



A Look at Ukraine from Space

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SATELLITES THAT ORBIT THE EARTH DO A LOT OF WONDERFUL THINGS – THEY HELP FORECAST THE WEATHER, FIGURE OUT YIELDS OF THE NEXT HARVEST, PREDICT THE COURSE OF HURRICANES, IMPROVE MAPS – THE LIST IS A LONG ONE. SOME SATELLITES ALSO TAKE PICTURES OF CERTAIN FEATURES ON EARTH, AND HIGH-RESOLUTION PICTURES TAKEN WITH POWERFUL ZOOMS ARE VERY IMPRESSIVE INDEED.

Oleksandr KOLODYAZHNY, director of the *Ukrainian Land and Resource Management Center (ULRMC)*, believes that the

results of earth observations from space can help solve a number of large-scale problems that Ukraine faces.

The Ukrainian: Mr Kolodyazhny, could you, please, explain in simple terms what high-resolution space photographs are? Do the pictures taken from space differ much in quality compared with pictures taken from airplanes?

Oleksandr Kolodyazhny: Resolution is the level of reproduction of detail offered by a TV or computer screen or a film image, the fineness of detail that can be distinguished in an image,

as on a video display terminal. In more simple terms, when, say, you have an aerial picture of two houses, which are situated at a distance of ten meters one from the other, then, if the resolution was five meters, you'd see both houses, but if the resolution was fifty meters, you would not see two houses – you'd see one object. Up to the end of the 1990s, the technology that made it possible to take pictures with a resolution of one meter was available only to the military. Since then, such technologies have been made available for the civilian purposes as well.

As far as I know, the USA has satellites orbiting the earth that can take pictures of the earth surface with a resolution between 80 and 60 centimeters. Next year, a satellite that can take pictures with a resolution of slightly over 40 centimeters is planned to be launched. Before 2010 other countries will also have satellites in orbit which will be able to take pictures with a resolution of less than one meter.

Up to quite recent times most of the large-scale maps were created with the help of aerial photography. The technology of such photography has reached a high level of sophistication. It provides very high levels of resolution, but the processing of photographs taken from the orbit can be done much faster, and such photographs can be obtained very fast and in any numbers at regular intervals from exactly the same spot. Besides, the prime cost of satellite photographs is lower.

EU members are required to have detailed

maps for agricultural purposes of the entire territories of their countries on a scale not lower than 1:10,000, and not older than five years old. It is much cheaper to create such maps with the help of satellite photography.

The Ukr.: Where does Ukraine stand in all this?

O. K.: In 1999, an agreement on creating the ULRMC as a center that would introduce sophisticated technologies for distance monitoring of the earth surface and for developing geographical information systems was signed between the USA and Ukraine. The ULRMC had to provide the information basis for GIS and remote-control probing of the Earth, water, forest and other resources of Ukraine. We carried out projects in the spheres of ecology management, preservation of natural resources, emergency situations, agricultural business, land-tenure, and forestry using satellite photography, digital cartography and geoinformation systems. But at present, it's not enough.

The Ukr.: More advanced technologies are needed?

O. K.: Ukraine wants to join the EU some time in the future, and that means that we, in Ukraine, have to use the same standards, the same rules of accessing and exchanging information. The ULRMC cannot do that alone – a nation-wide infrastructure of geographical information is needed. The EU offers Ukraine help if Ukraine agrees to accept the EU rules.

The Ukr.: Isn't the ULRMC equipped at the cutting edge of technology? Why can't it operate on the European level?

O. K.: The ULRMC is well known both in Europe and in the USA; we have in our archives more than 3,000 photographs of high and very high resolutions; we have an extensive database of cartographic information. But as I said, it's still not enough. A special commission has been set up to deal with this important issue – The Commission

for Processing and Comprehensively Dealing with the Carrying out of the State Policies in the Sphere of Rational Use and Protection of Land. A special, working geo-space land survey group has been set up too, and I am the secretary of this group. We, jointly with the Institute of National Security Problems, are working out a project of creating a Ukrainian national center of geo-space information, which is to be set up on the basis of the ULRMC. In order to create a comprehensive, "basic map" of Ukraine with a scale no less than 1:10,000 that will meet the EU and NATO requirements, necessary steps will be taken towards using satellite pictures of a very high resolution.

The Ukr.: What kind of map is it going to be?

O. K.: "Basic map" is a term used in the geographical information systems. In the USA, for example, such map is created by different departments. By superimposing one layer of information over the other, it is possible to get a comprehensive map of a given territory. There are eight such layers – roads and transportation infrastructure, forests, water reservoirs and so on. Such maps can be used both by government institutions and by private companies. They are of a great help in carrying out building or telecommunications projects. Such maps can be accessed at certain portals in the Internet. The rules of access and use of such maps are established by a special committee. In Europe, the main thing is to have the compatibility of information. Ukraine cannot meet the European requirements since Ukrainian maps are outdated, the inventory of land and land survey have not been completed.

The Ukr.: As far as I know, according to the State Committee of Ukraine for Land Resources, between 70 and 80% of land used for different purposes has been inventoried.

O. K.: Yes, but it is too early to say that the inventory of land in Ukraine is close to completion. Only when all the plots of land have been inven-

toried and made available for sale, we can say that the job has been done. There's really very much work to do – I know it from my own experience. Take the Crimean Peninsula, for example. When we analyzed its forest and land cadastre, we found differences in their boundaries of up to 200 meters.

Ideally, the whole available land should be broken into plots, with their characteristics obtainable from information systems. It includes the protected water reservoirs, land and forest reserves and private property.

The Ukr.: Why has the work on the land inventory started so late?

O. K.: I think it was the lack of systematic approach and of political will that prevented the work on the land inventory and other things connected with the land use from being done earlier. Before the work on the land inventory began, the land had been considered to be "means of production" and the assessment of land was done only for the purpose of forecasting the yield from the next harvest. Now, when the land is becoming real estate, it has its own value and price – that is why it is important to know the exact boundaries between the plots of land. In November last year, the National Security and Defense Council of Ukraine issued a decree which listed all the tasks to be done in fixing the boundaries of villages and towns, and the tasks to be done in land cadastre and inventory. The ministries and various departments concerned were informed of that decree, but there was no proper financing to back it up and the work is progressing slowly.

The Ukr.: I know that there is a term "integrated cadastre." What is it?

O. K.: When we were doing preparatory work for setting up a working group of geo-space information and land cadastre, I used the term "integrated cadastre" but our lawyers told me that this term is not used in Ukraine. We have an integrated system but no integrated cadastre. At first glance, it seems that it is hardly more than the matter of words used but, in fact, there is a great difference. All cadastres are done in Ukraine separately and they are not interlinked, though the Land Code of Ukraine stipulates that the land cadastre must be the foundation for doing all the other cadastres (they are ten in number – land, water, forest and others) in strict correspondence of one with all the rest.

The Ukr.: What are the main directions of work of the ULRMC and what will be its future?

O. K.: When the center was just established, the main concern were the consequences of the Chernobyl disaster. Measures to prevent the radionuclides from being carried by wind and rain out of the Chernobyl zone into other areas were proposed. The center was monitoring the situation and was providing forecasts of possible forest fires and inundations. The center got six photographs daily taken from the orbit of a territory of more than 2,000 kilometers. But this direction of our work could not stay a priority over a long period of time and, gradually, we

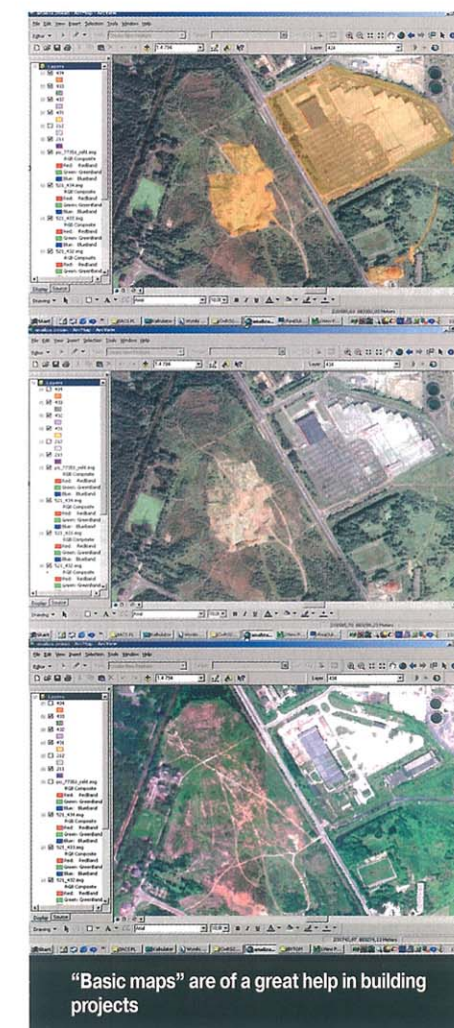
ULRMC HAS IN ITS ARCHIVES MORE THAN 3,000 PHOTOGRAPHS OF HIGH AND VERY HIGH RESOLUTIONS

began work in other directions. We studied, for example, the way deforestation, resulting from excessive timber cutting, increases the danger of landslides; we monitored floods. We studied the Black Sea and the Sea of Azov; we created information systems for the Dnipro River basin and

for other rivers. We have accumulated very large databases, and we can use them for prognostication. But in order to do serious work, we have to have orders from the state and adequate financing. We, for example, would be able to complete the land inventory of the Crimea in two months but we have no financial backing in spite of the government's decisions to have this work done.

EU MEMBERS ARE REQUIRED TO HAVE DETAILED MAPS FOR AGRICULTURAL PURPOSES OF THE ENTIRE TERRITORIES OF THEIR COUNTRIES ON A SCALE NOT LOWER THAN 1:10,000

I hope that the creation of a nation-wide infrastructure of geographical information will consolidate the efforts of all the interested organizations, and that a clear program of actions will be worked out. Only then we can talk in more concrete terms about our future. ■



"Basic maps" are of a great help in building projects



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