took an interest. Alexander Lazarov, Director of the Agency of Geodesy, Cartography and Cadastre attended the conference. From the Ministry of Transport, Information Technology and Communications Liliana Turnalieva, Head of Spatial Data EA ESMIS took part in the events. Ministry of Interior was represented by experts from civil protection from local and regional level.

Temenoujka Bandrova
Department of Photogrammetry and Cartography, UACEG, Sofia, Bulgaria

3. INTERNATIONAL CONFERENCE ON "GEOGRAPHY AND REGIONAL DEVELOPMENT", 14-17 OCTOBER, 2010, SOFIA, BULGARIA

The international conference "*GEOGRAPHY AND REGIONAL DEVELOPMENT"* took place in Sofia from 14th to 17th of October, 2010. The event was organized by the Institute of Geography at the Bulgarian Academy of Sciences. The Conference commemorated the 60th anniversary of the beginning of geographical studies within the Bulgarian Academy of Sciences (BAS). It was dedicated to all geography researchers, who have worked at the Institute of Geography, BAS, and contributed to the development of geographical science and to the dissemination of geographical knowledge in Bulgaria and the world.

The international conference presented the innovative potential of geography and its contributions to the more efficient regionalization of the country for different management purposes, the optimum management of the Euroregions, in which Bulgaria participates, solving of regional problems, and sustainable and balanced territorial development.

The basic thematic scientific topics of the conference have been concentrated on the following themes:

- Regional development and regional policy – theory, methodology and practice
- Geographical problems of the Euro-integration processes
- Bulgaria's geopolitical position in Europe
- Globalization impacts on Bulgaria's regional development
- Trans-border cooperation in Southeastern Europe
- Socio-economic dimensions of the demographic crisis and population mobility
- Global changes, risks, and regional development
- GIS technologies and their application to regional management

Rumiana Vatseva
Head, Geography Department, NIGGG, BAS

4. INTERNATIONAL CONFERENCE "IDENTIFYING THE RESEARCH BASE FOR A SUSTAINABLE DEVELOPMENT OF THE MOUNTAIN REGIONS IN SOUTHEASTERN EUROPE", 24-26 APRIL 2009, BOROVETS, BULGARIA

The international conference "*Identifying the Research Basis for Sustainable Development of the Mountain Regions in Southeastern Europe"* took place in Borovets from 24th to 26th of April, 2009. The event was organized by the Institute of Geography at the Bulgarian Academy of Sciences and was supported by the Austrian Science and Research Liaison Office - Ljubljana/Sofia and the Federal Ministry of Science and Research of the Republic of Austria in the framework of its SEE science cooperation initiative.

The international conference in Borovets brought together researchers from different countries in Southeastern Europe (Austria, Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Albania, Macedonia, Romania, Greece, Turkey and Bulgaria) working on scientific questions concerning mountain regions. The international organizations as MRI and Alpine convention have participated in the conference. Challenges as the rapid transformation in land-use, biodiversity, waters, tourism, nature risk and bio-productivity in line with the global changes, in particular with the local impacts of climate change were key questions for scientific discussion, and was the base of triggering the process of establishing a convention for mountain regions in Southeastern Europe.

The basic thematic scientific topics of the conference have been concentrated in several areas:

1. Nature protection, nature renovation and conservation and nature use
2. Nature disasters and risk decisions
3. Social – economical development of the mountain regions
4. Sustainable practices and politics for landuse
5. Development of the regions
6. Transborder cooperation

A main topics discussed during the conference were connected with development of the international scientific network for the problems in Southeastern Europe and promotion of the idea for realization of "*SEE-convention*" for mountainous regions based on the recent examples of the two present conventions – Alpine and Carpathian.

The most important aspects of the problems in mountain regions in Southeastern Europe formulated as a result of the work at the conference were as follows**:**

- Mountain environments are sensitive ecosystems. In Europe, they are among the most threatened landscape systems.
- Mountain regions must preserve their function as a living space.
- All mountain regions must be subject to a proper policy of planning, development and mountain population promotion.
- The development of tourism, transport and industry must be based on the efficient management of natural resources.
- Effective preventive measures must be taken against natural disasters such as avalanches, torrents in spate, landslides and falling rocks.
- Natural, semi-natural and cultural landscapes and environments must be preserved.
- A mountain network of biogenetic reserves must be established.
- Efficient measures must be taken to preserve the originality of rural mountain life indispensable for conserving the living mountain environment.
- Grazing strategies and management plans must be optimized.
- Lighting of fire in mountain regions must be prohibited.
- Native species in maintaining or restoring the forest cover must be used.
- The protection of fauna and flora and the reintroduction of extinct species wherever possible must be one of the priorities.
- Adequate ecological control of game is required.
- Conservation of the natural heritage of mountains and their ecosystems through scientific co-operation at all levels.
- Appropriate programs are required for informing and educating the public, for shaping opinions and for training specialists.
- There should be set up of a distributed Spatial Data Infrastructure (SDI) adhering to relevant standards and conforming to the INSPIRE framework of the EU, as a foundation for monitoring, decision support and research activities.
- Human, ecological and economic problems arising in various mountain regions have the same basic characteristics irrespective of the country.

Practical Outcomes of the Conference:

- Higher integration of researchers in the problems of the mountain regions in Southeastern Europe as a result of the Conference.
- The Initiative for integration of the researchers of the mountain regions in Southeastern Europe aims to function as a promoter for joint activities, facilitating contacts between countries and institutions and creating conditions for technical cooperation and resource mobilization at the national, regional and global levels.
- Bringing in the perspective of two recent conventions and stimulating the discussion of a possible regional convention and the role of research in the process towards such a convention
- Determination of the problems and ideas for future scientific projects concerning the general topic of the Convention to found a research basis for the process.
- Presentation of particular regions in the respective countries or regards trans-border cooperation areas (offered from the participants) with sustainable practices and

assessing the research monitoring or other components of research inputs for the development of these regions. Comparative analysis, quantitative investigations and evaluation of the different practices for managing the nowadays problems from a scientific point of view.

- Drawing the direction for the next steps in the process of development of a Convention.
- Integration with politic of international organizations as *Mountain Partnership* and *Mountain Research Initiatives*.

Georgi Zhelezov
Geography Department, NIGGG, BAS

5. SOUTH EASTERN EUROPEAN MOUNTAIN RESEARCH NETWORK (SEEMORE)

Background

The South Eastern European Mountain Research network (SEEmore) is a regional network of scientists to advance research efforts in the field of Global Change to support sustainable development in the Balkan region. The Network is a branch of the European Mountain Research Initiative.

On the occasion of the conference on „Identifying the research basis for sustainable development of the mountain regions in Southeastern Europe" in Borovets, Bulgaria (24-26 April, 2009) organized by the Institute of Geography, Bulgarian Academy of Sciences, and the Austrian Science and Research Liaison Office (Ljubljana and Sofia), the 54 participating scientists from Balkan countries agreed to launch a new mountain science network for the South East Europe.

It is the response to a growing need to better integrate global change research in mountain regions, and to further problem-oriented and demand-driven approaches.

Objectives

The SEEmore network aims to advance research efforts in the field of global change to support sustainable development in the region; and to formulate recommendations to the national and international institutions and organizations for initiating the development of a Balkan Convention, based on the present experience of Alpine and Carpathian conventions.

Activities:

After its launch in 2009, the 1st SEEmore Conference in Timisoara, Romania (26-29 August, 2010) further elaborated the strategic aims of the SEEmore initiative.

The SEEmore Network was presented on the conference "Global Change and the World's Mountains" , 27 and 28 September, 2010 in Perth, UK during a special Lunchtime Session.

In early 2011 was published the first SEEmore book: Sustainable Development of Mountain Rehgions. Southeastern Europe, Shpringer, G. Zhelezov (ed).

National SEEmore Workshop "Mountain regions: Science and Practice" was organized by the Department of Geography, National Institute of Geophysics, Geodesy and Geography, Bulgarian Academy of Sciences on 16th of May, 2011 in Bulgarian Academy of Sciences, Sofia, Bulgaria. The workshop addressed the Bulgarian scientific community and representatives of the national and local governments to discuss how to tally the needs of

the regional development policy with the research capacity and priorities of the scientist working on mountains problems.

A workshop with open debates and round-table discussions on a wide range of topics related to regional climate dynamics during the Pleistocene and Holocene in the mountain environments of the Carpathian and Balkan ranges was held at the University of Suceava, Romania, 9–12 June, 2011.

The SEEmore web site is: http://mri.scnatweb.ch/mri-europe/south-eastern-europe/.

Mariyana Nikolova
Geography Department, NIGGG, BAS

6. 7TH BULGARIAN COMPETITION FOR CHILDREN'S WORLD MAP "LIVING IN A GLOBALIZED WORLD"

Organization of the National Competition

The National Institute of Geophysics, Geodesy and Geography at the Bulgarian Academy of Sciences and the Association of Bulgarian Schools Abroad organized the 7th National Competition for Children's World Map which is held according to the theme and rules provided by ICA.

Co-organizer of the competition was the University of Architecture, Civil Engineering and Geodesy.

Support was provided by the National Geographic KIDS Bulgaria, DataMap Europe Ltd. and ESRI Bulgaria.

Media support was provided by the National DARIK Radio.

The contest was announced also in web page: http://www.abgschool.org

Photo: Rumiana Vatseva *(Note: All photos in this document)*

Drawing of Kristiyan Tonchev, 8 years old from Bulgarian language school "John Atanasoff", Chicago received I-st prize.

The title is "Earth".

Participants

123 drawings of children between 6 and 15 years of age from 13 settlements in Bulgaria as well as from London, Chicago, Valencia and Xativa participated in the competition. Some schools participated for the first time, like the Bulgarian schools in Chicago, Valencia and Xativa, and many art schools participated by tradition. All drawings are of very high quality in the meaning of cartography and art.

Yoana Hristova, 8 years old from Varna, Bulgaria titled her drawing „How small the world is!", received I-st prize

Chavdar Lalov, 10 years old from Pleven, Bulgaria, has I-st prize. The title is "The world today – knowledge to everyone"

Viktoriya Lyubka Pishmanova, 12 years old from Bulgarian school in London titled her drawing „In a global world peace has no alternative '", received I-st prize

Ivo Gabrovski, 11 years old from Sofia, Bulgaria has I-st prize. The title is "World, we love you!"

Drawing of Galina Marinova, 14 years old from Kazanlak, Bulgaria received I-st prize.

The title is "Together for the future of the Earth".

Commission of Evaluation

The members of commission of evaluation were:

1. *Assoc. Prof. Dr. Petar Penev*, Vice Rector of the University of Architecture, Civil Engineering and Geodesy
2. *Assoc. Prof. Dr. Temenoujka Bandrova*, University of Architecture, Civil Engineering and Geodesy
3. *Prof. DSc Ivan Choleev*, Faculty of Geology and Geography, Sofia University "St. Kliment Ohridski"
4. *Assoc. Prof. Dr. Boris Davidkov*, Faculty of Geology and Geography, Sofia University "St. Kliment Ohridski"
5. *Assoc. Prof. Dr. Boian Koulov,* Research Director of the National Institute of Geophysics, Geodesy and Geography (NIGGG), BAS and President of the Association of Bulgarian Schools Abroad
6. *Assoc. Prof. Dr. Rumiana Vatseva*, Head of Department of Geography, NIGGG, BAS
7. *Assoc. Prof. Dr. Mariyana Nikolova*, NIGGG, BAS
8. *Assoc. Prof. Dr. Georgi Zhelezov*, NIGGG, BAS
9. *Assoc. Prof. Dr. Stoyan Nedkov*, NIGGG, BAS
10. *Dr. Emilia Tcherkezova*, NIGGG, BAS
11. *Yoana Stoyanova,* PhD student, NIGGG, BAS
12. *Krasto Tersiev*, artist

The commission awarded 6 first, 6 second, 6 third and 17 stimulating prizes.

I am sending the drawings that won the six first places.

The names of the winners received first prize in the 7th Bulgarian Competition for Children's World Map "Living in a globalized world" 2011 are the following:

1. **Kristiyan Tonchev,** 8 years old**;**
   Address: Bulgarian language school "John Atanasoff" Oakton Community College 1600 E. Golf Rd. Des Plaines IL 60016 USA

   Drawing title: *"**Earth**"*.

2. **Yoana Hristova,** 8 years old;
   Address: Art School IDEA, 21 Knyaz Al. Batenberg Str., Varna, Bulgaria

   Drawing title: ***"How small the world is!"***

3. **Chavdar Lalov,** 8 years old;
   Address: j.k.Storgozia, bl. 58, vh. A, app. 5, Pleven 5800, Bulgaria

   Drawing title: ***"The world today – knowledge to everyone"***

4. **Ivo Gabrovsky,** 11 years old;
   Address: j.k.Lulin, bl. 725, vh. V, app. 44, Sofia 1324, Bulgaria

   Drawing title: ***"World, we love you!"***

5. **Viktoriya Lyubka Pishmanova,** 12 years old;
   Address: Bulgarian Embassy / Bulgarian School London SW7 5HL UK

   Drawing title: ***"In a global world peace has no alternative"***

6. **Galina Marinova,** 14 years old;
   Address: Art School Zhivopis, 3 Kokiche Str., 6100Kazanlak, Bulgaria

   Drawing title: ***"Together for the future of the Earth"***

Exhibition and award ceremony

The exhibition and award ceremony was held in the Earth and Man National Museum.

For the 7th national competition the ex-president of ICA Prof. Milan Konecny, DSc was invited. He took participation in the award ceremony and greeted the six winners.

Other prizes were handed by Assoc. Prof. Dr. Petar Penev, Vice Rector of the University of Architecture, Civil Engineering and Geodesy (UACEG), Dr. Temenoujka Bandrova from UACEG, Dr. Boian Koulov and Dr. Mariyana Nikolova from NIGGG, BAS, and Mr. Krasto Tersiev.

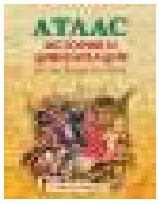
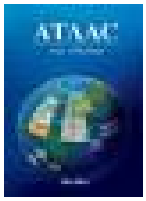
All children attending saw the Earth and Man National Museum exposition.

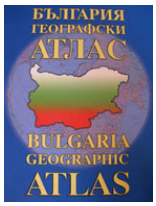
The NATIONAL GEOGRAPHIC KIDS Bulgaria will publish an article for the 7th Bulgarian Competition for Children's World Map "Living in a globalized world" in its edition in May 2011.

Photo by National Geographic Kids Bulgaria: from left: T. Bandrova, M. Konecny, R. Vatceva; from right: B. Koulov, P. Penev; in the middle: awarded children

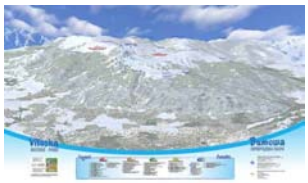
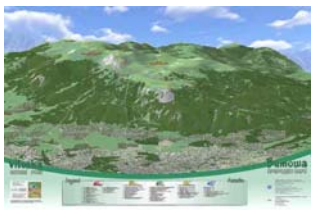
Dr. Rumiana Vatseva
National coordinator for Bulgaria

7. BULGARIAN MAPS AND ATLASES ON INTERNATIONAL EXHIBITION, PARIS, 2011

Title **Type** **Format** **Platform** **Authors** **Publsihed by** **Date published** **Category**	**Language**	**Brief abstract or additional comments (max 100 words)**
Atlas Geography and Economics, 8.grade Paper Atlas, 80 pages 240 x 160 mm paper Temenoujka Bandrova DataMap Europe Ltd December 2009 Educational Cartographic resources on paper medium (New for ICC2011) - Secondary (middle; high) School (12 – 18 years)	Bulgarian 	The atlas provides rich information about nature, water and soil, climate, plants and animals, environmental issues and natural hazards, population, industry and agriculture, transport, trade and tourism, country / administrative map and state structure of each territory. The Atlas is divided in separate colors of three parts: Europe, Balkan Peninsula and Bulgaria. All rich natural and statistical information that we offer is made and treated by the Geographic Information System (GIS). The latest statistics from EuroStat and National Statistical Institute Bulgaria, satellite images, GIS map of Sofia, which will help you to do your market research are used. It is approved by Ministry of Education for use in Bulgarian schools for 8th grade.
Atlas History and Civilization, 11. grade Paper Alas, 80 pages 240x160 mm paper Hristo Matanov and Temenoujka Bandrova DataMap Europe Ltd December 2009 Educational Cartographic resources on paper medium (New for ICC2011) - Secondary (middle; high) School (12 – 18 years)	Bulgarian 	The atlas History and Civilization is created for 11. Grade of Bulgarian schools. It covers all approved curriculums by the Ministry of Education and all textbooks of history and civilization. The content of the atlas is divided into the following sections: - Spreading of Christianity and the decline of Antiquity - Middle Ages, IV-XI century - Bulgaria in XI-XIV century - Bulgaria under Ottoman Imperia, XV-XVIII century - Revival of the Bulgarians - Bulgaria from 1878 to 1945 - Bulgaria after Second World War. The maps are developed based on the latest historical research and data, using Geographic Information Systems. Geographical basis is presented accurately and fairly, and for easier orientation in the situation the shade relief is used and it is obtained from the 3D terrain model. It is approved by Ministry of Education for use in Bulgarian schools for 11-th grade.
Atlas of the World Paper Atlas, 80 pages 240x160 mm paper Temenoujka Bandrova DataMap Europe Ltd Devember 2009 Atlases	Bulgarian 	The atlas provides rich information about the solar system, Earth as a planet, moon, time zones. 55 detailed maps of the world (nature, climate, population, administrative map, statistical maps); continents (nature and countries map), nature maps of the regions of Europe and the world, natural and administrative map of Bulgaria. Comparative charts and tables, Schematics map sheets of Europe and the world, Countries Information: flags, size, population, language, religion, currency status and Alphabetical listing the names of the atlas could be found.

BULGARIA Geographic Atlas Paper Atlas, 220 pages 290 x 310 mm paper Iliya Kopralev (Ed.), Panel of Authors Tangra TanNakRa Ltd. January 2010 Atlas	Bulgarian & English 	BULGARIA Geographic Atlas is a joint edition of the Institute of Geography at the Bulgarian Academy of Sciences and Tangra TanNakRa Publishing House Ltd. It is dedicated to the 60th anniversary of the establishment of the Institute of Geography at the Bulgarian Academy of Sciences. BULGARIA Geographic atlas is the first bilingual (Bulgarian and English), richly illustrated atlas containing over 120 maps with explanatory text on the following topics: geographical location and borders of Bulgaria, geology, topography, climate, water, soils, flora and fauna, population and demographic processes; economy; tourist resources and environment. The atlas has 220 pages, ISBN 978-954-378-060-0.
Map of the World - countries M 1: 34 000 000 paper Wall map 1000x700 mm paper DataMap Europe Ltd DataMap Europe Ltd June 2010 Thematic Maps	Bulgarian 	The map contains: geographic grid, countries represented by background colors and borders, hydrography, capitals, major cities, inscriptions of hydrography, countries and others. The map contains also flags of States and legend. It is suitable for prolonged use because of laminated paper.
Map of the World - Nature M 1: 34 000 000 paper Wall map 1000x700 mm paper DataMap Europe Ltd DataMap Europe Ltd June 2010 Thematic Maps	Bulgarian 	The map contains: geographic grid, topography presented by hypsometric colors; reefs, sandy deserts and swampy areas, winter limit of floating ice shelves and glacier ice cover, hydrography, natural resources, borders, capitals and major cities, classified according to number of inhabitants; altitudes, depths, volcanoes and depressions; symbols of hydrography, orography, countries and others.; legend. It is suitable for prolonged use.
Crusades, XI-XIII century and Fourth Crusade paper Wall map 1400x1000 mm paper DataMap Europe Ltd DataMap Europe Ltd January 2011 Educational Cartographic resources on paper medium (New for ICC2011) - Secondary (middle; high) School (12 – 18 years)	Bulgarian 	The map contains: geographic grid, countries represented by national borders and background colors, countries created after the I-st Crusade; boundaries of individual domains; border of the Holy Roman Empire; I-st, II-nd and III-rd crusades with leaders; hydrography, capitals, main towns of autonomous domains, etc., cities; inscriptions of hydrography, country, historical and geographic areas, etc.;. legend. IV-th crusade with leaders is represented in a separate map.

Second World War 1939-1945 paper Wall map 1400x1000 mm paper DataMap Europe Ltd DataMap Europe Ltd December 2010 Educational Cartographic resources on paper medium (New for ICC2011) - Secondary (middle; high) School (12 – 18 years)	Bulgarian 	The map contains: geographic grid, countries in Europe and north Africa, represented by the state borders of 1.IX.1939, and background color indicating affiliation to belligerent camp or neutrality; areas of action submarines; border to the USSR on 22.VI.1941, hydrography, major military operations, including the advance of German troops in 1941 and 1942, Russian and Finnish troops (Soviet-Finnish War) from 1939 to 1940, the Allied forces and the USSR, 1942-1945 onwards; major battles (including shipping); landing operations, heavy bombing, major concentration camps, resistance movements; years of accession of the Baltic states to the Soviet Union; important battles, etc..; legend. An inset map contains: countries of Southeast Asia, represented by the borders of 1939 and the background color indicating membership of a belligerent or neutral camp; range of territories occupied by Japan until July 1942, represented by hatching, areas of action submarines; line of the greatest movements of Japanese troops in the Pacific; hydrography; advance of Allied troops; important sea battles, places of attacks with atomic bombs, date of surrender of Japan; capitals and cities.
Panoramic tourist map of resort Sunny Beach - Bulgaria Paper Map , Wall map , Internet map 1550 x 900 mm paper Davis Dinkov Cartographic studio DavGEO may 2011 Maps of tourism, orienteering and parks	Bulgarian, English 	The first panoramic tourist map in Bulgaria, based on a real three-dimensional digital model of terrain, buildings and facilities. It represents the Bay of Sunny Beach. Buildings, facilities and land cover are represented with their actual proportions and visual characteristics. The map is updated every year. After that the printed paper publications, wall maps and Internet applications are available.
Panoramic tourist map of resort Sveti Vlas - Bulgaria Paper Map ,Wall map 900 x 600 mm paper Davis Dinkov Cartographic studio DavGEO may 2011 Maps of tourism, orienteering and parks	Bulgarian, English 	Panoramic map of Sveti Vlas and its resort zone. Buildings, facilities and land cover are represented with their actual proportions and visual characteristics. Hotels, apartment complexes, restaurants, office buildings and the beaches are represented on the map.

Panoramic tourist map of Nessebar Paper Map 900 x 450 mm paper Davis Dinkov Cartographic studio DavGEO may 2011 Maps of tourism, orienteering and parks	Bulgarian, English 	Panoramic map of the town of Nessebar - a new town and old part. The Ancient City of Nessebar is under the auspices of UNESCO and the part of world heritage. Buildings, facilities and land cover are represented with their actual proportions and visual characteristics. Hotels, apartment complexes, restaurants, office buildings and special development of archaeological sites in the Old town of Nessebar are represented on the map.
Panoramic tourist map of resort Pamporovo Paper Map 900 x 600 mm paper Davis Dinkov Cartographic studio DavGEO may 2011 Maps of tourism, orienteering and parks	Bulgarian, English 	Winter panorama map of the resort Pamporovo . The map represents actual land cover (snow, forest, ski facilities). Buildings, facilities and land cover are represented with their actual proportions and visual characteristics. Hotels, apartment complexes, restaurants, office buildings with actual three-dimensional models are represented on the map. Ski runs are devided to different categories, areas for ski and snowboard school are represented.
Vitosha Nature Park - Winter panorama map Paper Wall Map 1500 x 900 mm paper Davis Dinkov Cartographic studio DavGEO December 2009 Maps of tourism, orienteering and parks	Bulgarian, English 	Winter panorama map of Vitosha Nature Park. The map is based on a real three-dimensional model of the Vitosha mountain and the majority of Sofia. Is depicted land cover - snow, winter forests, rocks, tourist infrastructure and road network. Through special markings are marked nature reserves. Are marked ski runs, lifts and drags. For Sofia buildings are depicted by standard models (for floors and construction), and more important buildings constructed detailed 3d models.
Vitosha Nature Park - Winter panorama map Paper Wall Map 1500 x 900 mm paper Davis Dinkov Cartographic studio DavGEO December 2009 Maps of tourism, orienteering and parks	Bulgarian, English 	Summer panoramic map of Vitosha Nature Park. The map is based on a real three-dimensional model of the Vitosha Mountain and the majority of Sofia. Land cover - forests, parks, neighborhoods, rocks, tourist infrastructure and road network are represented. Through special markings are marked nature reserves. Tagged are lifts. For Sofia buildings are depicted by standard models (for floors and construction), and more important buildings constructed detailed 3d models.
Rila Monastery Nature Park - tourist map Paper Map 900 x 600 mm paper Davis Dinkov Cartographic studio DavGEO April 2011 Maps of tourism, orienteering and parks	Bulgarian, English 	Tourist map of Rila Monastery Nature Park. Contents: relief by contour lines and shaded forested land cover areas, cities, tourist routes, accommodation places, nature reserves, roads, forest roads and trails, cultural and historical objects, photographs and information about the park.

8. BPC ART POSTER PRODUCED BY BULGARIAN PARTICIPANT IN BPC AND THE COMMISSION ON CARTOGRAPHY AND CHILDREN

The Commission on Cartography and Children will organize the 10th International Exhibition in Paris, July 2011 during the 25th ICC. The local organizers are Francois Lecordix and Jasmine Desclaux-Salachas, President of the Commission Communication and Cartography at the French Committee of Cartography.

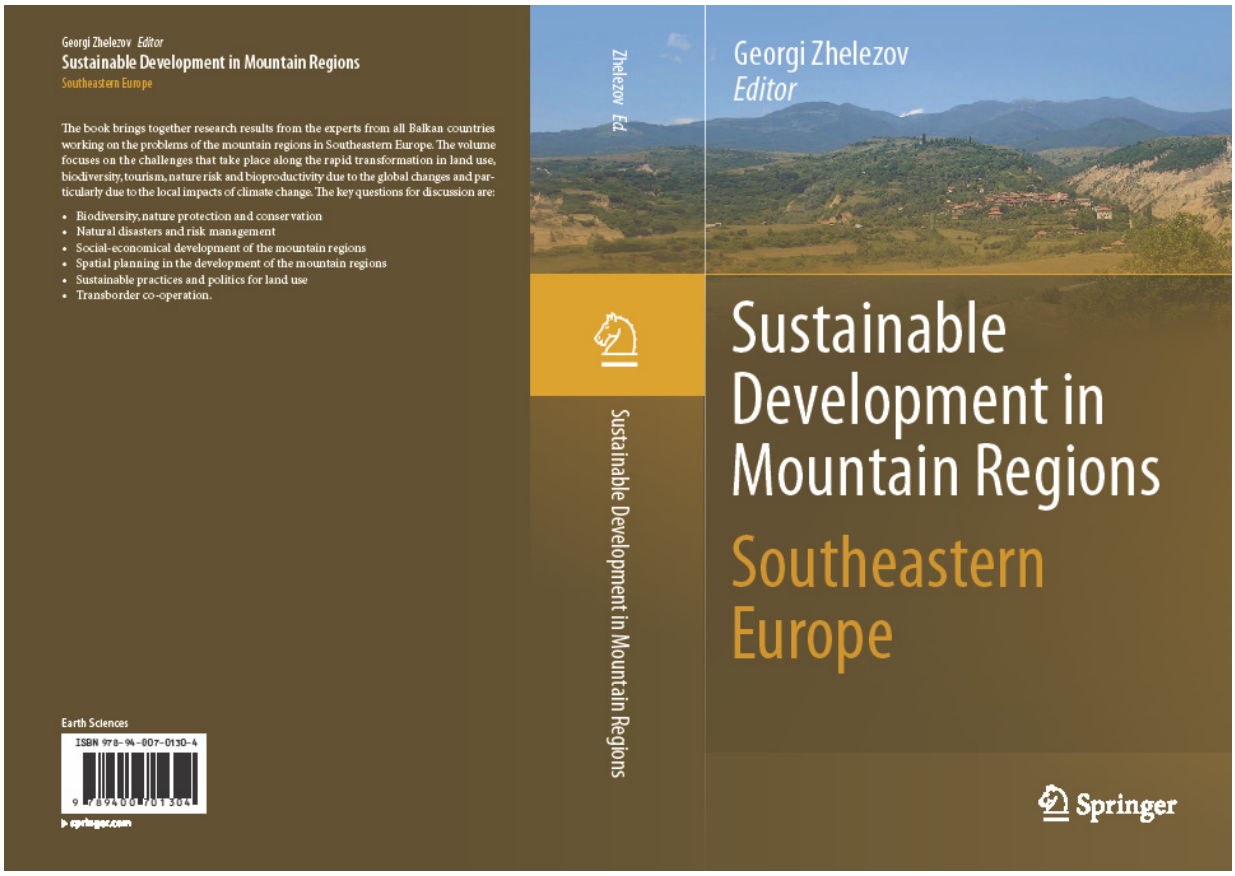
The poster announces also 20 Years of Barbara Petchenik Competition which celebration will be held in Dresden, 2013 during the next 26th ICC.

The children drawings used for Poster design were scanned by Jeet Atwal, Canada. The poster designer is Aneliya Yotova, former BPC participant from Bulgaria.

The poster is sponsored by ICA. It is already distributed to the national BPC organizers. The national members and ICA representatives will receive a copy in Paris during General Assembly.

9. SUSTAINABLE DEVELOPMENT IN MOUNTAIN REGIONS SOUTHEASTERN EUROPE

http://www.springer.com/earth+sciences+and+geography/geology/book/978-94-007-0130-4?changeHeader



The book "**Sustainable Development in Mountain Regions. Southeastern Europe"** integrated the work and results connected with the international conference "*Identifying the Research Basis for Sustainable Development of the Mountain Regions in Southeastern Europe",* 24-26 April 2009, Borovets, Bulgaria. The book brings together research results from experts from all countries working in the problems of the mountain regions in Southeastern Europe. The volume focuses on the challenges that take place along the rapid transformation in land use, biodiversity, tourism, nature risk and bioproductivity due to the global change and particularly due to the local impacts of climate change.

The basic questions of discussion in the book integrated in 5 parts and 23 chapters:

Part I Global Problems and Mountain Regions

1. Scientific Research Basis for Sustainable Development of the Mountain Regions: Main Concepts and Basic Theories

2. Solar Activity – Climate Change and Natural Disasters in Mountain Regions

3. Mass Movement Processes Under Changing Climatic and Socioeconomic Conditions

Part II Nature Resources and Land Use in Mountain Regions

4. Mountains and Mountain Regions in Bulgaria

5. The Natural Potential of Mountains in Bulgaria and Its Sustainable Use

6. Morphometry and Land Use on the Mountains in Republic of Macedonia

7. Usage of the Mountain Areas in the Republic of Macedonia

8. Landscape Structure and Ecosystem Services of Etropole Municipality

9. Evaluation of the Avalanche Danger in Northwest Rila Mountain

10. Management of Snow Avalanche Risk in the Ski Areas of the Southern Carpathians-Romanian Carpathians

11. BEO Moussala – A New Facility for Complex Environment Studies

12. Researches of Field Evidence for Late Quaternary Climate Changes in the Highest Mountains of Bulgaria

Part III Social, Economic and Regional Problems of Mountain Regions

13. Demographic Potential and Problems of the Settlements Network in the Mountains of Bulgaria

14. Demographic Limits to Sustainable Development of Mountain Regions in Serbia

15. Regional Differences and Regional Planning of Economic Activities in Bosnia and Herzegovina

16. On the Sunny Side of the Alps: Slovenian Mountains and Their Perspectives

17. Impact of Macroeconomic Changes and Property Rights on Forest Degradation, Land Use and Environmental Situation in Albania

18. Sustainable Development in the Eastern Black Sea Mountains: Present State and Perspectives

19. Changes in the Ethnic and Demographic Profile of the Population in Eastern Stara Planina Region

Part IV Nature Protection and Conservation

20. Applying Integrated Nature Conservation Management: Visitor Management and Monitoring of Winter Recreation Activities Focusing Grouse Species in Berchtesgaden National Park

21. Human Pressure on the Environment in the “Mun¸tii Maramure¸sului” Natural Park

Part V Networks and Strategies for Mountain Regions

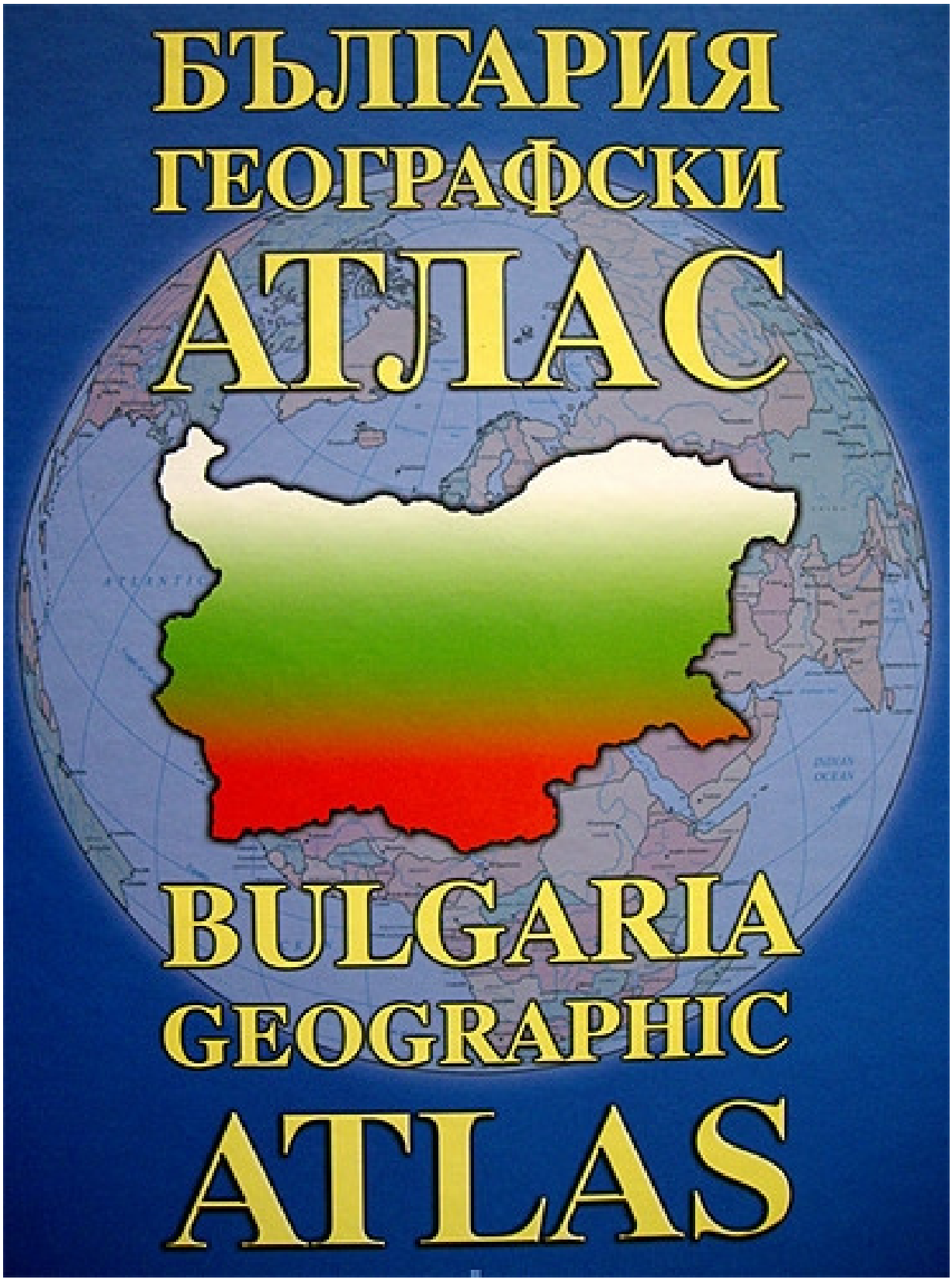
22. Models and Strategies for Sustainable Management of Mountain Territories in Central and Southeastern Europe

23. Science Networks for Global Change in Mountain Regions: The Mountain Research Initiative

The integration of the scientific expertise's and opportunities of the scientists look the intensification of the connections between institutions, nonprofit and business organizations for development and realization of "Convention for sustainable development of the mountain regions in Southeastern Europe" using the present experience and schedule of Alpine and Carpathians conventions.

Georgi Zhelezov
Geography Department, NIGGG, BAS

10. BULGARIA GEOGRAPHIC ATLAS



A richly illustrated volume, entitled “BULGARIA Geographic Atlas”, was published in January, 2010. It was a joint production of the Institute of Geography at the Bulgarian Academy of Sciences, and TANGRA TanNakRa Publishing House Ltd.

This is the first publication of its kind since 1973. It is dedicated to the 60th anniversary of the establishment of the Institute of Geography, BAS.

BULGARIA Geographic Atlas is the first bilingual richly illustrated atlas with texts in Bulgarian and English. The presented most current geographic information is targeted to a wide circle of users, both from Bulgaria and abroad. More than 120 maps, explanatory texts, various photos and diagrams offer information about the nature (geology, relief, climate, water resources, soil, flora and fauna), demographic change (population and demographic processes), settlement network, economy, tourist resources and environmental protection of Bulgaria for the period after this country’s EU accession.

The atlas has 220 pages. It was printed on paper with format 290 x 310 mm.
ISBN 978-954-378-060-0.

Rumiana Vatseva
Head, Geography Department, NIGGG, BAS

11. ESRI BULGARIA 2007-2011

The Company

ESRI Bulgaria Ltd. is privately-owned Software Company specialized in Software Design, Development, Implementation, Training, Support, and Integration. The company is experienced especially in GIS (Geospatial Information Systems) based solutions.

Our mission is to provide our clients with everything they need to achieve their business goals through implementing state-of-the art Information Technologies.

Starting 15 years ago as GIS pioneer in Bulgaria, ESRI Bulgaria is the only Bulgarian company to develop and integrate the GIS projects of national scope and importance.

We are proud of our many national and international achievements and rewards. Each year the ICT researches show ESRI Bulgaria as the leader on the GIS market.

At ESRI Bulgaria we believe that successful projects require careful management. To be successful the project needs more that just a pool of resources and a project plan. The key is project management that constantly plans, monitors progress, allows flexibility and ensures that business needs are met. ESRI Bulgaria has vast experience in system integration for the period of its presence on the market.

Projects

The current report aims to describe some of the main projects of the company during the past four years, representing its expertise and the significance of GIS implementation in operational processes of both companies and institutions. The projects described are as follows:

- *GIS For The Military Geographic Service*
- *National Biodiversity Monitoring System In Bulgaria*
- *GIS For The Needs Of Water Management At The Ministry Of Environment and Water*
- *GIS In Goce Delchev Municipality*
- *GIS For Quality E-government Of Gabrovo Municipality*
- *Dobrich Municipality – The One and Only Bulgarian Municipality With Developed GIS For Underground Facilities*
- *A System For Geospatial Data Management In Sofiyska Voda Ltd.*

- *Geographic Information System for the purposes of National Railway Infrastructure Company*

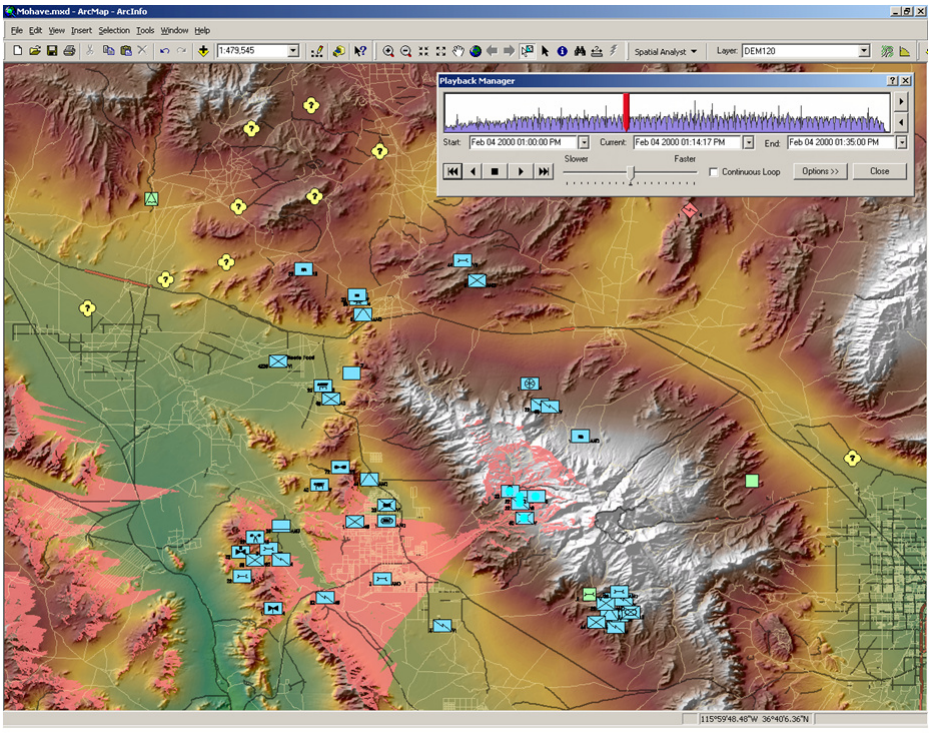
GIS For The Military Geographic Service

The partnership between The Military Geographic Service of the Bulgarian Army and ESRI Bulgaria dates back to 1993. With the help of the ArcINFO raster images and vector data were transformed, raster files were automatically turned to vector files, attribute information was acquired, models were generated, etc.

The necessity of implementing certain standards and data structure led to the necessity of developing GIS, based on the ESRI platform, for the Bulgarian Army.

In 2002 ESRI Bulgaria started the building of GIS, which had to provide its users (armed forces, state administration and private clients, who have access) with updated information about the area, corresponding to new requirements as well as to reach interoperability and respond to NATO and European structures' standards.

Following its engagements to NATO The Military Geographic Service had to start producing cartographic materials. Thus the implementation of an automized system for production of cartographic materials called PLTS started.



The system continues working today and is regularly updated. All efforts through the years led to the integration of a working system for automated production of:

- Databases - VMAP1 and VMAP2 following the DIGEST standard of NATO;
- Maps at 1:50 000 scale - Topographic Line Map (TLM) and general map - Join Operation Graphic (JOG) – 1:250 000, GROUND and AIR variant;

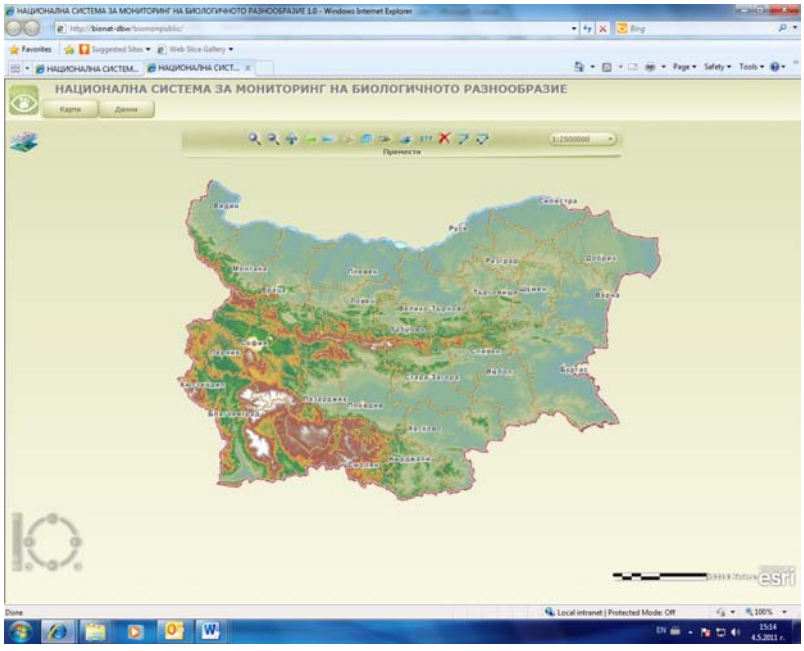
- Generation and replication of standard digital geographic products - SHP, DTED 1 and DTED 2, CADRG, ADRG, CIB.

National Biodiversity Monitoring System in Bulgaria

The National Biodiversity Monitoring System is developed in 2010. It is part of a project № BG0052 called 'Development Of Information System Of The National Biodiversity Monitoring System in Bulgaria', realized with the financial support of Island, Liechtenstein and Norway via 'The Financial Mechanism Of EEA.'

In March 2010 a contract is signed between the Executive Environment Agency and ESRI Bulgaria, which object is the creation of single system for data exchange between regional databases and the National Biodiversity Database, administered and located at the Executive Environment Agency as well as delivery of ESRI base GIS software.

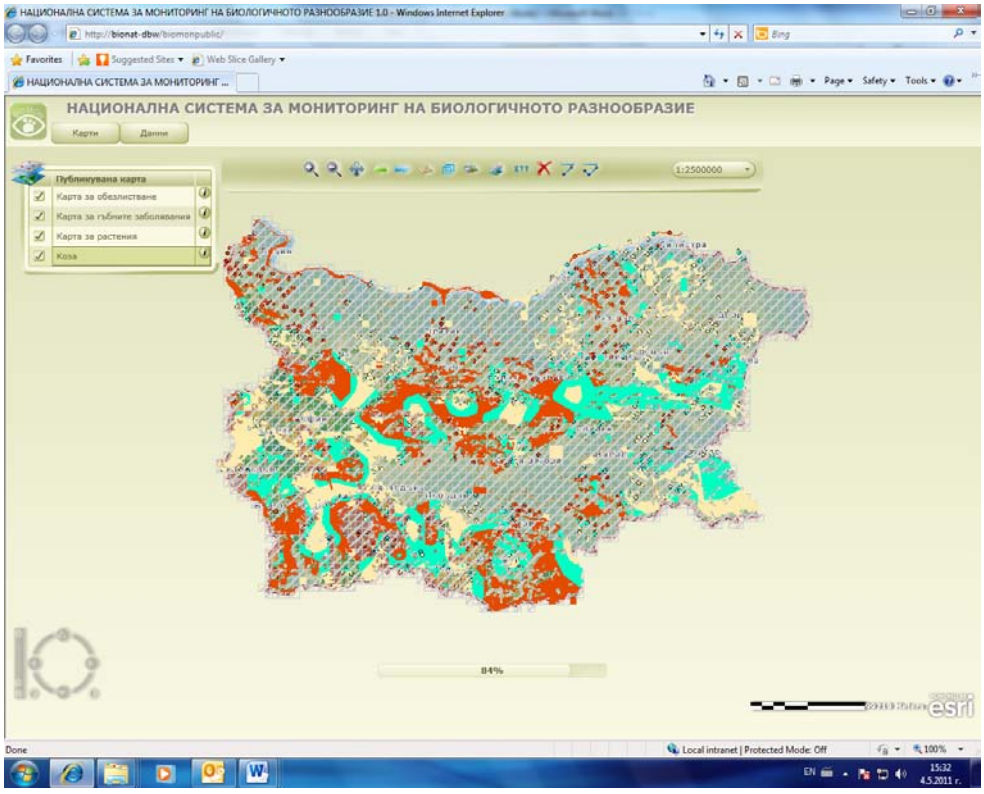
The Department of 'Land, Biodiversity and Protected Territories Monitoring' at the Executive Environment Agency is the coordinator and administrator of the National Biodiversity Monitoring System. The information system of the National Biodiversity Monitoring System includes databases on national and regional level. It gives the ability to exchange data with external databases, collecting information for the protected areas by Natura 2000 ecological network, which is administered by the Department of 'National Office for Nature Protection' at the Ministry of Regional Development and Public Works, The Register of Protected Areas at the Executive Environment Agency as well as databases for birds, administered by the Bulgarian Society for The Protection of Birds. The main role of the information system is to create mechanism for authenticity validation of the information, uploaded in the National database. Data, uploaded in the National database of the National Biodiversity Monitoring System, is publicly accessed via the Internet.



GIS of the National Biodiversity Monitoring System has service-oriented architecture, based on ArcGIS. The system is based on ArcGIS Server Advanced Enterprise on central level in Sofia, which stores and manages data from the National Biodiversity Database as well as data from the regional offices.

The development of the system is divided into 4 separate but related parts:

- Improvement and renovation of the current Regional databases for biodiversity monitoring;
- Development of National Biodiversity Database, which aims to integrate and analyze data from the biodiversity monitoring;
- Development of Internet application for visualization of the biodiversity monitoring data, providing publicity and access with ability for uploading and displaying information from performed monitoring;
- Data synchronization and exchange between the National Biodiversity Database and 6 external databases – Natura 2000, Register of Protected Areas, Common Bird Monitoring, Mid-winter Count, Nesting Bird Species, Monitoring of important ornithological places.



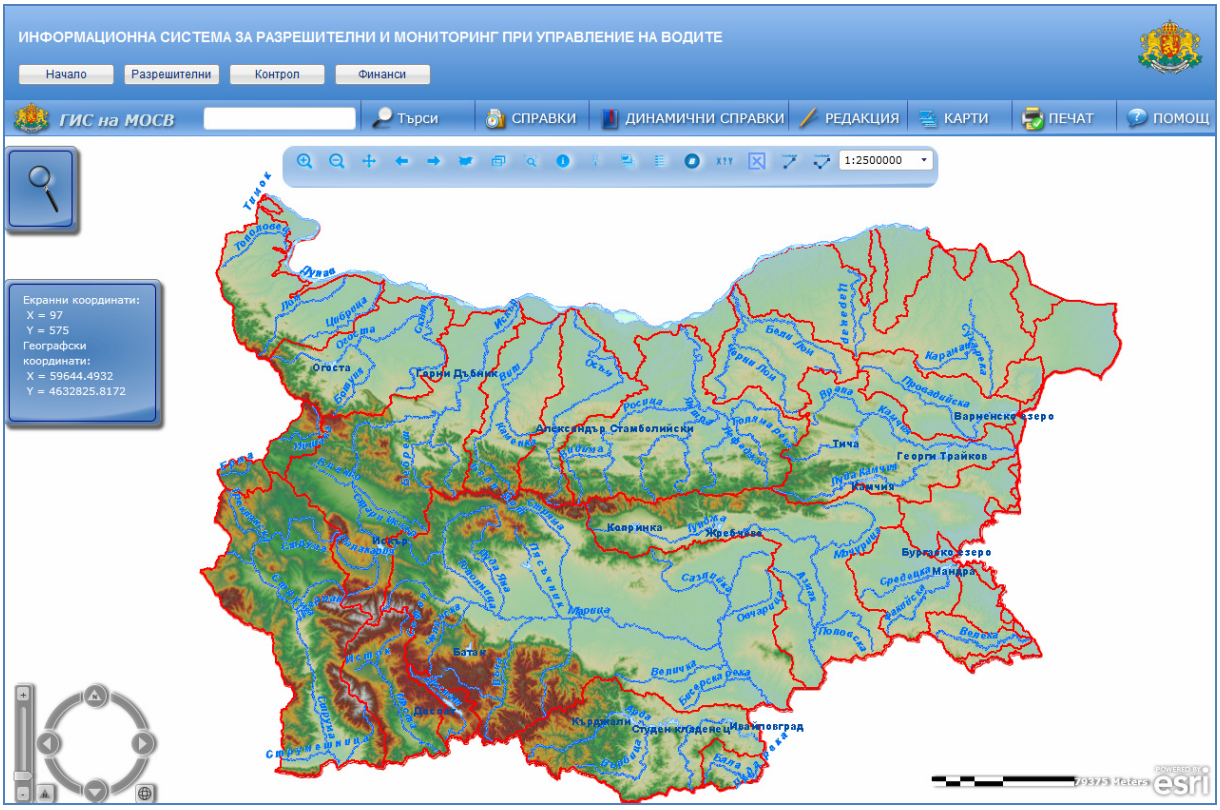
GIS For The Needs Of The Water Management at The Ministry Of Environment and Water

In order to respond to the European IT standards The Ministry of Environment and Water needs to develop information and reporting system for registering, monitoring and control over the permits, including permits for complex mitigation and control over the pollution as well as fees for water usage and improvement of their collection.

The project is based on the current software products, delivered for The Ministry of Environment and Water and its structures. The purpose of the information system is to publish data from single server and create connections with other modules and systems, based on a single geo database.

The GIS module of this information system is provided by ESRI Bulgaria and based on the ESRI GIS platform. It provides functional capabilities, connected with the geographic location of the water sources and related features, hierarchy, metadata, etc.

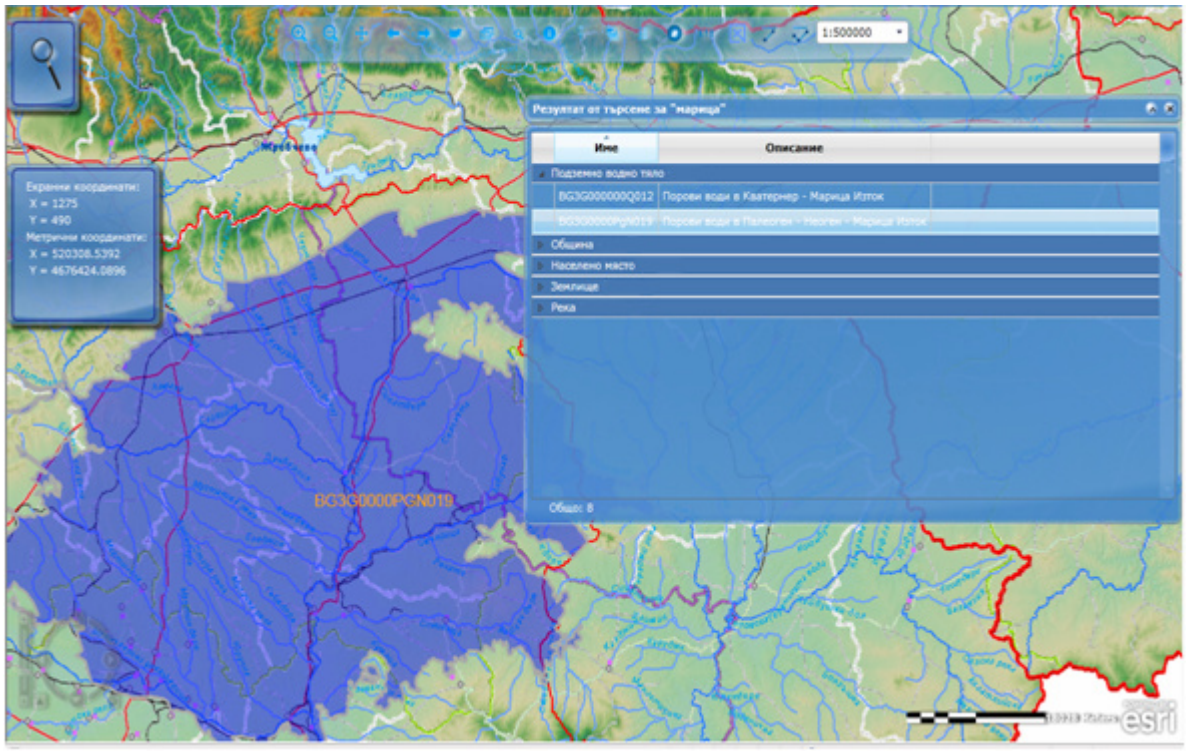
The GIS module includes structured geospatial information about the permits, monitoring and control of the permits' conditions. This module is used as basis of the National infrastructure for water objects spatial data and gives the opportunity for GIS data exchange between the Ministry and other institutions, related to waters. The GIS module includes functions for searching and visualizing of data from the central geospatial database.



The main GIS functionality includes:

- Visualizing all geo data – both raster and vector;
- Visualization management – including/excluding layers;
- Navigation on the map;
- Searching for an object on the map;
- Data editing;
- Uploading inquiries;
- Performing analyses;
- Connection to relational tables.

The project also aims to support the process of modernizing the infrastructure of the Ministry.

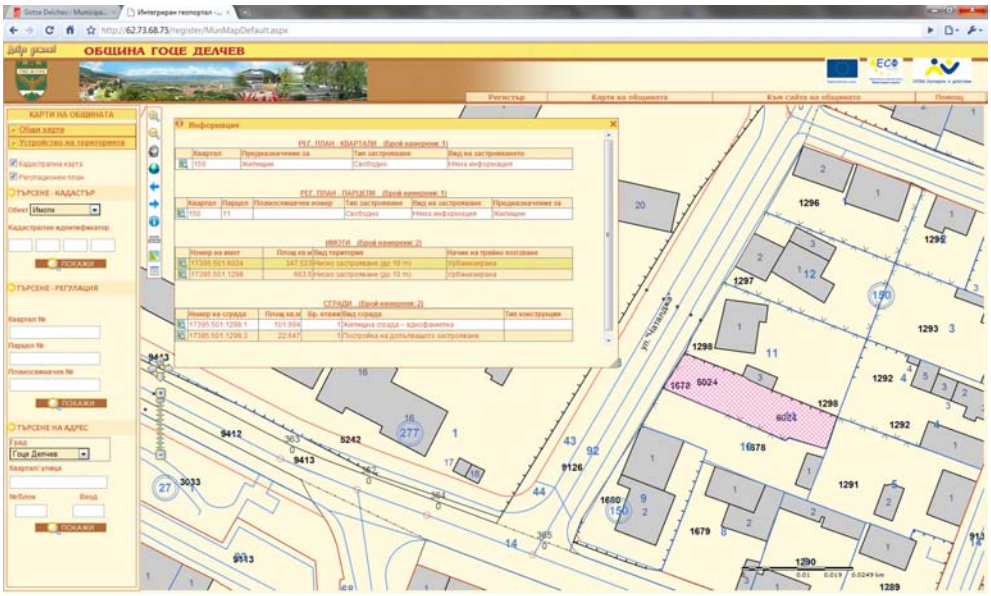


GIS In Goce Delchev Municipality

The project for development of GIS for Goce Delchev Municipality is the first municipal project in this area, through which new advanced technologies are implemented to improve the work of the administration and lead to faster quality service.

The developed GIS gives the ability to optimize data management and its electronic distribution as advanced method for servicing citizens and businesses, identifying initiatives with public-private character, etc. In the context of the project, on which GIS was developed, an access is ensured to information concerning free terrains and objects on the territory of the Municipality, through which new investments could be attracted.

GIS of Goce Delchev Municipality is based on the ESRI platform and particularly the integrated family of ArcGIS software products, which use modern IT standards and provide user friendly solutions with rich functionality, corresponding to the need of the Municipality. The system I provided by ESRI Bulgaria.



The effect of the GIS development can be seen in several areas:

- saved time and money;
- increased performance;
- better service;
- faster and better decision making.

The website of the Municipality provides additional functionality and options.

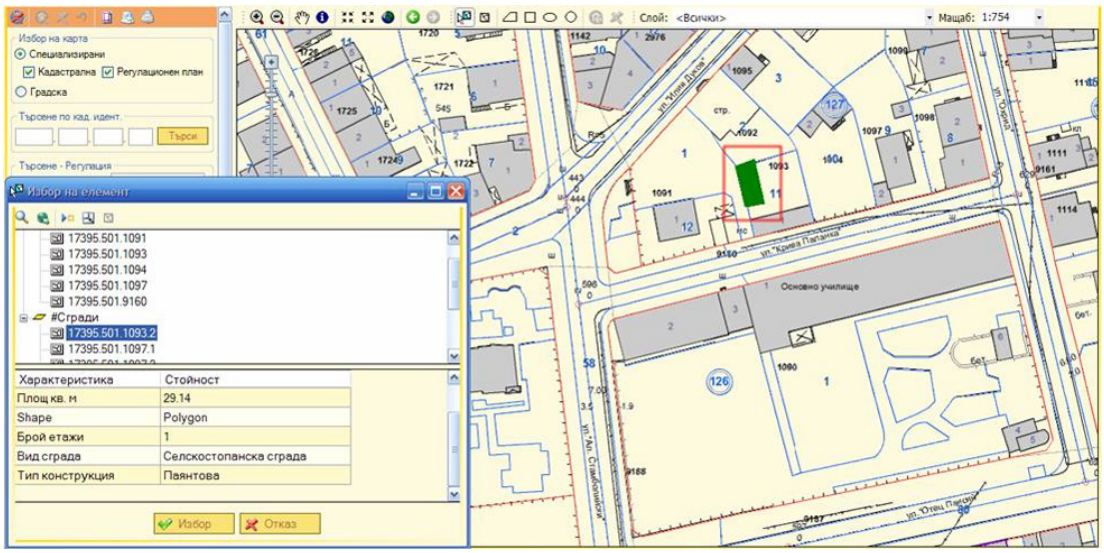
The functionality of the system brings many benefits to Goce Delchev Minicipality. An upgrade of GIS is planned with additional modules as well as preparation of projects for the introduction of e-services for citizens and businesses.

GIS For Quality E-government Of Gabrovo Municipality

In 2009 Gabrovo Municipality wins funding on 'Administrative Capacity' OP for the project 'Modernizing The Administrative Service in Gabrovo Municipality By Developing and Providing Quality E-services For Citizens and Businesses.' The aim of this project is to improve the quality of the administrative service for citizens and businesses through development of e-services, reengineering and optimization of the administrative processes via implementation and integration of advanced GIS in the Municipality.

In order to achieve this purpose a GIS back office is developed and implemented for integrated management and service in areas such as cadaster, territorial development and municipal property in the Municipality. Based on the GIS for municipal property an e-register is also developed providing public access. The register gives the users the ability

to make inquiries about the municipal property. In order to facilitate the participation of the citizens and businesses in tenders of the Municipality a connection is provided linking the register to a map, where users can locate certain property and visualize it on the map.



The GIS system is based on the ESRI platform and integrated by ESRI Bulgaria with customized system, developed to provide electronic administrative services for the territorial development (front office) and their administration and management in the back office of the Municipality. With the start of the system citizens and businesses have the ability to use e-services for:

- Creation of documents and sketches regarding properties;
- Creation and maintenance of the regulatory plan;
- Making copies of the cadastral plan/cadastral list and the manual sketch.

The system is based on the ArcGIS technology built on service-oriented architecture and gives the ability for future development both in e-services and applications of the geo databases and the GIS functionality need by the experts in separate departments of the Municipality.

Dobrich Municipality – The One and Only Bulgarian Municipality With Developed GIS For Underground Facilities

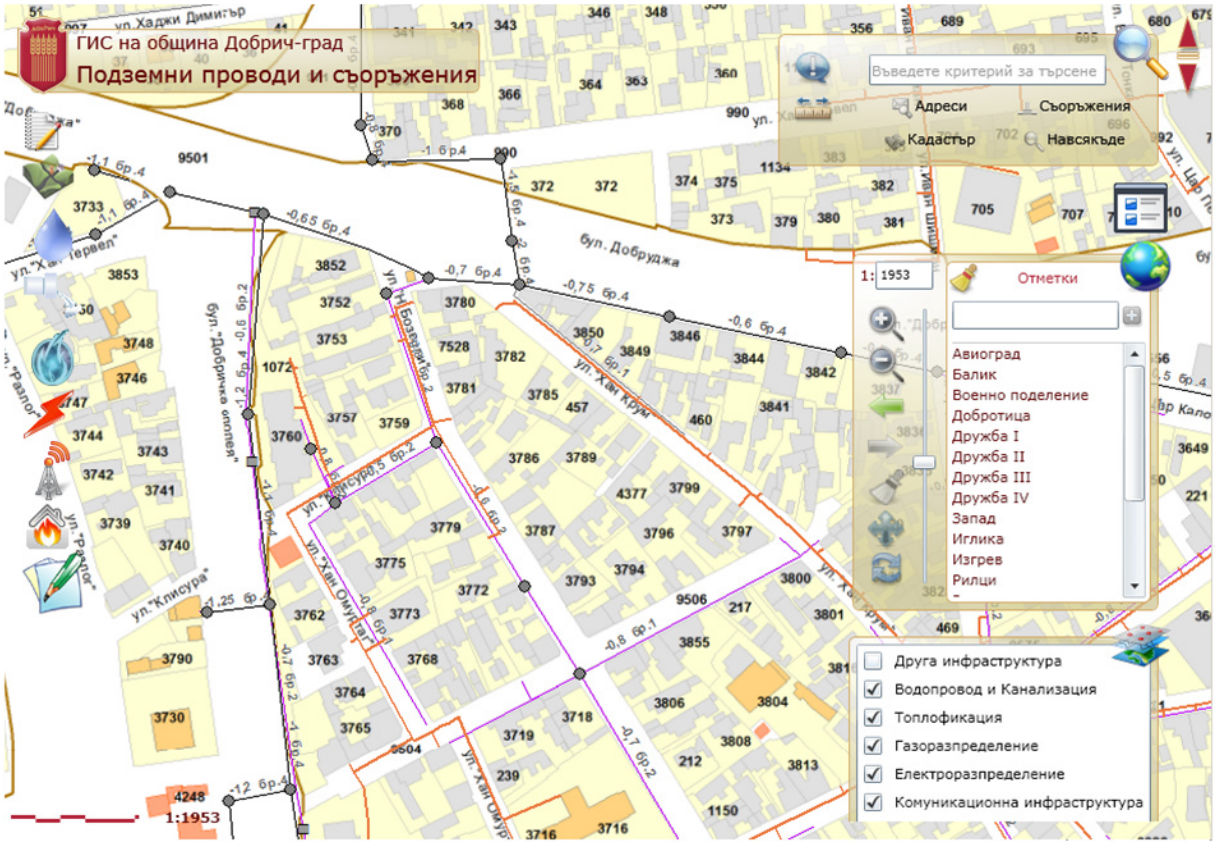
Dobrich Municipality managed to gain funding for the development and integration of GIS for underground facilities on the territory of the whole town. The funding is based on BG0039 Project called Plan ‘Future’ - Improvement of Dobrich Municipality Human Resource Capacity for Better Town Management, Planning and Development. Its funding is approved by the Financial Mechanism of the European Economic Area and is estimated EUR 300 000.

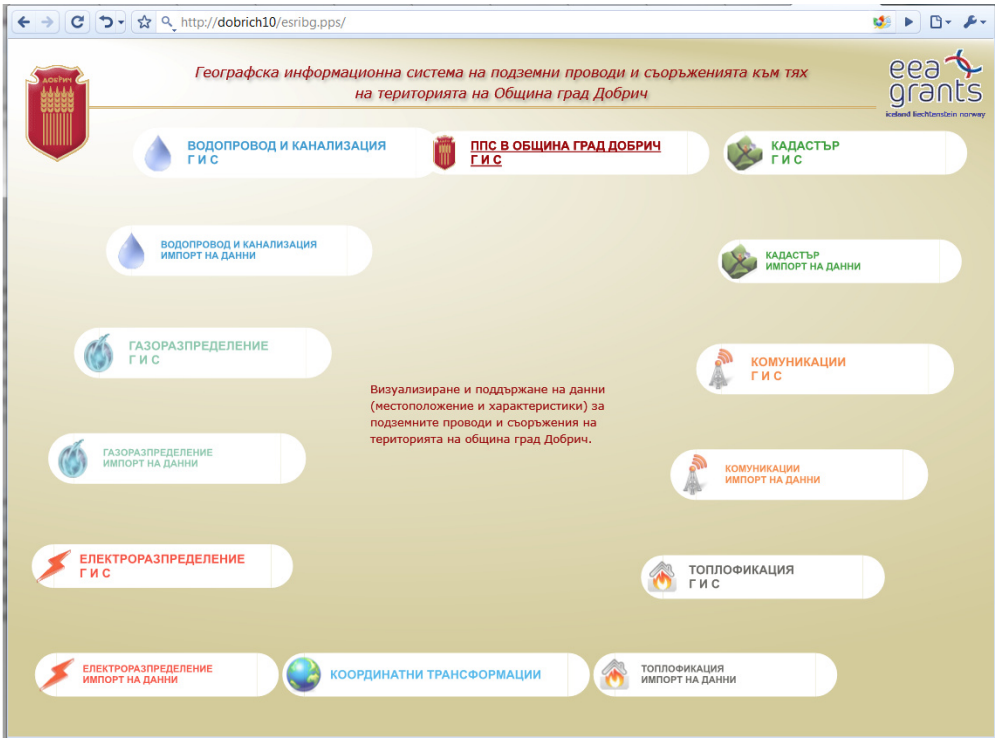
The general aim of the system is to improve the capabilities for access to underground facilities data, decrease infrastructural and network maintenance and management risks

as well as improve the operations for urban planning and development. GIS maintains the information about the water and sewerage networks as well as for the electric distribution, gas distribution and trolley networks.

Thus GIS provides:

- Access to digital data for underground facilities as well as their features;
- Creation of digital and tabular reports;
- Visualization of data changes.





GIS is based on the ESRI technology and provides specialized functionality for editing and displaying of both cadastral data and data for the underground facilities. The system is provided by ESRI Bulgaria. GIS offers customized model for registering and processing of different administrative services such as:

- Creating combined sketch for land property by using data for the underground facilities;
- Uploading data for newly built underground facilities;
- Displaying and copying the thematic map of the underground facilities;
- Creating and maintaining the thematic map of the underground facilities.

The benefits for the Municipality from the integrated system are as follows:

- GIS for the underground facilities – a basis for the development of complete corporate GIS of Dobrich Municipality;
- Implementation of advanced system for improvement of the capabilities and decreasing the underground infrastructure management risks;
- Advanced usage of underground cadastre data by the officials;
- Improved cooperation between all institutions responsible for the management and maintenance of the underground infrastructure;
- Improvement of the human resource capacity in Dobrich Municipality.

With this project Dobrich Municipality demonstrates a new model of underground infrastructure management and thus lays the beginning of future initiatives aiming to upgrade GIS.

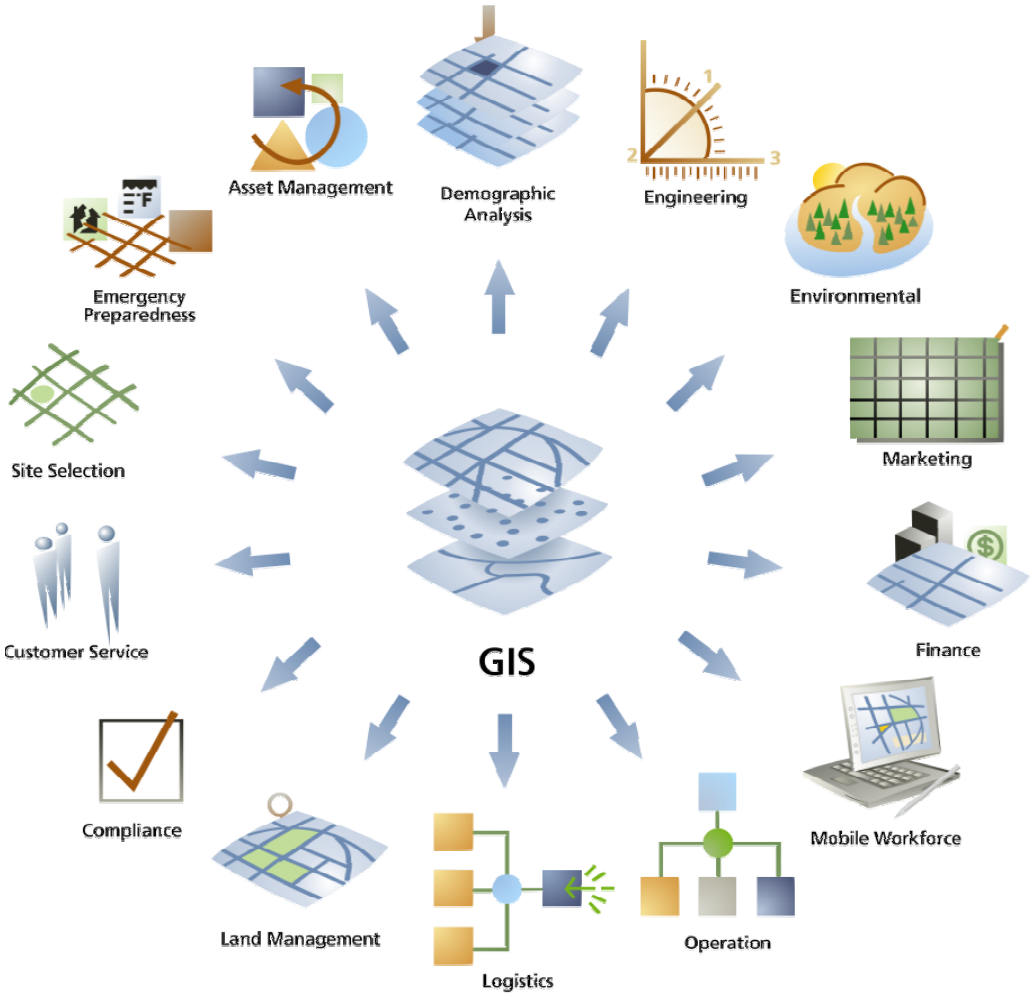
A system for geospatial data management in Sofiyska voda Ltd.

Sofiiska voda Ltd. provides services for water supply, sewage and wastewater filtration for more than 1,5 million people on the territory of Sofia Municipality. The company represents the one and only public-private partnership in the water sector in the country.

In order to have effective management of the operating and investment activities reliable data is needed for the condition of the water and sewerage networks and facilities. This is priority task of the creation of single corporate database with information for all assets, which has to merge spatial and infrastructural data.

Geospatial information is vital for the operation of Sofiyska voda. It plays key role in many business processes. That is why Sofiyska voda decides to use the most advanced GIS technologies for the creation of integrated corporate system for assets management in the company.

The System for Geospatial Data Management is provided by ESRI Bulgaria and is based on the GIS solution of the ESRI platform, which automates and integrates corporate processes, especially where spatial information is part of the decision making process. Geo services are accessible through the developing service-oriented architecture (SOA), which provides GIS functionalities and data at each spot of the process flows.



The System for Geospatial Data Management gives the ability to increase data and service quality, process tracking, information security and flexibility as well as the abilities for the GIS scale.

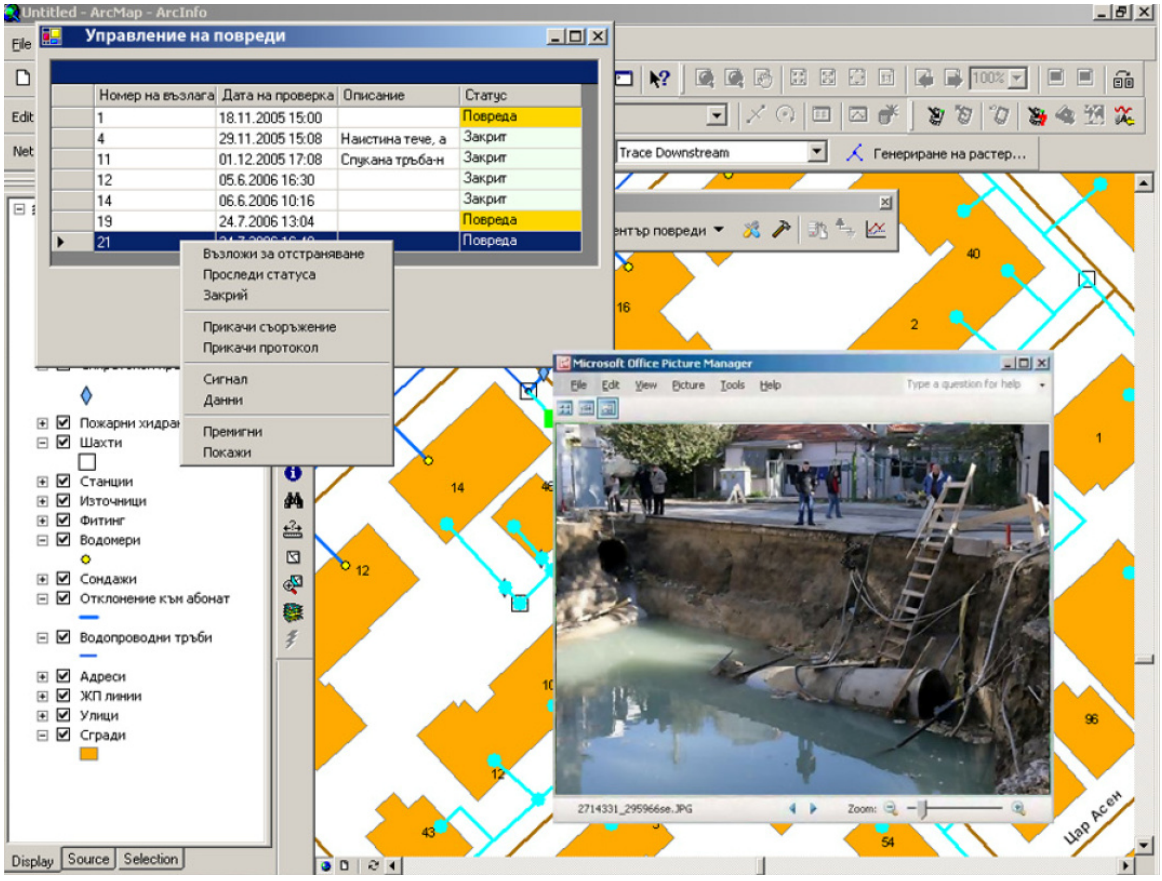
GIS provides the necessary data for:

- water and sewerage networks operation;
- water and sewerage failure management;
- networks management;
- preparation of investment project.

Uploading of customer data in GIS enables fast analyses of the water quantities spent as well as of the incomes from the separate territories. A complete e-register of the assets of the company is created also based on GIS.

The program for the major water and sewerage networks repairs is scheduled with the help of GIS information. The system provides data for the creation of technical information about the water and sewerage networks for the clients. GIS experts provide schemes and maps on daily basis for the needs of the water and sewerage networks operation. They also work on the breakdowns restoration. The system is a basis for the development of hydraulic models and long-term investment planning.

The GIS solution provides benefits for the clients of the company, who receive schemes from GIS containing detailed and updated information about the water and sewerage networks.

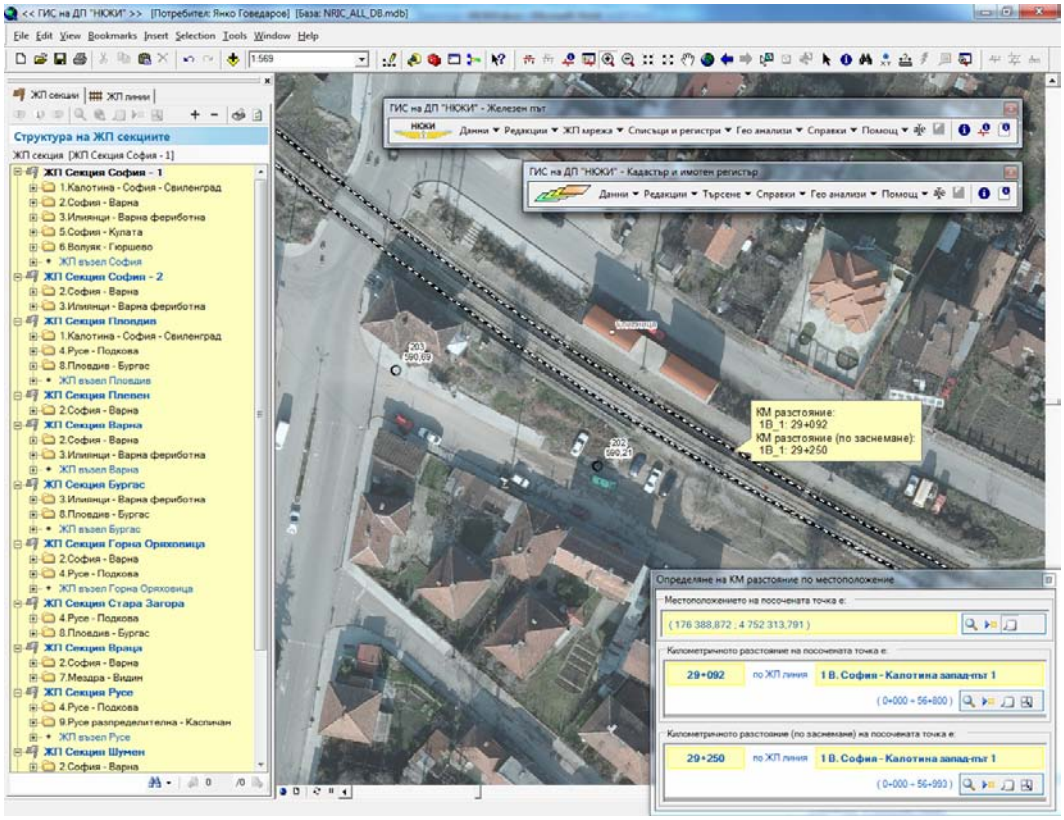


Geographic Information System for the purposes of National Railway Infrastructure Company

The National Railway Infrastructure Company (NRIC) exists since 2002. NRIC is a trader, a state enterprise as well as manager of the Bulgarian railway infrastructure. The company organizes its entire activity on the basis of researches, prognoses and programs for the development of the railway infrastructure.

With the start of the reforms in the company the necessity of building and implementing GIS for the purposes of NRIC occurs. ESRI Bulgaria provides GIS, designed to perform collection, accumulation, storage, transmission and analysis of spatial and descriptive information about the railway infrastructure, property and ownership and other relevant data and provide conditions for improving the operational, commercial and financial management of the company.

Through introduction of modern geospatial information technologies GIS, based on the ESRI platform, NRIC allows improvement of processes for asset management (rail infrastructure and property) and ensuring attainment of standards of rail transport in the European Community.



Applications of GIS NRIC:

- Management of railway infrastructure;
- Planning of maintenance;
- Property Management;
- Analysis and planning;

- Digital archive.

Using GIS supports operation, maintenance and repair, inventory, inspection, investigation and planning, analysis and reporting, decision making, property management and others.

The system is set up and maintains dimensional digital models of railway infrastructure and property used for asset management and provision of data and information to consumers using modern technological means.

The system provides access in an integrated environment to:

- Basic and specialized maps and data for the country;
- Raster data (aerial-photo images) from capturing infrastructure;
- Spatial and hierarchical representation of objects of railway infrastructure and property;
- Information on technical characteristics of sites and facilities of the railway infrastructure;
- Audit reports on the status of sites and facilities of the railway infrastructure;
- Reports, analyzes and balances;
- Records of sites and facilities of the railway infrastructure and property;
- Cadastral data;
- Thematic visualization;

Advantages:

- Complete solution for asset management of railway infrastructure and property in a single environment;
- Quick access to integrated information from different sources;
- Management of information in real time;
- Strong analytical capabilities;
- Prioritization of efforts in planning and maintenance;
- Multiple options for information display;
- Implementation of international standards and models;
- Use of long experience of ESRI, GIS as a leader in Bulgaria;

GIS NRIC includes two major subsystems: "Railway" and "Cadastre and Property Register'. Each subsystem has a desktop and the Web Part. All these components are tightly integrated and used together. The system gives opportunities for monitoring, evaluation and analysis of sites and facilities infrastructure to integrate the fulfillment of all staff to address strategic and operational tasks. Thereby improving the management of railway infrastructure and achieve significantly better economic performance.

In the future enlargement of the system is provided for the inclusion of subsystems for ‘Energy, signaling and telecommunications’ and ‘Manage the movement of trains and capacity.’ The system is a prerequisite for achieving long-term objectives for sustainable development and modernization of national infrastructure.

Evgenia Karadjova
General Manager, ESRI Bulgaria

12. KARTGEO LTD.
2007 - 2011

KartGeo Ltd. is a modern, creative company founded in 2004. Its main activities include map design and publishing; design, development and maintenances of information systems, GIS, GPS and communication technologies; software applications development; survey; remote sensing.

The company works with a wide variety of clients on custom map projects. It provides services and products to the National Assembly of the Republic of Bulgaria, the Ministry of Environment and Waters of Bulgaria, the Geodesy, Cartography and Cadastre Agency, the National Railway Infrastructure Company, the Bulgarian Tourist Union, Bulgarian regional and local authorities; companies; tourist, geographic and sport societies. The company participates in cross-border projects, regional and local development projects.

In the field of cartography KartGeo Ltd. has a great experience with tourist and mountain mapping, as well as mapping for disaster management. The company aims to design and create accurate, up-to-date, useful and attractive maps.

In the period 2007–2011 the company worked on the production of a wide range of high quality cartographic products. Some of the cartographic projects of KartGeo Ltd. are:

Sofiyska Mala Sveta Gora, 2011

A detailed tourist map covering Sofia and the mountain areas surrounding it. Scale: 1:140 000, size: 50 x 70 cm.

Sofiyska Mala Sveta Gora is a unique complex of monasteries surrounding Sofia. Situated in the most beautiful mountain areas of Vitosha, Lyulin, Lozenska planina, Stara planina and some plains, the monasteries represent a great part of the Bulgarian cultural and historical heritage. The map shows 65 monasteries. The most significant ones are represented by paintings, pictures and detailed information. The key to map symbols is in Bulgarian and English. The map is published in association with the Sofia Holy Metropolis.

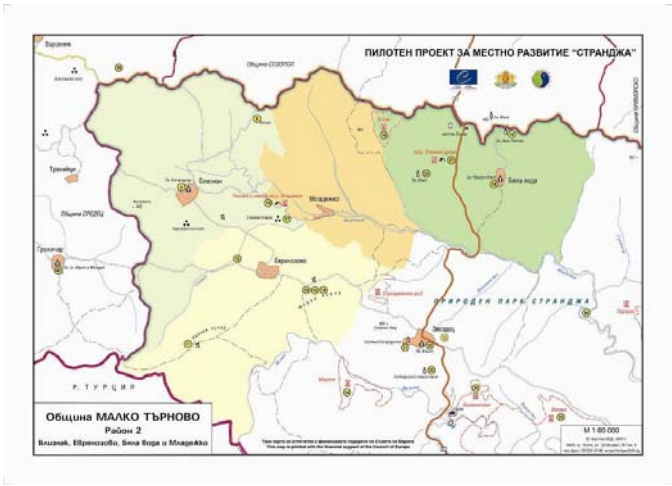
Sofiyska Mala Sveta Gora – tourist map

Maps according to the Local Development Pilot Project "Strandja", 2010

A set of maps of the territory of the Pilot Project covering the Bulgarian part of the Strandja mountain (1:110 000), the municipalities of Malko Tarnovo, Tsarevo and Sredets (1:60 000).

Local Development Pilot Project "Strandja"

Municipality of Malko Tarnovo



Municipality of Malko Tarnovo – Region 2

100 National Tourist Sites of Bulgaria, 2010

A compact, pocket sized tourist map covering the whole of Bulgaria and showing the most significant cultural, historic and natural landmarks of Bulgaria. Scale: 1:800 000, size: 50 x 70 cm.

The map publishing is ordered by the Bulgarian Tourist Union and aims to promote the National movement “100 National Tourist Sites”. It contains attractive individual paintings of all the sites. There is also an index, listing visitor information and contact details.

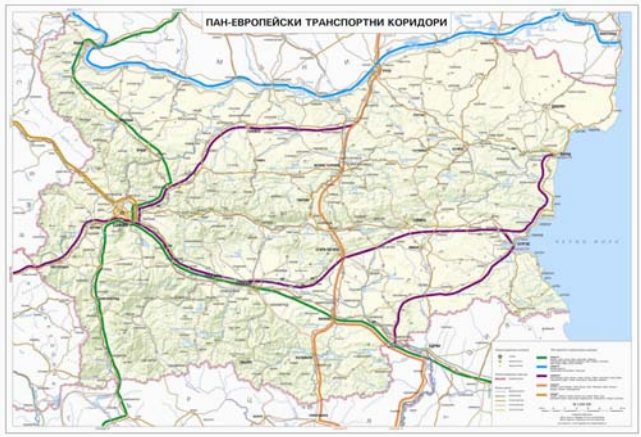
100 National Tourist Sites of Bulgaria – tourist map

Pan-European Transport Corridors, 2010

Scale: 1:2 800 000
Ordered by the National Assembly of the Republic of Bulgaria.

Pan-European Transport Corridors Passing Through the Territory of Bulgaria, 2010

Scale: 1:600 000
Ordered by the National Assembly of the Republic of Bulgaria



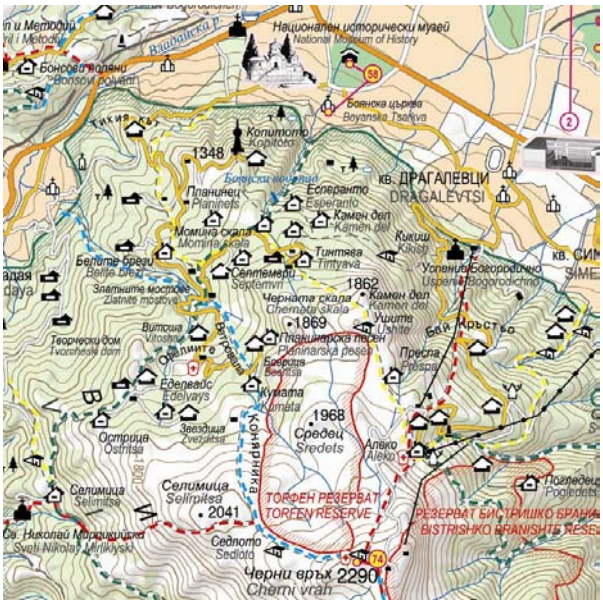
Pan-European Transport Corridors Passing Through the Territory of Bulgaria

Sofia and The Vicinity, 2009

A detailed small format tourist map covering Sofia and the mountain areas surrounding it. Scale: 1:120 000, size: 50 x 70 cm

Sofia and The Vicinity – tourist map

Ordered by the Bulgarian Tourist Union the map is designed to promote the cultural and natural landmarks in and around Sofia. It contains a selection of important tourist sites, marked trekking routes and protected areas. Some important buildings and places of interest in Sofia are presented by individual paintings. Geographic information about the mountains surrounding Sofia, tourist information about some important sites and attractive pictures are presented on the reverse. The key to map symbols is in Bulgarian and English. The map can be used for one or two day tour planning in the vicinity of Sofia.

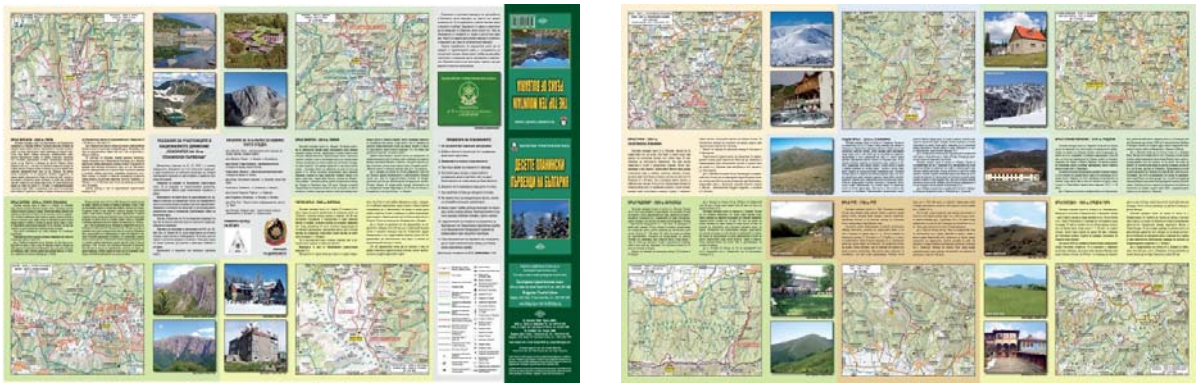


Sofia and The Vicinity – tourist map (fragment)

The Top Ten Mountain Peaks of Bulgaria, 2009

A small format tourist map containing separate detailed maps of the top ten mountain peaks of Bulgaria. Size: 50 x 70 cm

The map is ordered by the Bulgarian Tourist Union. The top ten mountain peaks of Bulgaria: Musala – 2925 m (Rila), Vihren – 2914 m (Pirin), Botev – 2376 m (Stara Planina), Cherni vrah – 2290 m (Vitosha), Ruen – 2251 m (Osogovska planina), Gotsev vrah – 2212 m (Slavyanka), Golyam Perelik – 2191 m (Rodopi), Radomir – 2029 m (Belasitsa), Ruy – 1706 m (Ruy), Bogdan – 1604 m (Sredna gora), are represented by separate maps including footpaths, trekking routes, tourist chalets and shelters, lifts, natural landmarks, places of interest, National Parks, Nature Parks, Nature Reserves. All marked trekking routes are highlighted. There are also useful tourist information and attractive pictures. The map key is in Bulgarian and English.



The Top Ten Mountain Peaks of Bulgaria – tourist map

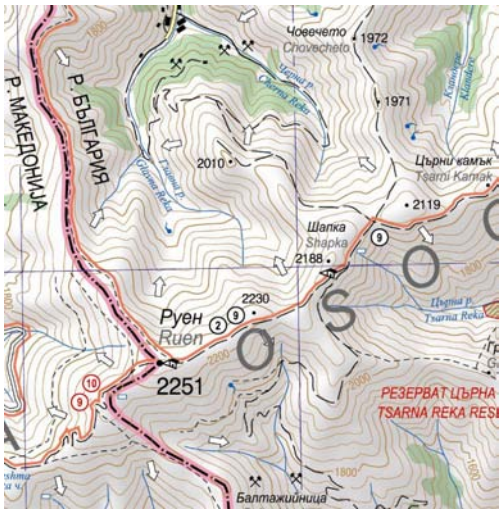
A tourist map of Vihren Peak, Pirin (fragment)

Osogovska Planina Mountain, 2009

A double sided tourist map covering the whole of the mountain area of Osogovska planina. Scale: 1:50 000, size: 70x100 cm.

The map publishing is ordered by the Bulgarian Tourist Union according to a cross-border project. It contains accurate and up-to-date information about the mountain area and the tourist infrastructure. The map includes all the marked trekking routes in the mountain both in Bulgaria and Macedonia, tourist chalets and shelters, a selection of important tourist sites, protected areas. Index listing detailed information about the tourist routes in the mountain and hiking times is also included. The map is designed to be used for route planning, hikng and navigation.

Osogovska Planina Mountain – tourist map



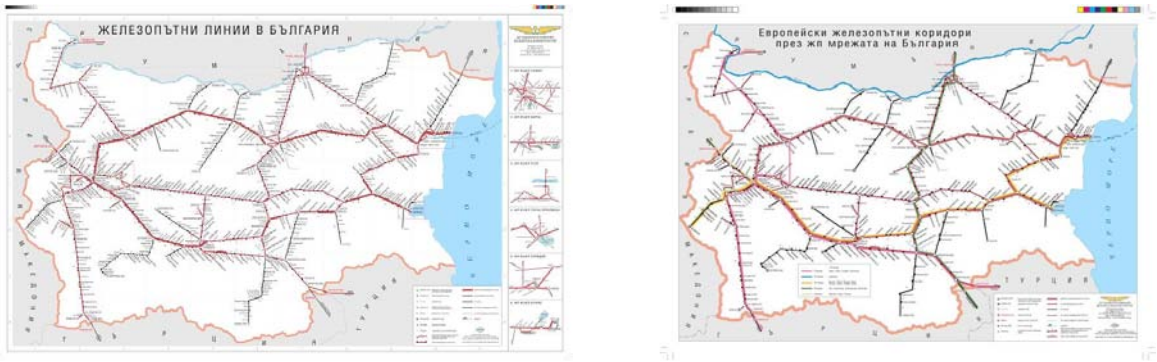
Osogovska Planina Mountain – tourist map (fragment)

Railway Lines in Bulgaria, 2009

European Railway Corridors Passing Through the Territory of Bulgaria, 2009

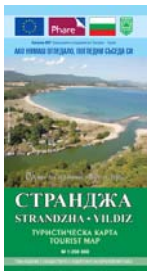
Ordered by the National Railway Infrastructure Company, Bulgaria.

A set of maps covering the territory of Bulgaria and representing the railway lines, their type and condition as well as the European railway corridors passing through the territory of Bulgaria. All elements of the railway infrastructure are featured in accordance to the requirements of the National Railway Infrastructure Company.



Railway Lines in Bulgaria (left)
European Railway Corridors Passing Through the Territory of Bulgaria (right)

Strandzha, 2008

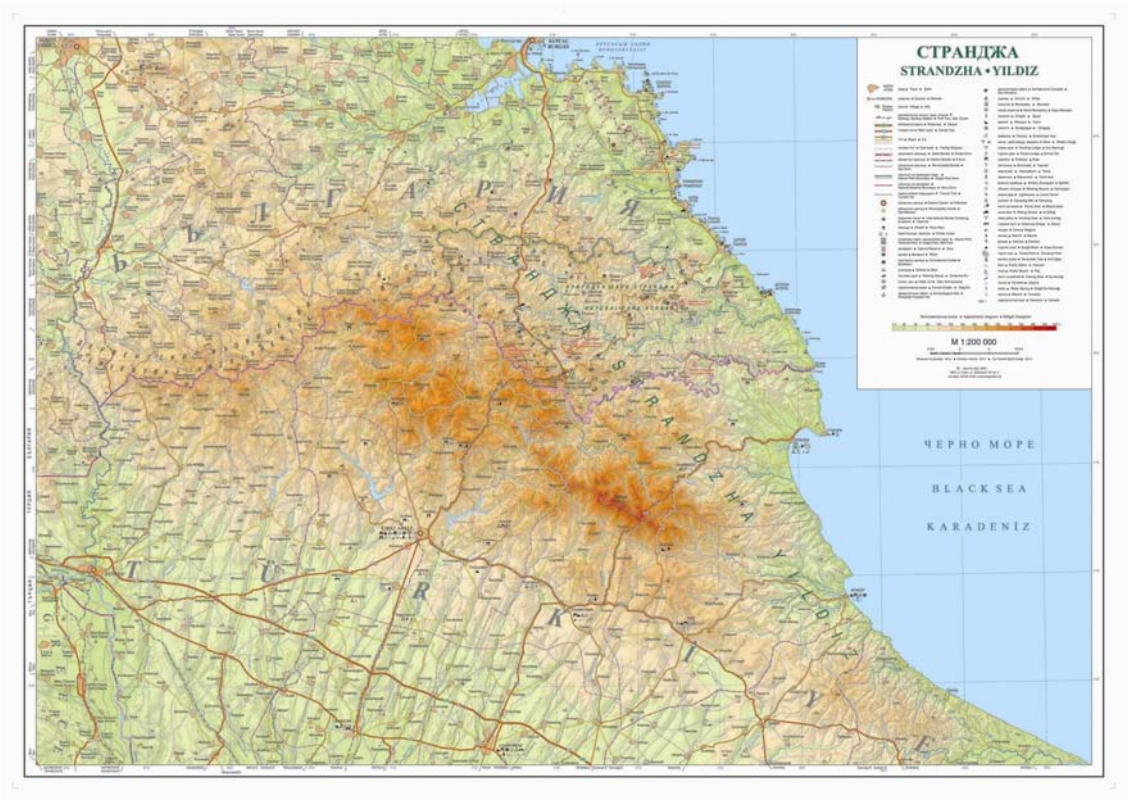


A detailed map that covers the whole of the cross-border mountain area of Strandzha. Scale: 1:200 000, size: 70 x 100 cm.

The map publishing is ordered by the municipality of Malko Tarnovo according to the BG2005/017-453.01.02.01-13 project which is a part of the Phare Programme Cross-Border Cooperation Bulgaria – Turkey "Grant Scheme for Promotion of Sustainable Development in Strandzha/Yildiz Mountain Area". The project is carried out both by the Bulgarian and the Turkish side of Stranzha/Yildiz mountain area and contributes for the enhancement of the sustainable development of the region. The activities take place in the municipalities of Malko Tarnovo, Kirklareli, and Tsarevo. They include making of inventory of the resources for the development of ecotourism of Strandzha Mountain; support of the economic growth of the local communities; publishing of the first tri-lingual tourist map of Strandzha/Yildiz mountain area – in Bulgarian, Turkish and English languages; increasing the possibilities for alternative tourism in the target area.

The map includes a huge amount of detail. It depicts the tourist infrastructure of the region, the most significant places of interest including archaeological sites, fortresses, museums, monuments, architectural complexes, caves, road network with classification, administrative units, tourist trails, Nature Parks, Nature Reserves. Some of the most attractive sites situated in the municipalities of Malko Tarnovo, Tsarevo, Primorsko,

Sredets, Kirklareli are presented by comprehensive tourist information and pictures on the reverse. The key to the map symbols as well as the text information are in Bulgarian, English and Turkish.

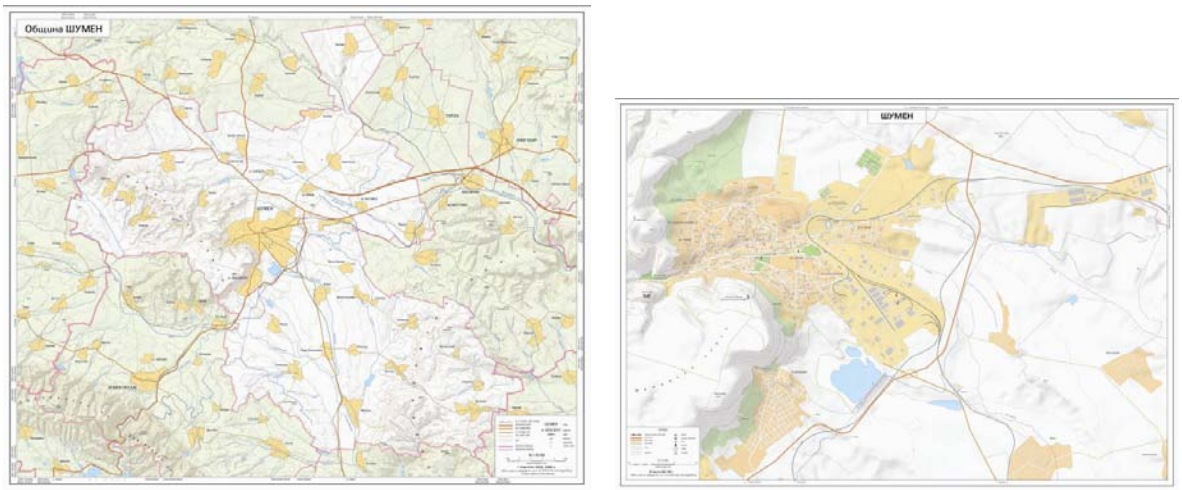


Strandzha – tourist map

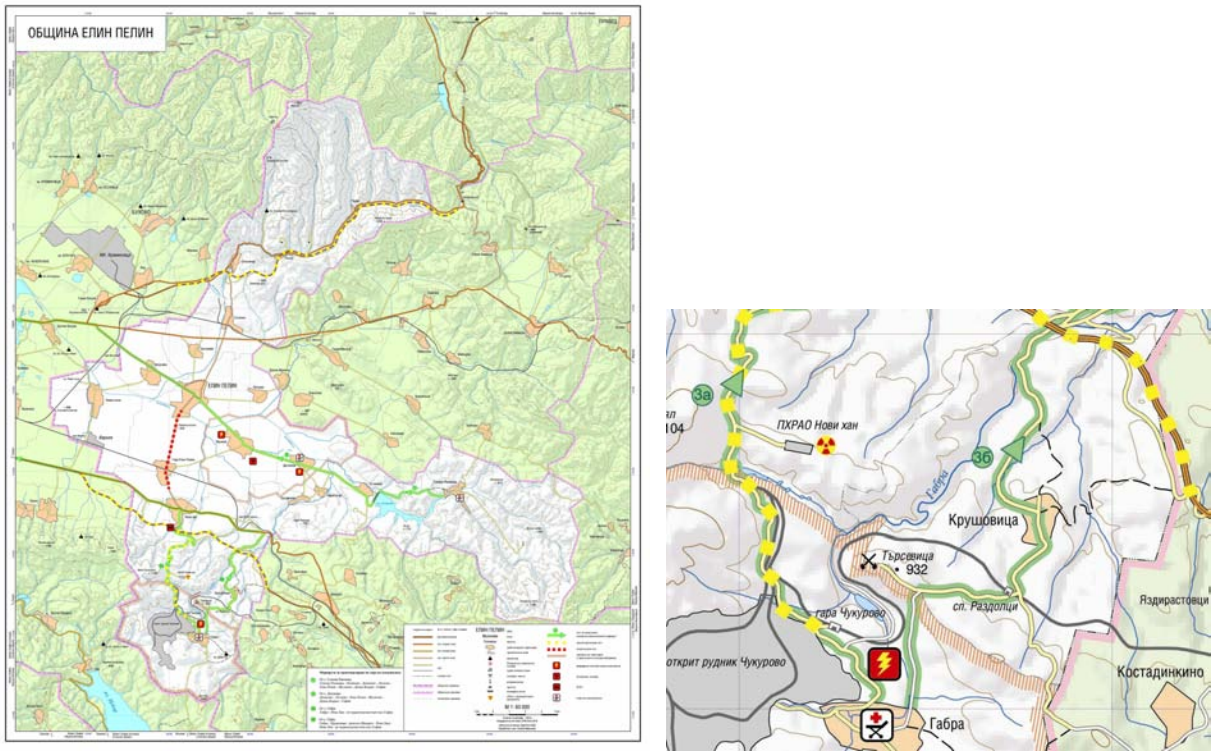
Strandzha – tourist map (fragment)

Maps for Disaster Management, 2007-2011

In the period 2007-2011 KartGeo Ltd. produced a series of maps intended to facilitate disaster prevention and preparedness activities of regional and local authorities.



Municipality of Shumen (left), The Town of Shumen (right)



Municipality of Elin Pelin

You can find more information about the activities of KartGeo Ltd. in the Web site of the company: www.cartgeo.com.

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www.cartgeo.com

13. KARTPROEKT LTD.
2007 - 2011

KartProekt Ltd. is a Bulgarian company established in 2001. The company provides a wide range of services in fields such as cartography, topography, survey, remote sensing, publishing.

In the field of cartography the company is specialized in: design, creating and publishing of a great variety of tourist maps; creating maps according to operational programmes; design, creating and publishing of custom maps ordered by regional and local authorities, companies, tourist, geographic and sport societies.

Some of the cartographic products that KartProekt Ltd. published in the period 2007-2011.

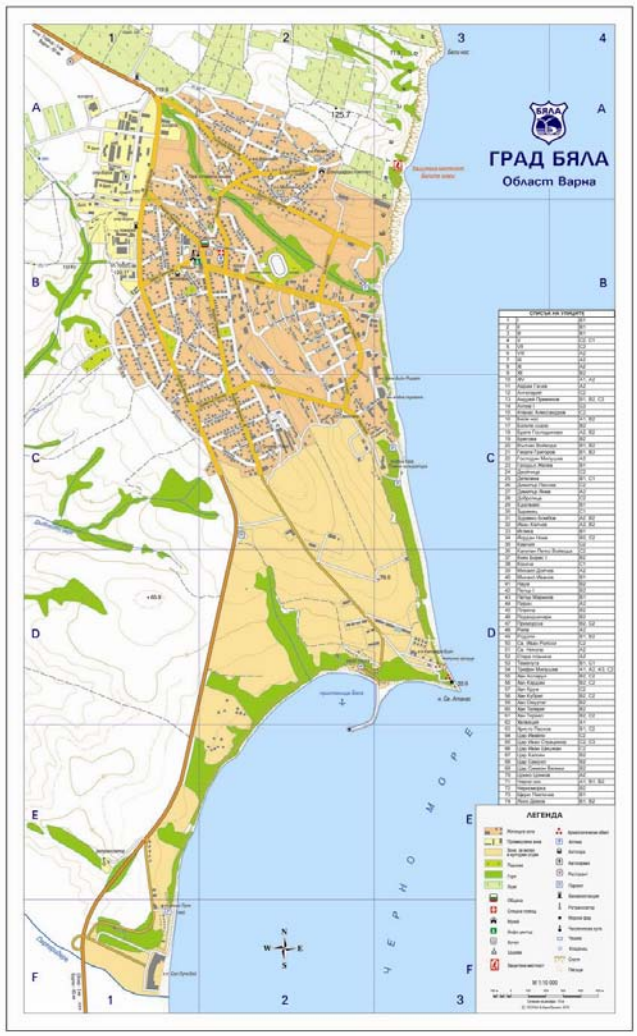
The Coastal Part of Stara Planina, 2011

Publishers: KartProekt Ltd. and Geopan Ltd.
Coverage: the East part of Stara planina and the Black Sea coast

The Coastal Part of Stara Planina – tourist map

The Town of Byala, 2011

Publishers: KartProekt Ltd. and Geopan Ltd.



The Town of Byala – tourist map

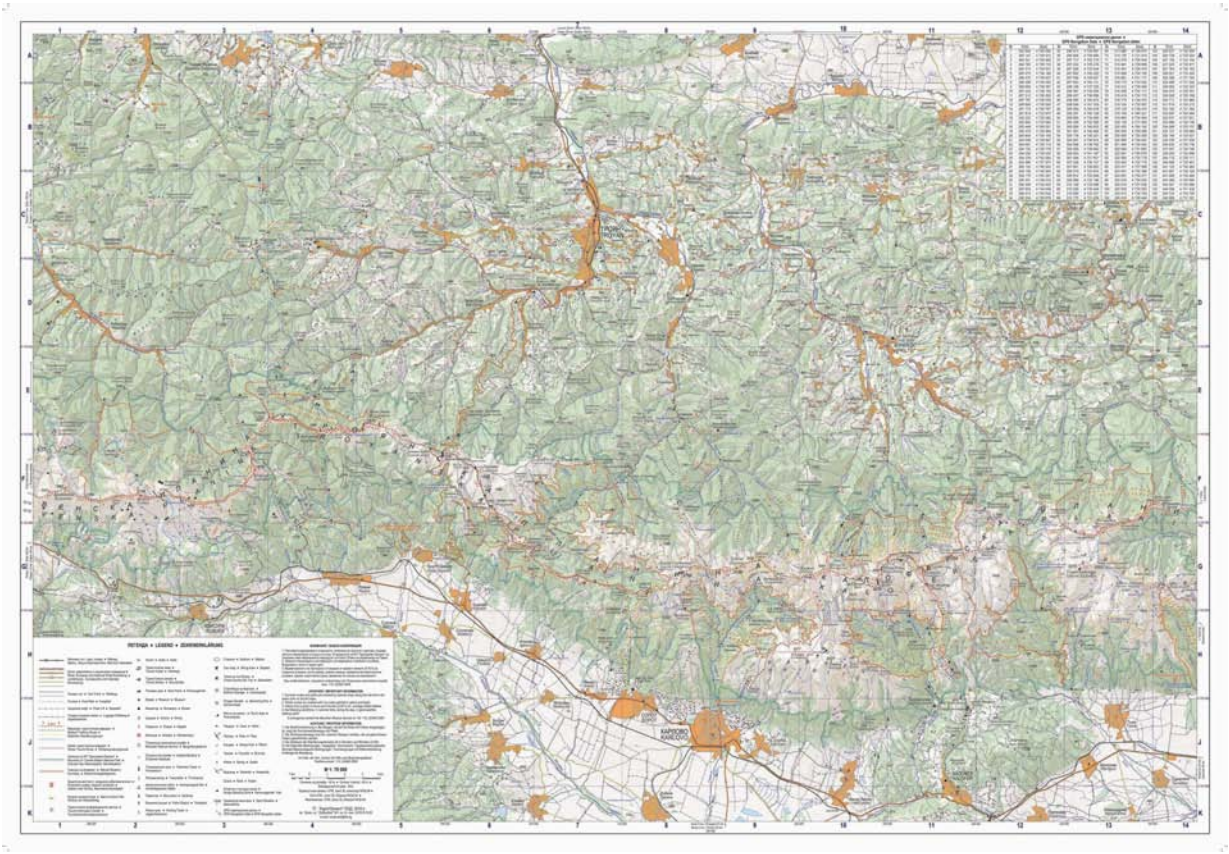
Troyanski Balkan /Troyan Balkan/, 2010

Publisher: KartProekt Ltd.

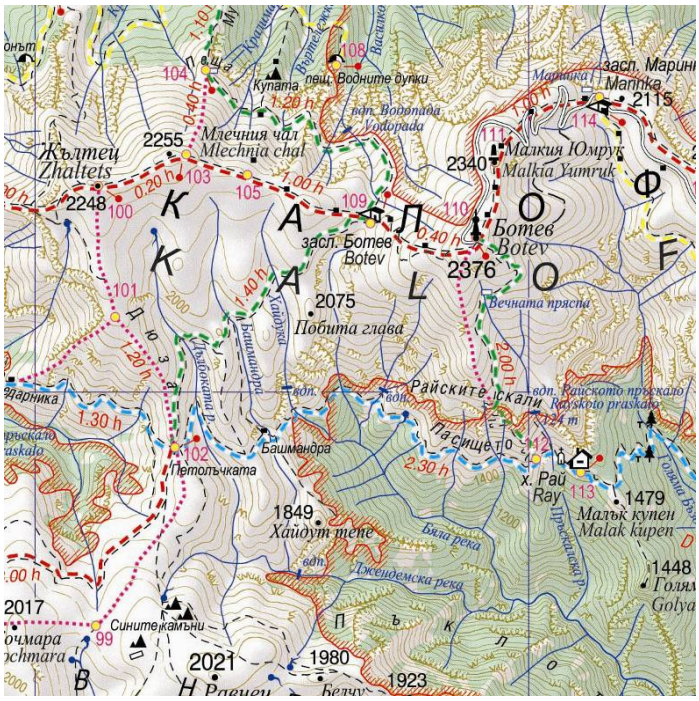
A detailed tourist map covering the highest and most attractive part of the Central Stara Planina - Vezhen Peak Kozya Stena Peak, Beklemeto Pass, Levski (Ambaritsa) Peak, Botev Peak, Triglav Massif. Scale: 1:70 000, size: 70 x 100 cm.

A huge amount of detail is included without compromising the clarity. The map contains up-to-date, accurate and detailed information about the territory and the tourist infrastructure. It includes railway lines and stations, detailed road network with classification, footpaths, eco-trails, protected areas, tourist chalets and shelters, hotels, rest homes, archaeological sites, natural landmarks and other places of interest.

The map depicts the boundaries of the Central Balkan National Park and the natural reserves located in the park.



Troyan Balkan – tourist map



Troyan Balkan – tourist map (fragment)

The map of the Troyan Balkan shows all summer and winter marked trekking routes with approximate hiking times. A list of tourist sites and important points with GPS-data is also included. The key to map symbols is in Bulgarian, English and German.

Comprehensive information about the mountain, the municipality of Troyan, tourist chalets and sites is provided on the reverse. It also contains information about dangers in the mountain as well as advices of the Mountain Rescue Service. The map can be used for route planning and navigation.

The map is issued to support the activities of the Mountain Rescue Service in Troyan

Devetaki Plateau – Routes and Sights (Information Boards), 2010

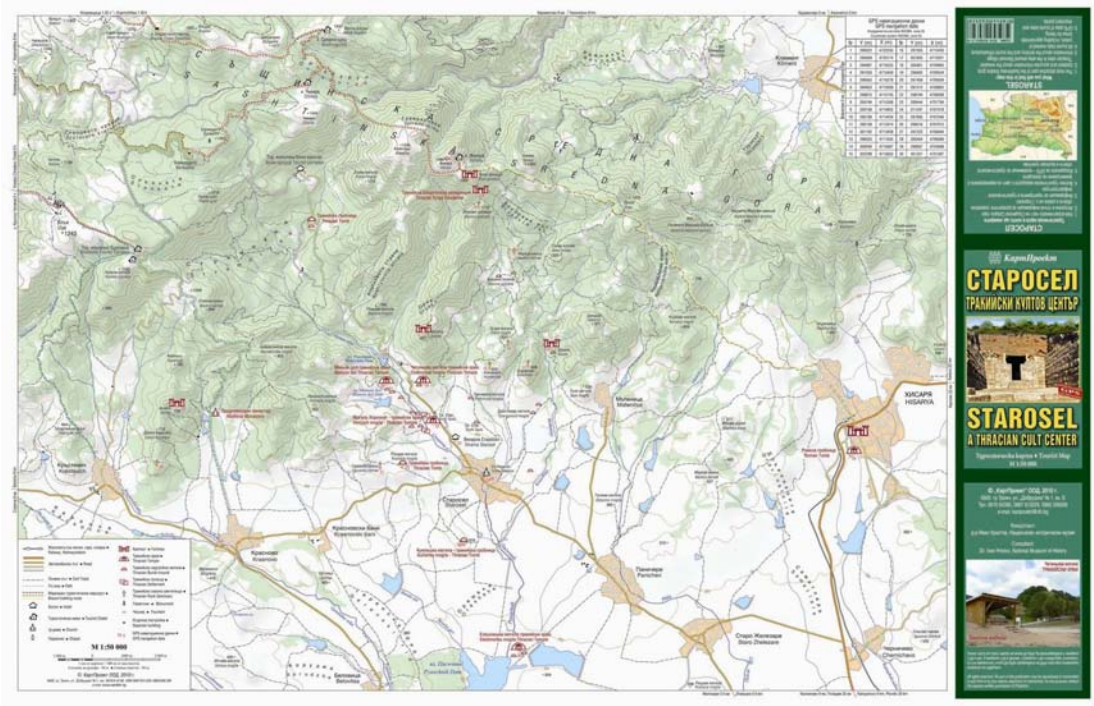
Publisher: KartProekt Ltd.
Ordered by: Devetaki Plateau Association

Archaeological Sites Surrounding the Kozi Gramadi Peak, Municipality of Hisarya, 2010

Publisher: KartProekt Ltd.
Ordered by: The National Museum of History

Starosel - A Thracian Cult Center, 2010

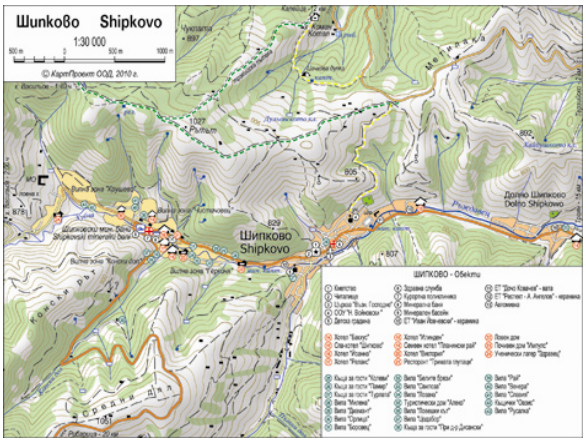
Publisher: KartProekt Ltd.
Coverage: the area of the revealed Thracian sites around the village of Starosel.



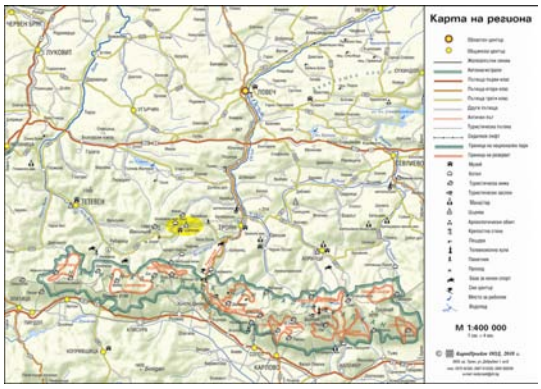
Starosel - A Thracian Cult Center – tourist map

Shipkovo Resort, 2010

Publisher: KartProekt Ltd.
Coverage: the most attractive tourist sites in and around Shipkovo resort



Shipkovo Resort – tourist map



The Region of Shipkovo Resort – tourist map

Bulgaria, 2010

Publisher: KartProekt Ltd.

A map of Bulgaria

Starosel - Thracian Monuments and Tourist Sites, 2009

Publisher: KartProekt Ltd.
Ordered by: The National Museum of History
Coverage: the area of the revealed Thracian sites around the village of Starosel

Starosel - Thracian Monuments and Tourist Sites

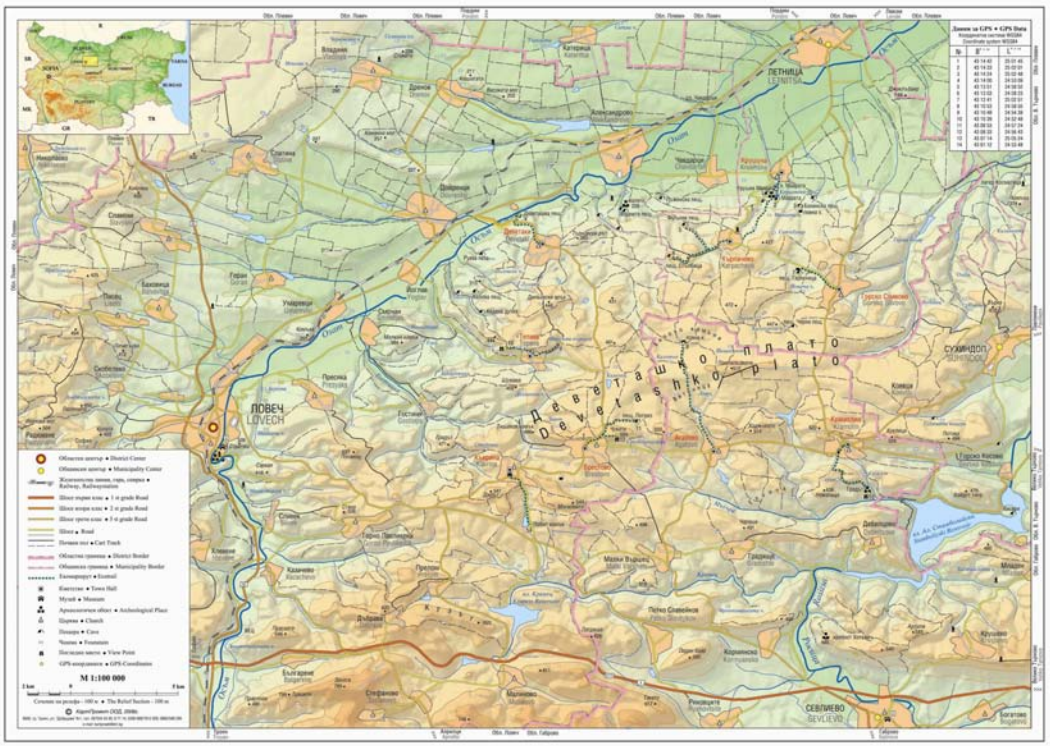
Devetaki Plateau (Information Boards), 2009

Publisher: KartProekt Ltd.
Ordered by: Devetaki Plateau Association

Devetaki Plateau – information board

Devetashko Plato /Devetaki Plateau/, 2008

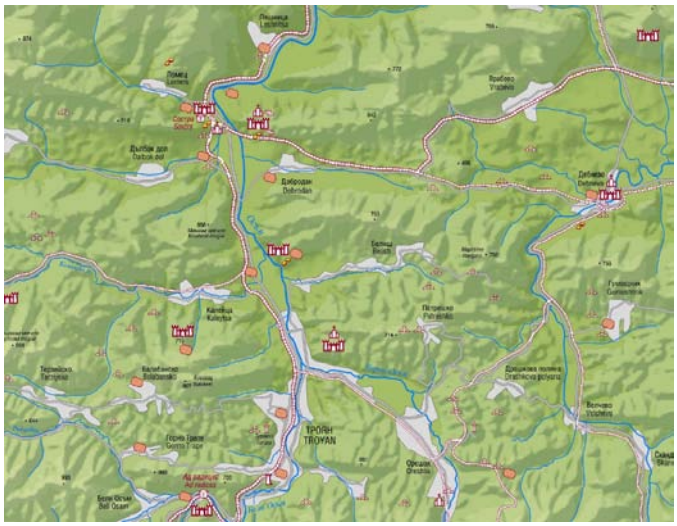
Publisher: KartProekt Ltd.
Ordered by: Devetaki Plateau Association



Devetaki Plateau – tourist map

Archaeological Sites in the Region of Troyan, 2007

Publisher: KartProekt Ltd.
Ordered by: The National Museum of History
Coverage: the Central Stara Planina – the Municipalities of Troyan and Apriltsi



Archaeological Sites in the Region of Troayan (fragment)

Erkesiyata, 2007

Publishers: KartProekt Ltd. and Geopan Ltd.
Coverage: South-East Bulgaria
The map represents the Old-Bulgarian border rampart Erkesiyata

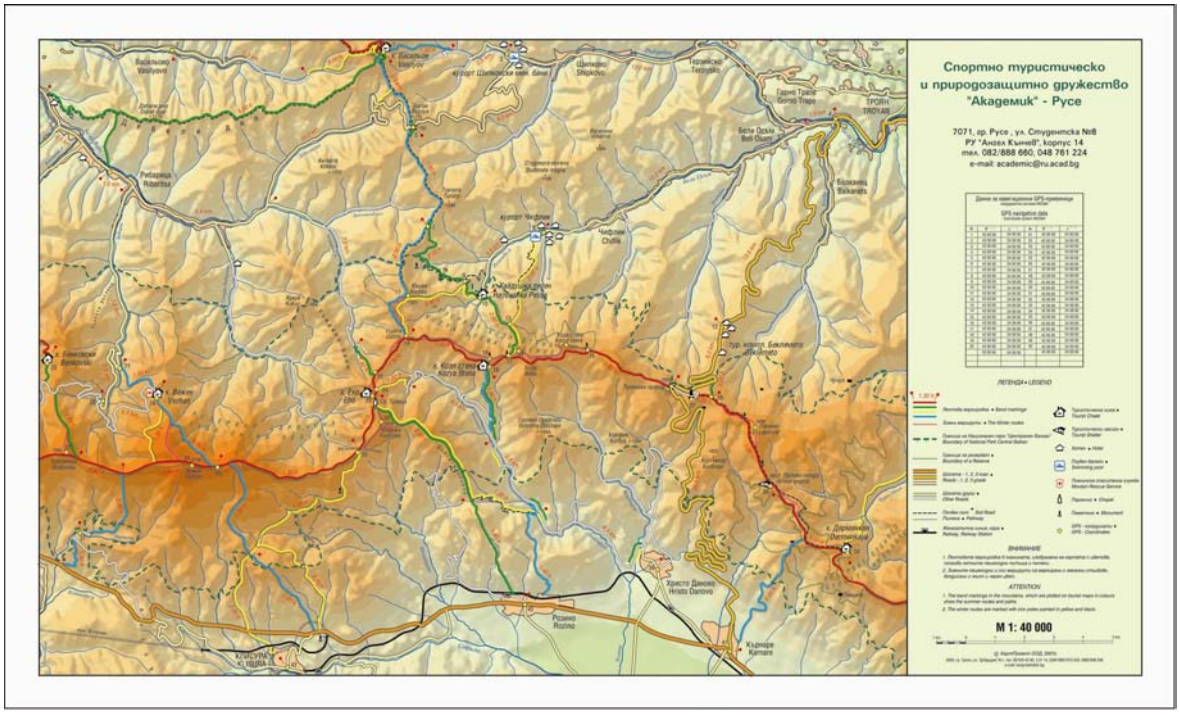
Old-Bulgarian Border Rampart Erkesiyata

Bulgaria, 2007

Publisher: KartProekt Ltd.
Ordered by: Global Housing & Develoment Corporation

STPD Akademik Ruse, 2007

Publisher: KartProekt Ltd.
Ordered by: STPD Akademik Ruse
Coverage: a part of the mountain area of Central Stara Planina



STPD Akademik Ruse

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14. CARTOGRAPHIC RESPONSE OF CHANGES IN GEOGRAPHICAL AND HISTORICAL SCHOOL CURRICULUMS

We are living in the time when many GI specialists will recommend usage of electronic maps and atlases and will not develop traditional cartography based on paper version products. The report consider both aspects: why we are not ready to use only electronic version of maps and atlases; how we can improve the traditional cartography – by new topics and modern visualization. Several examples are given by the latest school atlases which are used in Bulgarian education in geography and history.

Some new aspects in cartographic products and visualization were created because of permanently changes in school curriculum and in the content of the geography and history atlases. Working by experiences and research in the schools, cartographers try to be better in all steps in maps' and atlases' creation and compiling.

INTRODUCTION

Working in cartography field the specialists should respond to every day changes of the life. But several months or years are necessary to change school curriculums. Meanwhile new important topics appear and cartographic products become outdated ones before their creation. Were we ready to respond to Haiti children after the earthquake that struck on Jan. 10, 2010? „A study by the Inter-American Development Bank estimated that the total cost of the disaster was between $8 billion to $14 billion, based on a death toll from 200,000 to 250,000. That number was revised in 2011 by Haiti's government to 316,000" (The New York Times, 2011). Are we ready to respond to the technically most developed nation and its children – Japanese children? Let's think about what happened for the first three months of 2011: floods, earthquakes, landslides! Some scientists and journalist already defined 2011 as "a year of disasters". McKibben B., 2011 gives us some data which is used to complete Table 1.

Types of disaster	Place	Time, 2011	Human cost	Economic cost
Earthquake of magnitude 9.0 , followed by a 15-20 m high tsunami	Japan, north-east coast	March	More than 10,000 dead; 17,000 missing	€ 215bn
Landslide	Brasilia	January	916 dead; 345 missing	€ 213m
Floods	Australia	Nov., 2010-January	37 dead, nine missing	€ 22bn – Australia's costliest natural disaster ever
Earthquake of magnitude 6.3 hit the city of Christchurch	New Zealand	February	166 dead	€ 5bn-€ 7.6bn
Devastating floods	Sri Lanka	January-February	62 dead; 1.1 million displaced	€ 340m
Earthquake of magnitude 6.8	Myanmar (Burma), 30 miles north of Tachileik on the Thai-Burma border	March	At least 75 dead; more than 110 injured	Not known in April 3rd, 2011
Floods, Heavy rains continued from December last year	Philippines	January - March	At least 75 dead	€ 30m
Severe storms, lightning and floods	South Africa	January	91 dead, 321 injured	€ 83m

Table 1. Natural Disaster in 2011 (January - March) by data of McKibben B., 2011.

During the last 3 months amount of countries and millions of people were affected (see Table 1). How cartographers will respond to children from Japan, Brasilia, Australia, New Zealand, Sri Lanka, Burma, Philippines and South Africa? In such moments it is visible that we are not ready to give response, it is visible that we are too slow to change something, that we are not ready with standards and visualization of all process that are happening around us in the nowadays geography All these comments make evident the need of more scientists to work on the topics, of more projects to be financed and developed, of more governments to help the scientists to develop standards and fast responses to everyday changes and to prepare our children and students for right behavior and give them enough information and knowledge.

Natural disasters are only one the many topics such as globalization, sustainable development, environmental protection that should appear in geography and history subjects in school curriculums. They are relatively new and find places in school curriculum's changes. Cartographers try to respond by including such themes in their new cartographical products illustrating that way geography and history lessons. The problem is that these cartographical products need to be updated more often that it is doing now.

CHANGES IN GEOGRAPHY AND HISTORY CONTENTS

The Ministry of Education in Bulgaria is responsible for the creation and approval of school curriculum for all subjects in elementary, secondary and high education. Here I will describe the situation in geography and history subjects. The changes are happening every 5 to 10 years. This situation is not typical only for Bulgaria. Zhang and Foskett (2003) declare for UK that the changes are in subject matter in 15 sets of British geographical text-books from 1907-1993. Some of changes are from general to regional aspects similar as concepts "regions" in elementary and secondary schools in USA (Stoltman, 1992). These changes lead to new aspects, details and topics in teaching problems. Every new curriculum is made to improve educations and give children more new aspects of modern society. In many countries this is done to provoke independent and active learning (Paris and Byrne, 1989).

A new law about elementary, secondary and high education in Bulgaria is preparing in the moment. This will bring new changes in geographical and historical curriculum. Many changes were done also in last few decades. The largest ones were in the general context of the mentioned subjects. The school subject of Geography changed its name to "Geography and economics" and History one – to "History and civilizations. These new scopes developed many topics which enlarged simply subjects 'geography' and 'history' to more broad ones including sustainable development of the society. The content in geography was enriched with some new topics like risk management, environmental protection and ecology. New topics also arisen in history field. As example we could present a visualization of Troy war and brigade distributions in socialistic time among others

CARTOGRAPHICAL RESPONSE TO THE NEW ASPECTS IN GEOGRAPHY AND HISTORY SUBJECTS

To help geographical and historical education, cartographers propose different types of cartographical products: wall maps, atlases, electronic atlases, contour blind maps, globes, virtual cartographic representations, etc.

Kindergarten

The first questions could be “when we should start?” There was a discussion between old cartographic generation keeping positions in state cartographic company and new generations, working for different private companies. Before 1990 students faces with the first map in the geography lessons in 3rd grade (10 years old children). Nowadays children receive everyday information by media, radio, TV, Internet and they start to use and read maps in their kindergarten ages. The fact that young kids are able to use maps was proved by experiences with children in 15 kindergartens in Sofia. Children had knowledge about the continents’ names, Bulgarian boundaries and cities, the names of the biggest mountains and rivers. They have been very active and accepted the questionnaire as a pleasant game. On the base of this experiment we created 2 posters for kindergarten: 1. Plants and animals in the World and in the opposite side of the poster: Plants and animals in Bulgaria (see Figure 1). 2. The major sights in Bulgaria and in the opposite side of the poster: 6 great Bulgarians important for our history (see Figure 2).

Figure 1: Plants and Animals in the World

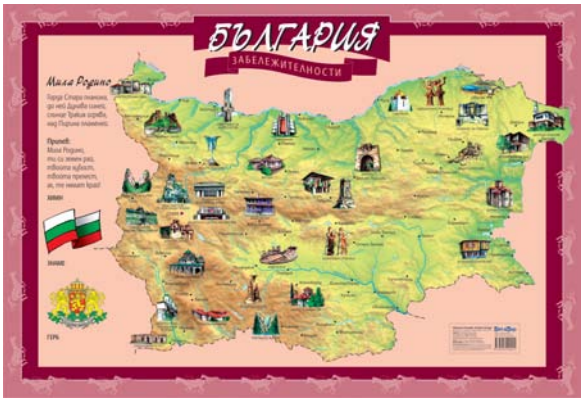

Figure 2: Major Sights in Bulgaria

Our work for and with children in kindergartens aims to achieve results in several aspects:

- prepare children for first lessons in school which need use of maps;
- improve their geography culture;
- give them additional knowledge in distracting way : by playing games and drawing pictures;
- show them art aspect of the maps and train them in aesthetical view of the maps.

All participants in this initiative believe that these kids will learn how to use maps in an appropriate way Facing with maps of high quality teachers and kids will be able to distinguish the good and useful products from the low quality ones which are sold on our free market.

Electronic variants of cartographic products

Students and kids share the values of a new generation who is using computers every day for every need. That is way the most appropriate solution is to propose geographical and historical mapping visualization through the medium of electronic cartographic products. Several ideas have been realized worldwide. An electronic school atlas of Quebec is a good example of product which architecture and content is connected to the child (Anderson, Carriere and LeSann, 2003). Other research (Pfander, Kollen and Greenfield, 2004) represents the Arizona Electronic Atlas (http://atlas.library.arizona.edu) as an interactive Web-based state atlas which allow users to create, print or download maps and data.The efforts of its creators are focused on the integration of the Atlas into the university classroom.

There are different opportunities for students training in organizing information according to classification schemes, understanding intellectual property rights and mastering the use of Internet based tools in the Norwegian GeoAtlas (http://www.avinet.no/). A lot of examples of electronic Atlases are available on the market and in the web. Nevertheless only few of them are developed for children and students use. There are large numbers of advantages of these atlases. They are well described by Uluğtekin and Bildirici (1997). One of the biggest advantages is shown by the same authors as they wrote “Atlas publishing in electronic form will become financially interesting more and more”.

After this short introduction about electronic atlases development in the world, we could pay attention to Bulgarian version of such atlas, called “MaxInfo”, product of Datamap-Europe Ltd. It contains a lot of information about Bulgaria, Sofia and other Bulgarian cities: maps, legend, photos and texts (see Figure 3). This information could be visualized in computer screen and printed after that. Teachers and students could include the necessary objects by interactively chosen symbols and automatically situate them on the base map. The students can search the necessary information by taping a keyword and situate or see it in pictorial and/or text form. In such a way they get knowledge about GIS function in the first step of their education. The Atlas is working in user-friendly way, so the students will begin to use GIS questions and will understand the productivity and usefulness of the real GIS (Bandrova, 2001).

Figure 3: A possibility of electronic atlas for data combining and use

The training with electronic atlas could be directed in 3 points:

- ***Work with data.*** Different kind of tasks can be given to students. They can select a list of type objects, classify objects, examine some details of every object and connect them with information for other objects. It is flexible system for object searching according to different criteria – name, type, address, key words and others. Every reference can be saved for future usage.
- ***Work with maps.*** There is a possibility for scaling maps, move map images, switch on or off the visibility of layers, choose a symbol system for object mapping.
- ***Work with data and maps.*** Students can add data on a map as a separate map layer, receive information for objects, find the object situation from a data list, etc. Examples of teachers tasks can be the following according to Ormeling F., (1996):
  "1. What is on a map (identifying);

  2. What is where on the map (classifying);

  3. Do you see a relationship on the map (relating);

  4. Check if this relationship is valid for each region on the map (checking, monitoring, validating)".

This electronic atlas has CD version and it is sold in Bulgarian market. This makes it difficult for use by teachers and students. Main users came by business field. Students are using free version of another Bulgarian web based atlas. It can be found on www.bgmaps.com. Its main purpose is to give the possibility to find address in the city situation. It is not adopted for student or children use.

Compromises?

Compiling and mapping geography and history information which we needed for school atlases and wall maps provided us with enough data which allow us to produce electronic or virtual variants of these cartographic products. From cartographer's point of view this will not be a problem. Also in these days many variants of electronic text-books appeared. It is clear that this will be the future of the school cartography development. However, the situation is still bad because of the poor computer equipment in school rooms. Only one room per a school is equipped with computers. This room is all time occupied by students studding computer science. There are no possibilities for geography teachers to use this room for their lessons. For this reason we still propose only paper atlases and wall maps in Bulgarian market. However, in outline maps and in some atlases there are tasks that require from users to perform an Internet research. Other reason are the open issues in terms of legacy. The students will use their personal notebooks we cannot allow usage of illegal software. Unfortunately, the necessary software for cartographic applications is too expensive. This point of view has been developped in the work of Gold (2008). He states that

„However, where vandalism, or irresponsible use such as software piracy, are perceived to be problems with the result that the machines may only be used when staff supervision is available, then even a large number of microcomputers in a laboratory may provide extremely limited access to students taking computer cartography courses".

A good idea is that geography and history lessons could be developed as computer games apropriate for different ages. Such experiment could be found in The Serious Games Institute (SGI) at Coventry University. Wortley (2008) says that it is established to „create an international centre of excellence for serious games and virtual worlds. The SGI has been pioneering the use of virtual environments for a range of applications which include e-learning, simulation, disaster management, virtual conferencing and social and business networking". Here, the issue is how to make such product cheep enough or free of charge for teachers and students and how to make it attractive enough for students' needs.

Modern visualization

The visualization of geographic and historic information on the school atlases is one of the main topics of modern cartography. Mapmakers should reach students' attention and provoke map reading and analysis. How do children think in terms of cartographic aspects? We can find different responses on this question as well as a lot of proposals. Many of these proposals are the result of questionnaire research. Reyes Nunez at al (2005 and 2008) on the base of international research and questionnaire propose to be used "**satellite images** in the textbooks and atlases..., which help the pupils to understand the content of the physical maps by visualizing the represented territories in their natural dimensions" (Reyes Nunez at al, 2008).

How to visualize the necessary information; how to choose the appropriate symbol system, what colours we should use? The answers of these questions need experiments with children to understand their maps' perception (Konecny and Svancara, 1996). To work with students and to be close to their thinking is one of the main steps of proposed technology for atlases creation in the work of Bandrova (2007). After many experiments, conducted mainly by questionnaire the prepared maps and atlases were approved and later published (Bandrova, 2010).

Figure 4: Use of photos and drawings in map's design

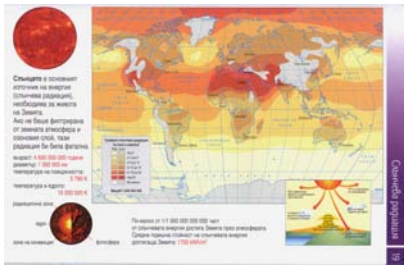

Figure 5: Use of diagrams and text in map's design

Figure 6: Visualization of different kinds of maps and mapping

There are several main differences in comparison with the old atlases proposed on the Bulgarian market:

- Usage of many photos and drawings in maps' and atlases' design (see Figure 4). This attracts students and direct their attention towards the topic of the maps;
- Use of different diagrams, statistics and text like in encyclopedia style (see Figure 5). These not only textual but also visual elements capture students' attention, provide them with more specific and curious information which is easy to understand and memorize. Use of examples in topic explanations. On Figure 6 this method was used to explain different types of mapping and maps;
- Use of colors on the borders of the pages or under the title to separate different parts of atlases.

All these improvements accompanied by the high quality printing and publishing make the atlases popular and attractive for students, parents and teachers.

New topics

The adoption of the new topics in the atlases and wall maps is related to the new curriculums in geography and history. Cartographers must adjust their products to the new curriculums because their cartographic assets should be approved by the Ministry of education. Thereby, these products could be used in Bulgarian schools.

New ideas and maps in the Geographical Atlases

Some the new topics are included in order to facilitate the teaching of other topics that the students find difficult to understand. For example different kinds of mapping and maps (see Figure 6) or map projections (see Figure 7).

Another reason is to help teachers and students to understand more complicated themes in their lessons. Map projections represent such a challenge. We try to show students how we manage to display the sphere on the plane. Different kinds of deformations appear (area, linear or angular) as a consequence of this transformation. This is visible in the map-play included as a separate part of the Atlas on geography – a puzzle or an icosahedron (volumetric map of the world with 20 equal triangular parts in gnomonic projections). The play with them is multifunctional in terms of geographical, cartographical and mathematical aspects (see Figure 7).

Figure 7: Map puzzle is used in lessons on map projection and deformations

Other new topics which appear in the geographical atlases are related to natural risks and disasters, natural resources, ecology and others.

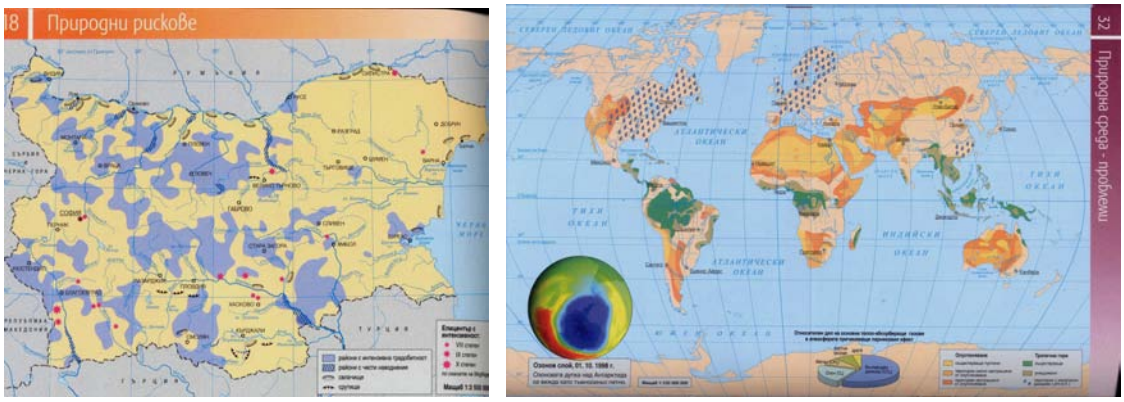

Figure 8: Maps from school atlases representing nature risks and disasters

Such examples could be seen on Figure 8. Children and teachers are prompted to describe and analyze the most affected territories and spots where disasters are likely to happen or some consequences that have already appeared. On the base of such maps some preventive activities could be planed and discussed.

The cartographer's role is to help children, students and teachers in their educational process. Another goal is to direct students attention to the global and regional problems and to the ways to improve and safe the environment. The next tasks are to find data and represent it in regional atlases in larger scales and thus we will help also regional geography items.

New ideas and maps in the Historical Atlases

The old historical atlases were criticised by teachers mainly in the following directions: too many represented objects from general geographic base, a lot of information represented in atlases for young students (for example, the history maps of Bulgaria for school years 5. and 11. have similar contents), too many symbols in common legend. The authors tried to avoid these difficulties and the new historical atlases are compiled on different way:

- clear general geographical base: only the biggest and relevent to the map's topic rivers are represented, the shade relief has replaced a lot of mountains names;
- different representation of one and the same theme for different school years: maps, compiling atlases for high school have richer content needed to studied topics;
- not so many symbols (only the most associative ones, for example, symbols represented state border, city, capital, etc.) are represented in the general legend.

Figure 9: A map for the Trojan War published in the Historical Atlas for school year 7

The new idea for atlas compiling is related to representation of specific themes in the Atlases. Such theme is the Trojan War which is not represented in old atlases. It is mapped based on the information taken from the Homer's poem "Iliad". The result could be seen on Figure 9.

1.  2.  3.  4. 

1. http://www.bc.edu/bc_org/avp/cas/ashp/NEWhp252/portnov/trojanwar.html
2. http://www.raremapsandbooks.com/index.php?main_page=product_info&products_id=12628
3. http://sillysoft.net/lux/maps/Trojan%20War%20-%20Year%2010
4. http://mmtaylor.net/Holiday2000/Legends/trojan.war.html

Figure 10: Different maps of Trojan War

The existing maps representing Trojan War (see Figure 10) did not provide us with the necessary information. The war was partly represented or with insufficient information. The explanations in text books should be expended with descriptions taken by literature. The teachers are very positively surprised when they receive such maps and can visualize their explanations.

Other new topics in historical atlases are related to the newest history. Brigade movement is one of the topics which are newly developed. These new maps regroup the distribution and localization of different meetings, grouping activities, protests and others are represented. The students have visualized topics and they can use the maps to connect historical lessons to situational facts.

CONCLUSIONS AND DIRECTIONS FOR FUTURE WORKS

The idea of this research was to find topics in school curriculum in geography and history where cartographers should react on fast way. The best variant is when people in responsible ministers react also on time and don't take an year or more but if it is not possible cartographers could propose some new themes as additional topics. This is allowed because the school atlases should contains about 20% additional contents than this one in school text books. Such examples are shown and the most important topics in these days are crises respond and disaster management. In the new Bulgarian atlases of geography some maps of these themes are already done.

Other decision could be if electronic variants of the atlases will be produced. Then the updating and including of the new themes could be easy and faster. The main problem for countries as Bulgaria is the possibility to use computers laboratories in the school in geography and history lessons. These laboratories are occupied by the lessons of electronic sciences and informatics. Teachers have not possibility to use them but students could use such atlases for home works and studying.

To help teachers in difficult topics cartographers could be ready to supply them with additional materials, maps, cartographic products. Such example is icosahedron product which will help teachers in explanation of map projection topic. Some new ideas for visualization of topics which are did not propose up to now will also help teachers and students in their educational process. Such example was a Trojan War.

The modern visualization in the new cartographic products (paper and digital) will be cartographers' target to reach students' attention and better understanding of all topics which should be studied. The electronic variants of atlases and maps give cartographers most power tools to do this by animation, sound and videos, 3D presentations and allowing users to produce their own products. This will be our tasks in the very close future to supply schools, teachers and students with such new cartographical products. This will be our respond to school curriculum changes.

REFERENCES

Anderson, J., Carriere, C., LeSann, J., 2003. *A Pilot Electronic School Atlas of Quebec.* International Research in geographical Environmental education, pp. 383-390, Vol. 12:4.

Bandrova, T., 2001. *The first Bulgarian Electronic Atlas – A Possibility for Cartographic Teaching in Schools*. E-mail Seminar of Cartography, Vol. 3, pp. 93 – 98, Sofia, Bulgaria.

Bandrova T., 2007. *Cartography – Close to Users: A Technology for Compiling of School Atlases for Education on Geography in Bulgaria*, XXIII International Cartographic Conference, 4-10 August, Moscow, Russia, CD proceedings.

Bandrova T., 2010. *Bulgarian Cartography: From Paper To Virtual Reality*. 3rd International Conference on Cartography and GIS, CD Proceedings, Nessebar, Bulgaria, ISSN:1314-0604 (keynote presentation).

Gold, C., 2008. *Cartographic Education in Canada,* [online] Available at:<http://www.voronoi.com/wiki/images/6/66/Cartographic_education_in_canada.pdf> [Accessed 09 March 2011].

Konecny, M., Svancara J., 1996. *(A)Perception of the Maps by Czech School Children*. Children and Education in Cartograpy. pp. 137-146, ICA, Gifu, Japan.

McKibben B., 2011. *Natural disasters?* The Guardian [online] Available at: <http://www.guardian.co.uk/world/2011/apr/02/natural-disasters-floods-earthquakes-landslides> [Accessed 03 April 2011].

Ormeling, F., 1996. *Teaching Map Use Concepts to Children*. Seminar on Cognitive Map, Children and Education in Cartography. Gifu, Japan.

Paris, S.G., Byrne, J. P., 1989. *The Constructivis Approach to Self-regulation and Learning in the Classroom*. Zimmerman B.J., Schunk, h. (eds.) Self-regulated Learning

and Academic Achievement: Theory, Research and Practice, pp. 169-200. New York, Springer.

Pfander, J., Kollen, C., Greenfield, L., 2004. *The Geographic Literate Student: The Arizona Electronic Atlas Experiment.* [online] Available at: <http://proceedings.esri.com/library/userconf/educ04/papers/pap5050.pdf> [Accessed 09 March 2011].

Reyes Nunez, J., de Moretti, C., Garra, A., Erika, G., Rey, C., de Castro, V., Dibiase, A., 2005. *Reading thematic maps in Argentine and Hungarian schools: experiences in both countries.* Mapping Approaches into a Changing World. 22. ICC 2005 conference CD Proceedings. A Coruna, Spain.

Reyes Nunez, J., de Moretti, C., Garra, A., Erika, G. Rey, C., de Castro, V., Dibiase, A., 2008. *Resuming an international project: Map use in Argentine and Hungarian schools.* Second International Conference on Cartography & GIS, pp. 113-122. ISBN: 978-954-724-036-0. Borovets, Bulgaria.

Stoltman, J., 1992. *Geographic Education in the United States: The renaissance of the 1980s*. Naish M. (ed.) Geography and Education. London University: Institute of Education.

The New York Times, 2011. *Haiti, Overview*, World. [online] Available at: <http://topics.nytimes.com/top/news/international/countriesandterritories/haiti/index.html> [Accessed 03 April 2011].

Uluğtekin, N., Bildirici, İ., 1997. *Advanced Mapping Technologies: Electronic Atlases.* Second Turkish-German Joint Geodetic Days, pp. 641-649, Berlin, Germany.

Wortley, D., 2008 GIS *And Virtual Worlds The Importance Of Place And Community*, Bandrova, T. (ed.), 2nd International Conference on Cartography and GIS, Vol. 1 pp. 317 – 322, UACEG, Sofia, Bulgaria, ISBN: 978-954-724-036-0.

Zhanng, H., Foskett N., 2003. *Changes in the Subject Matter of Geography Textbooks: 1907-1993*. International Research in geographical Environmental education, pp. 312-329, Vol. 12:4.

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15. NEW HISTORICAL ATLASES FOR EDUCATIONAL NEEDS

Bulgaria is a country with one thousand and four hundred years history and one hundred years tradition in cartography for education needs. But ten years ago only one state cartographic company was working in Bulgarian market as a monopolist. Its production did not change a lot during all fifty years of its existing. The new technologies connected with geographical information systems, the new ideas and cartographical concepts were alien for all cartographers working in this company.

Now the situation is changed and Bulgaria has free market. This fact has created concurrent firms making new, modern and more attractive atlases for children and education needs. The history as a subject in the schools also has developed itself and some new topics were represented in history curriculum and textbooks. The first lessons and historical maps appear in textbooks and atlases for school years 3 and 4 grade (ages 9-10 and 10-11, respectively) and the last ones - for school year 12, last grade of Bulgarian high school education (ages 18-19, respectively).

The proposed atlases, discussed in the report, are designed by the author and published by DataMap-Europe Ltd in Sofia, Bulgaria. They are designed for every school year of education and are accompanied with blind maps and wall maps for the most important periods. A technology for their creation includes GIS (Geographical Information System), rich geographical data base, historical sources and works with different specialists: history professors, teachers, GIS specialists, cartographers, artists, designers and specialists in pre-publishing and publishing process.

The first historical maps follow the logic and historic succession of studied themes for school years 3 and 4 (ages 9-10 and 10-11, respectively) of Bulgarian schools. They are connected with the reach history of Bulgaria. Each of the atlases for school years 5 and 6 (ages 11-12 and 12-13, respectively) contain about forty maps and every session is designed with different colour frame and starts by a chronology for the presented historical period. This is done for easy orientation in the atlases. The pages are designed accompanied by photos around the maps. This fact makes the atlases more interesting, beautiful and more informative school aids.

Some new topics are developed for the first time not only for Bulgarian but as well as for world cartography as a Trojan war, represented by Homer’s poem. Another new element in creation of historical atlases and wall maps for Bulgarian education is the research questionnaire experiments with their users, students. The questionnaire is made with school year 5 (ages 11-12, respectively) students. The maps are prepared exactly for these ages. All results are analysed in the paper and on this base some corrections are made before publishing of the atlases. All atlases and blind maps are compiled under the instructions of school curriculum and have all elements represented in text books for every year. They are also approved by the Ministry of Education in Bulgaria.

The whole process of atlases' creation, from the idea to their publishing, is described in the report. The new developed topics are presented. They are well accepted by teachers, students and parents in Bulgarian market.

Introduction

We are living in a time of rich information society in a global world with many communication possibilities. Cartography is developing incredibly in the technology aspect. Old paper version products started to be not enough attractive to students. The tasks of cartographers have to find a closer way of communication with students in historical lessons and this could be achieved by quality information representation and attractiveness of cartographic products. In some studies we can find that the communicative map quality means the effectiveness to what extent the information transfer occurs. And all this could be a part of the total quality of a map with communication purposes. Also some authors speak about another aspect of cartographic quality as attractiveness of the map (Vansteenvoort Liesbeth, De Maeyer Philippe, 2005). Combining all these tasks and using curriculum in history, as well as a new design and high quality printing it is achieved the great students' and teachers' interest by the new paper version atlases for education on history in Bulgaria.

Figure 1. Some covers of educational Atlases in a Poster

2. Presentation of the new paper version atlases on history in Bulgarian education

The atlases are proposed by Prof. Matanov (Professor on history in Sofia University) and the author of the report (Assoc. Prof. on cartography) and all process of their creation are leaded by the author. Designer-specialist is responsible for pre-publishing and publishing process. All products are made in a private cartographic company in Bulgaria and all of their description could be seen on **www.datamap-bg.com**. All of them are approved by the Ministry of Education and science and improved after experimental research with students. The pages are designed by different colours for every of chapters for better orientation in the Atlas contents.

The atlas "History and civilization" (32 pages, sizes 31x24 cm, published in 2007) for school year 5 (ages 11-12, respectively) contains 40 maps. The topics are represented in four chapters: Ancient civilizations to IV c.; Bulgaria in Medieval, IV – XI c.; Bulgaria in XI-XIV c. and Bulgaria under Ottoman Imperia, XIV – XVII c. Every chapter begins with a chronology of the historical events. For this goal the time line is designed. The pages are compiled with photos for the represented historical period and they make the Atlas informative, nice and interesting school issue. A page from the atlas representation can be seen on Figure 2.

The atlas "History and civilization" (32 pages, sizes 31x24 cm, published in 2007) for school year 6 (ages 12-13, respectively) contains 38 maps. The topics are represented in four chapters: Revival period of Bulgaria; Leaders of the Bulgarian

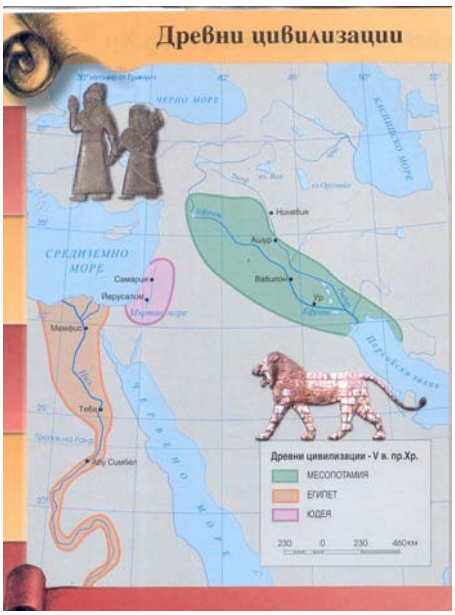

Figure 2. Ancient civilizations mapped in history atlases for

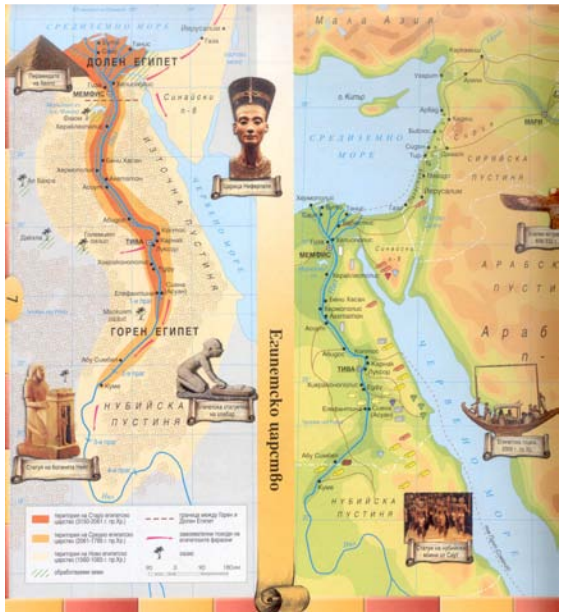

Figure 3. Ancient Egypt mapped in history atlases for school year 7.

National Revival, Bulgaria to middle of XX c. and Bulgaria after Second World War.

Figure 4. A blind outline map for Persian Imperia for school year 7.

The atlas "History and civilization" (32 pages, sizes 31x24 cm, published in 2008) for school year 7 (ages 13-14, respectively) contains 50 maps. The topics are connected with dynamic societies in prehistory and ancient world for the period IV millennium B.C. – V c. The maps are divided in the following chapters: Prehistory; Ancient East; Ancient Greece, Ancient Roma. Geographic Information System, computer generated shade relief, modern design and high quality paper publishing are used for map and atlas compiling. A page from the atlas representation can be seen on Figure 3.

The atlas "Blind outline maps" (16 pages, sizes 31x24 cm, published in 2007 / 2008) is designed for school years 5, 6 and 7. Every school atlas is supported by Blind outline maps. When students use them, some special skills for working with historical maps are acquired, space orientations is helped. For easy working with these maps, some short and clear tasks, instructions, indications, additional explanations are written. One example is that students can use blue colour only for hydrology representations. Other one is that arrows and symbols should be draw and colour in one and the same way and size on the map and on the legend. Places and instructions for legends making are also done. On this way the students can compile a map. In the beginning of each chapter time line is represented. Students have a task to fill in missing dates and events. An example of such map can be seen on Figure 4.

3. New ideas and maps in the Historical Atlases

The old historical atlases were criticised mainly by teachers in some directions: to many represented object from general geographic base, a lot of information represented in atlases for young students (for example, the history maps of Bulgaria for school years 5 and 11 have similar contents), too many symbols in common legend. The authors tried to avoid these difficulties and the new historical atlases are compiled on different way:

- clear general geographical base: only the biggest rivers and these ones with importance to theme of the map are represented, the shade relief replaced a lot of mountains names;

- different representation of one and the same theme for different school years: maps, compiling atlases for high school have more rich contents according to studied topics;

- not so many symbols (only the most associative ones, for example, symbols represented state border, city, capital, etc.) are represented in the general legend.

Other new idea for atlas compiling is connected to representation of specific themes in the Atlases. Such theme is the Trojan War which is not represented in any atlas or encyclopaedia. It is mapped according to information taken from the Homer's poem "Iliad". The result could be seen on Figure 5.

Figure 5. A map for the Trojan War published in the Historical Atlas for school year 7.

4. Research Experiment with Students

Four maps from the Atlas for 5th year of Bulgarian education have been chosen for research experiment. These maps represent a lot of information in the periods when our country changed its borders very often. This fact makes the represented information difficult for understanding and fast information extraction.

Because of this a questionnaire with nine questions were prepared for every of these four maps. The aim of questions is that cartographers should understand if students understand represented information and how fast they extract it. Fifty five students from school year 5 of their education took participation in the experiment. Some problems have been identified after receiving their responses:

Students don't know some historical terms appeared in the legend text explanations;

Students would like the represented period to be mentioned in maps' titles;

The borders represented by hachure are uneasy for reading;

The symbol representing battle is not enough visible;

Stronger contrast between yellow and green colors which represent neighbor territories;

Shade relief representing mountains is not enough clear for geographical orientation.

All these difficulties should be taken in attention and maps should be improved in the direction to minimize them. Other remarks came from history teachers, show not enough geographical understanding and they have not been accepted: for example the north direction was not represented additionally to the maps because meridians are the correct lines that show north direction. Other recommendation of history teachers was the text "Bulgaria" to be situated on the maps. The reason that I do not accept this recommendation is because all represented maps in the atlases are concerned to the Bulgaria as a territory in different historical periods.

Twenty six students from school year 9 also participated in the experiment. No problems in fast reading and map understanding have been indicated. The maps are enough clear and easy understandable for these ages. The conclusion is that for older students the maps could be complicated and more information could be represented for experiment maps.

5. TECHNOLOGY FOR CREATION OF NEW ATLASES

The methodology of atlases and maps creation is developed in its first version only as working steps in [Bandrova, T., Dinev, C. (2005)]. The proposed technology was working perfectly in the process of geographical atlas compiling. The atlases for geography cover all school years of Bulgarian education: from school year 1 to 12 and the proposed atlases cover one or two school years. Here the complete technology is expanded with participants and used software. It is shown in Table 1 and the steps of it started from the idea and finished with pre-publishing process.

No	Working steps	Participants	software
1	Idea	author	-text editing program
2	School curriculum and its analyses	author, teachers and inspectors of history	text editing program, Excel
3	Atlas and maps' contents	Authors: historian and cartographer	text editing program, Internet
4	Currently statistical and text data and GIS cartographic vector data base	author, cartographers, historians, GIS specialists	GIS MapInfo, Excel, additional private software
5	Draft representation of the contents	author, cartographers	GIS MapInfo, Excel, CorelDraw
6	Test analyses on the base of student reaction and information extraction	author, teachers, students	text editing program, Internet
7	Atlas and contour maps compiling	author, cartographers	GIS MapInfo, CorelDraw
9	Modern design	author, designer, artists	CorelDraw, PhotoShop
9	Editor process and process of Approving by Ministry of Education	historians, inspectors	text editing program, Internet
10	Pre-publishing and Publishing processes	publishers	Pre-publishing software

Table 1 Technology for atlas creation consists working steps, participants and used software

The proposed software is used for creation of the paper atlases presented in this study. It could be replaced with similar software of other companies. Private software is done especially for atlases creation, respectively in specific topics as map projection which is suitable for world map presentation and it is not proposed in GIS market. Other specific software is produced for automatic generalization of available database.

6. Conclusions and directions for future work

The proposed technology for atlas creation give a base for some different tasks and works on the base of paper version atlases and as well as of production of electronic version ones. Considering paper version atlases, the achieved results and cartographic products allow the following:

Updating of the atlases and maps in every new edition and publication;

Creating of similar atlases on different languages;

Creating of different thematic atlases.

GIS database and as well as computer designed atlases' pages allow developing of the technology to creation of electronic version of atlases for Bulgarian education. Facilities of such maps and atlases are described as dramatically changing of maps. Design of electronic atlas should response of the facilities. (Friedmannova, L., Konecny, M., Stanek K. (2005a) and (Friedmannová L., Konečný M., Staněk K. (2005b)). It means that the electronic version of the future atlases will not be simple production of raster versions of atlases' pages. The vector and raster data will be used for new designed view of the atlas included 3D models, animation, sounds and interactive cartographic work with GIS elements by teachers and students.

References

Bandrova, T., Dinev, C. (2005) *The New Cartographic Products in Bulgaria - Modern School Atlases,* CD Proceedings of the XXII International Cartographic Conference (ICC2005) A Coruña, Spain, ISBN: 0-958-46093-0.

Friedmannova, L., Konecny, M., Stanek K. (2005a) *Open Regional Atlas of South Moravia,* Proceedings of the Joint ICA Commissions Seminar: Internet-based cartographic teaching and learning: atlases, map use and visual analytics, Universidad Politecnica de Madrid, pp. 93-98.

Friedmannová L., Konečný M., Staněk K. (2005b) *Tvorba otevřeného regionálního atlasu, Kartografické listy*, r. 2005, č.13, Bratislava, pp.43-52.

Vansteenvoort Liesbeth, De Maeyer Philippe. (2005) *An Approach to the Quality Assessment of the Cartographic Representation of Thematic Information,* CD Proceedings of the XXII International Cartographic Conference (ICC2005) A Coruña, Spain, ISBN: 0-958-46093-0.

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16. MULTIFUNCTIONAL CARTOGRAPHIC APPLICATION OF 3D MODEL OF BULGARIAN MOUNTAIN TERRITORY

The report describes a complex technology that tracks the creation of several 3D mapping applications based on a 3D model. Three types of applications will be considered: 3D printing map, virtual flight (animation map) and 3D map with an interactive web application. Each application requires certain features of the 3D model according to its type and method of creation. These features depend on the purpose and the user of the map, on its way of visualization and publication, on the software which will be used for creation of the different 3D maps and on the technical requirements and hardware capacities of the computers.

1.INTRODUCTION

Major advantage in 3D cartographic modelling is that once created three-dimensional model can be used with different purposes. It can be seen as a database and source material for the production of various types and functionality applications targeted in different areas of interest.

One of the cheapest technologies for 3D cartographic modelling was called “From Paper to Virtual Maps” [1]. The basic steps of this technology are also used in the creation process of more complex one with several applications. The development of this technology could be done with aim to cover one of the Digital Earth concepts. We need to gather data and later use this data for many purposes and submit our users with appropriate applications. This is achieved by a technology which we use for creation of 3D model and multifunctional cartographic applications.

2.PREPARATION OF DATABASE FOR 3D MAPPING

2.1. Object description

Pamporovo resort is situated in the heart of the Rhodopi Mountain, 260 km away from Sofia, the capital of Bulgaria, 85 km south from the city of Plovdiv and only 15 km from the town of Smolian. Pamporovo is one of the sunniest mountain resorts in Bulgaria – there are more than 240 sunny days per year. The climate is mild, with strong Mediterranean influence. The average annual temperature is 8,5° C, and the thickness of the snow cover is 140-150 cm. The altitude of the resort is 1650 m, the highest peak is Snejanka – 1926 m.

Almost all ski slopes in the resort start from Snejanka – the highest peak, and their average altitude is from 1926 m to 1400 m. The touristic season starts from December and continues almost till the end of April. The ski slopes in Pamporovo are with different level of difficulties. The resort is relatively difficult for orientation and lots of tourists have problems to find their way coming for the first time, because of the distance between the

ski slopes and the numerous hotels. That's why we chose Pamporovo for our pilot project to test the proposed technology.

2.2. Data Sources

The earth information is collected from different sources – remote sensing data, GPS data, photogrammetric or surveying measurements, which give us a possibility to make 3D presentations. The maps are one of the most used tools for presentation of such information. Nowadays, most companies create 3D models of city or country environment. These 3D models give a possibility to understand and gain knowledge of the real world and thus we achieve an easy, communicative access for all users [1]. The photo-realism of these models (see Figure 3) gives the possibility for a quick and easy access to large range of users: from the youngest pupils to the highly skilled specialist in different fields of science and practice.

We used satellite images from Google maps for gathering data that we need for 3D model creation (see Figure 1). These images give readers information for large enough territory situation and relief information; have high enough resolution and accuracy for cartography needs. Other reason to use them is a free access to data sources. Especially for mountain resorts, as presented Pamporovo is, the images from Google maps give the necessary terrain information, ski-tracks and equipments, as well as information for afforested territory. Additionally to the images from Google maps, the existing maps of territory in scale 1:10 000 are used [2].

2.3. Data processing

The gathered data and sources should be processed. The authors of 3D maps use different methods and data to approach the 3D applications. In Kuwait for example they use the topographic base data and the software technology for 3D mapping in private industry applications [3]. In Malaysia the topographical contour lines are digitalized into GIS and they are assigned to be an attribute value. On this base authors generate DEM [4]. In Helsinki a 3D Model is produced by using digital photogrammetry, digital aerial photos and orthophotos, which serve as a great source of geospatial information presented in various resolutions [5].

In the proposed project the processing of the images, before going to 3D modelling, is done in AutoCad. The pictures are imported as raster images and are scaled according to the linear scale of each picture. When a larger range of territory is needed and respectively larger resolution of the pictures, the whole image should be pieced together from the different small pictures and each picture should be scaled according to the linear scale before that. After this, the small pictures can be put together with the help of some typical and highly distinctive points, which present in both pictures that must be connected. That's why in the pictures there must be a zone of overlapping (see Figure 1).

When we get the whole image, then we proceed to vectorizing. For getting a relief and different objects, that are important for the subject of the map, we vectorize contour lines. The contour lines and the different types of objects are separated in different layers, and thus they can easily be imported later in the 3D modelling program and can be easily manipulated with.

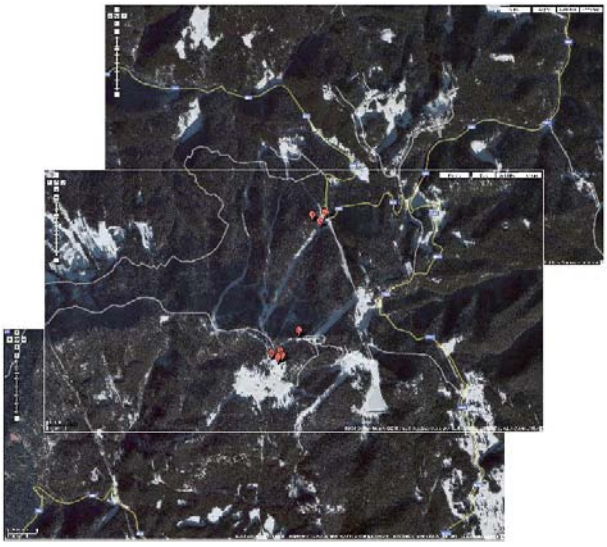

Figure 1: Satellite images from Google maps

3.CONSTRUCTION OF 3D CARTOGRAPHIC MODEL

The proposed applications are based on one and the same 3D model. It is designed and constructed by the software for 3D modelling. For this aim we used processed data base. When the real object is designed some cartographic rules are kept (e.g. generalization, symbolization, legend design, etc.). In this way we can say that this is a cartographic model or a product.

A 3D map could be defined as a computer, mathematical defined, tree-dimensional high realistic virtual representation of the world surface or other heavenly body, the objects and phenomena in the nature and society. The represented objects and phenomena are classified, designed and visualized according the specific purpose [6].

The concrete content of the 3D map is designed after the definition of objects and phenomena that will be included. It could be subdivided into three themes:

- **Main content -** large topographic or landscape objects such as relief bodies, roads, buildings etc. Most designed 3D maps, presented by different companies in the world, represent it.
- **Secondary content**, carrying the basic information. For example in 3D urban maps – objects, represented by symbols – traffic signs, facilities, transport elements, information signs, trees, etc.

- **Additional content**, providing the quality and quantity information about objects, often created as a textual database, regarding each of designed objects or the map as a whole.

The digital terrain model is generated on the base of vectorized contour lines. The software should contents modules for object modelling, texture attaching, photorealistic rendering and animation. 3DS Max was chosen to execute this project.

3.1. Steps of Modelling

The basic modelling consists the following steps:

- Import of the vector data in 3DS Max;
- Creation of TIN;
- Modelling of the different objects in the situation and input them on the terrain;
- Fixing of the virtual camera and lights.

3.2. Construction of the digital model of the terrain

The surface of the terrain is constructed on the base of vector contour lines, which are input on their corresponding elevations. So, the character of the relief is correctly described. The contour lines should be modelled in AutoCad as polylines. The software can construct the triangulated irregular network (TIN). They represent the object called „spline" in 3DS Max. The function „terrain" of the program takes care for the creation of triangles, by using the points of the polylines from the contour lines. Before that we need to adjust the number of the points, that will take part in the creation of the map to avoid the creation of unnecessary sides of triangles, because this makes the relief look rough and create heavy graphic information. Most often we use quarter of a number of all points, that take part in the creation of the contour lines, for the creation of TIN.

3.3. Modelling of different objects from the situation

Objects from the main content should be well accented, and be clearly visible and distinguishable from the landscape. Many authors propose that they are represented by photorealistic way [1,5, 8]. Here, a conflict appears. If we like three-dimensional map to maintain its communicative function as in two-dimensional ones, we need to design symbol system. But some of the objects are too similar. The other problem is that it is necessary to use different levels of detail in perspective. There are also technical problems: 2D-symbol takes less computer memory than the three-dimensional object. Moreover, the users are already familiar with contemporary two-dimensional maps and three-dimensional symbols should be also easy to read. The symbols should not be too geometric, because such symbols do not attract the attention of the user [2, 7]. This has great significance in using the model for interactive presentation - If the model is built with the less polygons, this will reduce the amount of memory and increase the speed of navigating the model in real time.

All cartographic symbols give information about the objects or phenomena and represent them in 3D space. There is a difference between the symbols for 3D maps and traditional ones but it cannot be considered essential, since only consider their graphic image [6]. In the design of 3D symbols we must take in attention some certain conditions:

- symbols that are represented in 3D map should be similar to the real objects;
- design and construction of a symbol must use the minimum numbers of polygons;
- symbols must be designed in the real dimensions of the represented objects;
- symbols are created for different purposes, depending on the users of 3D maps [8].

Several 3D symbols that represent real objects were created for the purpose of the designed map. These are the television tower "Snejanka" - a symbol of Pamporovo, pillars of lifts, build on initial and final stop of the lifts and sign of the North.
A virtual camera is used to have a view and a navigation of three-dimensional world and it is a kind of natural addition to the 3D scene. Therefore it is good to know some key features of real cameras, before proceeding to work with the virtual ones. When we like to photograph landscapes (whether taking pictures or making video), the result is an image that has no difference from reality. The following characteristics relate to landscape photography in general:

- to make a good photograph, it takes time - time to plan composition a picture, to select the appropriate light, which usually comes from a natural source;
- good landscapes are done by wide-angle lenses;
- for more details we should use telephoto from 100-300 mm;
- panoramic pictures give an excellent imagination of the real landscape.

The same principles could be applied to the 3D environment but it should be noted that three-dimensional worlds have significant advantages in some respects and even they could be preferable. Lighting, for example, could be chosen freely. The light source could change its location. The type of camera could be chosen, etc [9]. Added cameras and light sources can be used in all three applications of the 3D model of that technology.

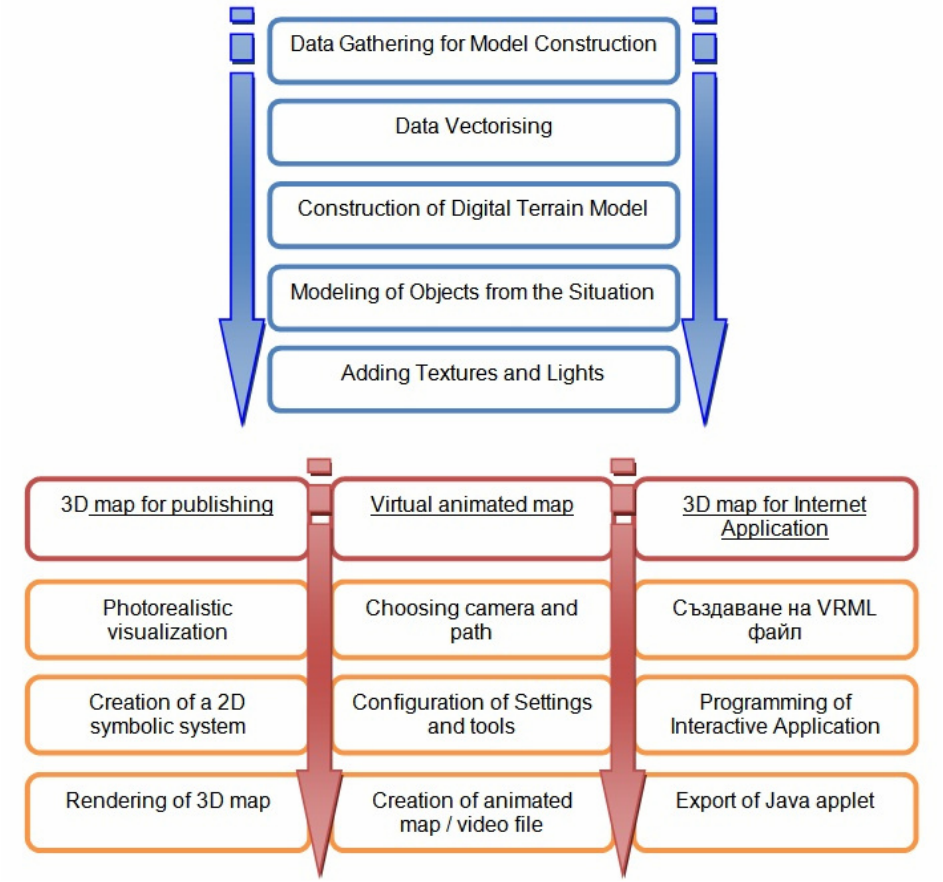

Figure 2: The technology "3D Multifunctional Cartographic Model"

4.TECHNOLOGY FOR CREATION 3D MODEL FOR MULTIFUNCTIONAL CARTOGRAPHIC APPLICATION

The proposed technology could be called **"3D Multifunctional Cartographic Model".** Why we need this technology? One of the most expensive steps of 3D mapping is gathering of sources and data. Once we have the basic 3D model of the reality we could use it for different purposes, for different users and for different application. This is our aim: when we have already the main contents of our 3D map, we will have any way and possibility to continue our works using different cartographic applications. Figure 2 describes all steps of the proposed technology.

4.1. 3D map for paper publishing

Two aspects of cartography are considered here: visualization and symbol system which transform the 3D model to the 3D map:

- **Photo-realistic visualization**

After completing the modelling of the entire 3D model we need to make the final frame of the model by already selected camera. A suitable picture of heaven, which reinforces the sense of realism and depth is selected as a background. Light sources and shading are added. The suitable resolution of the image is chosen and after rendering it is stored as a bitmap, see Figure 3.

Figure 3: A paper map designed on the base of 3D map

- **Creation of 2D symbol system and visualization of 3D map**

Having already obtained bitmap on the base of the 3D model we need a software for image processing, for example Photoshop.

2D symbol system is preferred for the final variant of map design. For this purpose we do not need to design 3D symbols. 2D cartographic symbols are sufficiently intuitive and readable. In most cases, they are standard symbols of 2D maps and users are used to read them (a symbol of medical assistance, bus, parking, restaurant, number of runs and lifts, etc.). Also 2D symbols are made much faster and easier and save both time and further work on 3D model.

The necessary text is also situated: landscape names, mountain tops, road directions. With a legend and a title the work on design of 3D map is completed.

4.2. Virtual animated map

Animation by virtual camera in a software, as 3DS Max, resemble real shooting movies with the camera. For this purpose, one or more virtual cameras are created. Their settings - focal length and angle are selected. To animate the movement of the camera we need to create a way on the 3D model and later we should set the movement. The path is chosen

to pass between the objects which should be shot according to the direction of the camera movement.

When the animation parameters should be set we need take into account the length of the path, camera speed and how many frames per second and its duration we need to do a video. All this will affect the volume of the video. If the length of the road is 35 m, and the speed of the camera is 1,5 m/s, this means that the road will be completed in 23 seconds. As a final variant a video extension in .avi format is created.

4.3. 3D map for Internet Application

- **Creation of VRML file**

For Internet application we use a creation of VRML file. The advantage of it is the relative autonomy of its platform and on the other hand - its availability in the world wide web. So-called hyperlinks can be integrated in both VRML, and the HTML data.

Major disadvantage is the fact that the description of more complex objects can contain vast amounts of information. For those who use the Internet, this means more time for transfer. In this case, it is essential to optimize the data in such a way as to maintain an optimum speed of information.

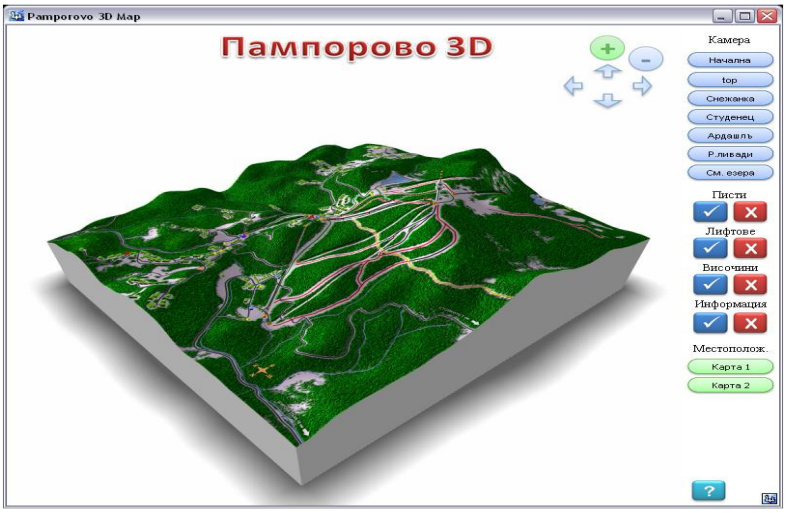

Figure 4: Internet cartographic application designed on the base of 3D map

- **Work with WireFusion**

We need Demicron WireFusion software for importing, processing and web visualization of the 3D model. Demicron WireFusion is a software for creating interactive Web3D presentations. A typical work flow consists of loading a 3D model, configuring / optimizing the 3D model and at last adding widgets and logic to the presentation. The 3D model is created in a 3D modelling software, like 3DS Max, Maya or any other 3D modelling

software that can export as X3D or VRML. The result is a presentation that can run in browsers supporting Java 1.1+. The model is visualized on Figure 4.

5.CONCLUSIONS

The aim of current day is to gather data, to proceed, edit, manipulate and use it for multifunctional purpose and for different kinds of users. The users need this data as well as its appropriate visualization [10]. This project give us evidence that if we think how to gather data and have clear ideas how this data will be used, we will lose minimum time, effort and with minimum financial support we will have several different results. The proposed technology “3D Multifunctional Cartographic Model” could help the idea of Digital Earth to fill up the needs of many specialists with tree-dimensional data with applications in 3 aspects: traditional paper mapping visualization, Internet presentation and virtual animated mapping. This shows that cartographic science with the latest modern technologies and appropriate visualization will find its place in the large aspects of tasks of digital earth, early warning and disaster management, climate changes visualization, touristic presentations, geo-science development. The next task is connected to find more applications and reduce the time and all machine and human sources for final model creation and visualization.

REFERENCES

[1] Bandrova T., Ivanova K.: 3D Cartographic Modelling in City Environment, *19th International Cartographic Conference*, Ottawa ICA’99, Canada, CD and Volume 2 pp. 805 – 811 (1999)

[2] Bonchev St.: Development of a three-dimensional map of a mountain resort for tourist purposes, *International Conference UACEG2009: Science & Practice*, CD Proceedings, Sofia (2009)

[3] Hermsmeyer D., Markus H. Guretzki, Hesham N. Al-Telaihi, Fuad S. Al-Aqeel and Waleed K. Al-Jassim, Gottfried Konecny: A 3d City Model of Kuwait: Data Processing and Possible Applications. *GIS Development, (Map Middle East 2005)* Internet version, http://www.gisdevelopment.net/technology/gis/me05_137.htm

[4] Amirin K., Hasmadi M.: The 3D Model and DEM Uncertainty using GIS. *GIS Development, (Map Malaysia 2009)* Internet version, http://www.gisdevelopment.net/technology/gis/mma09_khairul.htm

[5] Lee K. H.: 3D Geospatial city - Developed Through Digital Photogrammetry & 3D Visualization. *GIS Development (Map Asia 2007)* Internet version, http://www.gisdevelopment.net/technology/survey/ma07168.htm

[6] Bandrova T.: Creation of 3D cartographical symbols. *International Symposium “Modern Technologies in the Cadastre”*, pp. 132-138 (1997)

[7] Petrovic D. Three-dimensional mountain map. *ICA-CMC-Session*, Beijing, China, 2001.

[8] Bandrova T.: Designing of Symbol System for 3D City Maps., *20th International Cartographic Conference,* Beijing, China, Volume 2, pp. 1002 – 1010 (2001)

[9] Rudiger M, Petschek P.: Visualization of Digital Terrain and Landscape Data. *Springer, Berlin Heidelberg New York,* ISBN 978-3-540-30490-6, pp. 365 (2007)

[10] Zlatanova S. Bandrova T,: User requirements for the Third Dimensionality. *E-mail Seminar of Cartography*, Sofia, Bulgaria, pp 61-72. (1998)

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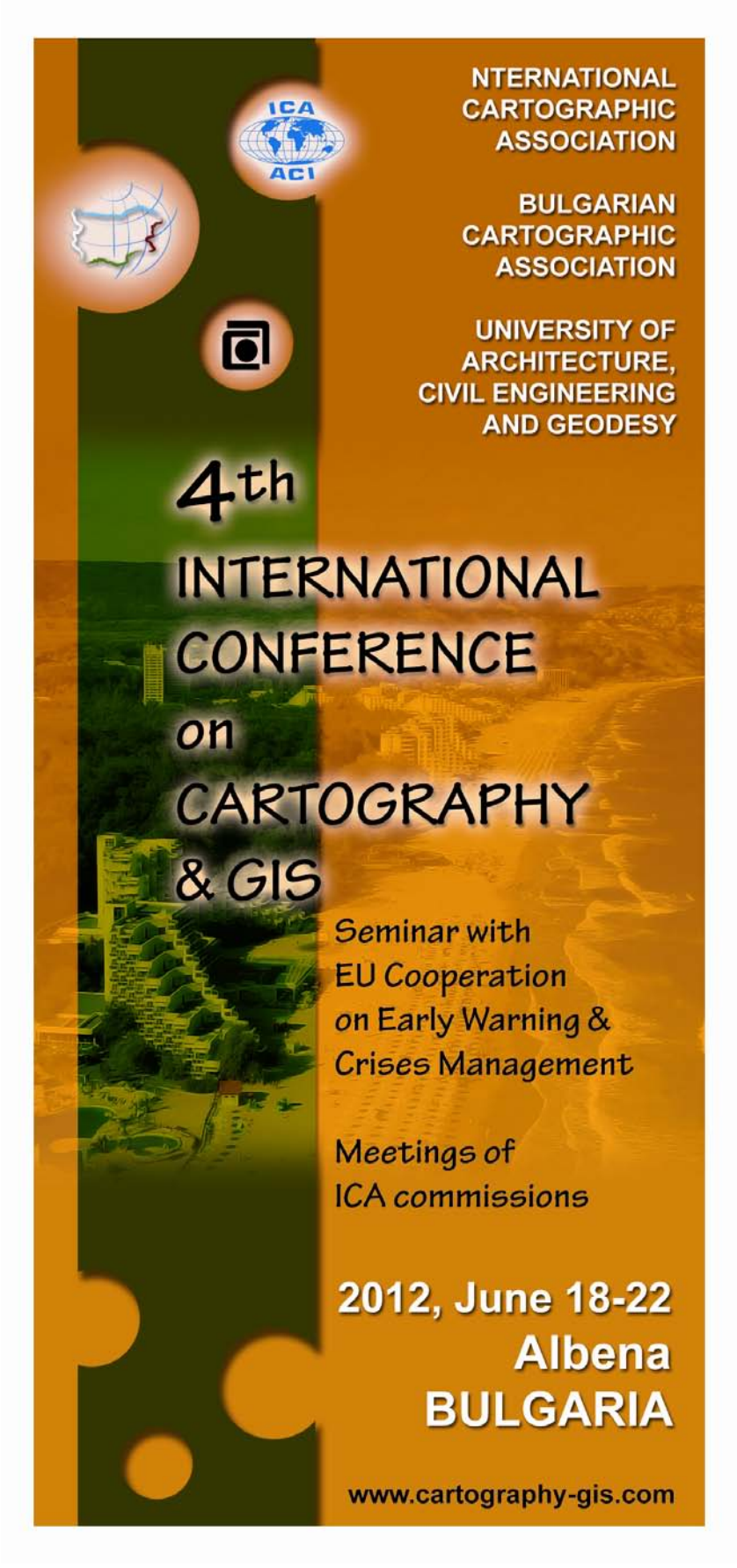
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