European Topic Center
Terrestrial Environment

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CLC2000 Interpretation Training in Montenegro Mission Report

Podgorica, Montenegro

(Geological Survey of Montenegro)

01-06 November 2005

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1. Activities linked to the preparation of the training

The interpretation training mission in Montenegro was organised according to the work plan (Technical Annex) of the CLC2000 in Serbia and Montenegro, 2 weeks after the basic training mission undertaken by the ETC-TE CLC2000 Technical Team (TT) on 11-16 October 2005. The National Team (here: Serbian partner EvroGeomatica) was asked to prepare orthorectified IMAGE2000 (guidelines provided by T. Soukup, ETC-TE partner GISAT) data suitable fpr photointerpretation. The mission was conducted by Barbara Kosztra (BK) on behalf of ETC-TE.

BK made a five-day stay in Podgorica at the venue of Geological Survey of Montenegro, practically working together with the three photointerpreters involved in producing CLC2000 for Montenegro.

2. Context of the CLC2000 project in Serbia and Montenegro

CLC2000 in Serbia and Montenegro is implemented under the CARDS programme. The project is fully funded by EEA. The ETC-TE and the CLC Technical Team leads and ensures the project implementation. This includes all tasks from general project coordination, training, supervision of the national implementation to the final acceptance of the database. EvroGeomatika is responsible for the formation of a national team, make a subcontract with Montenegrin partner and the correct execution of the national activities.

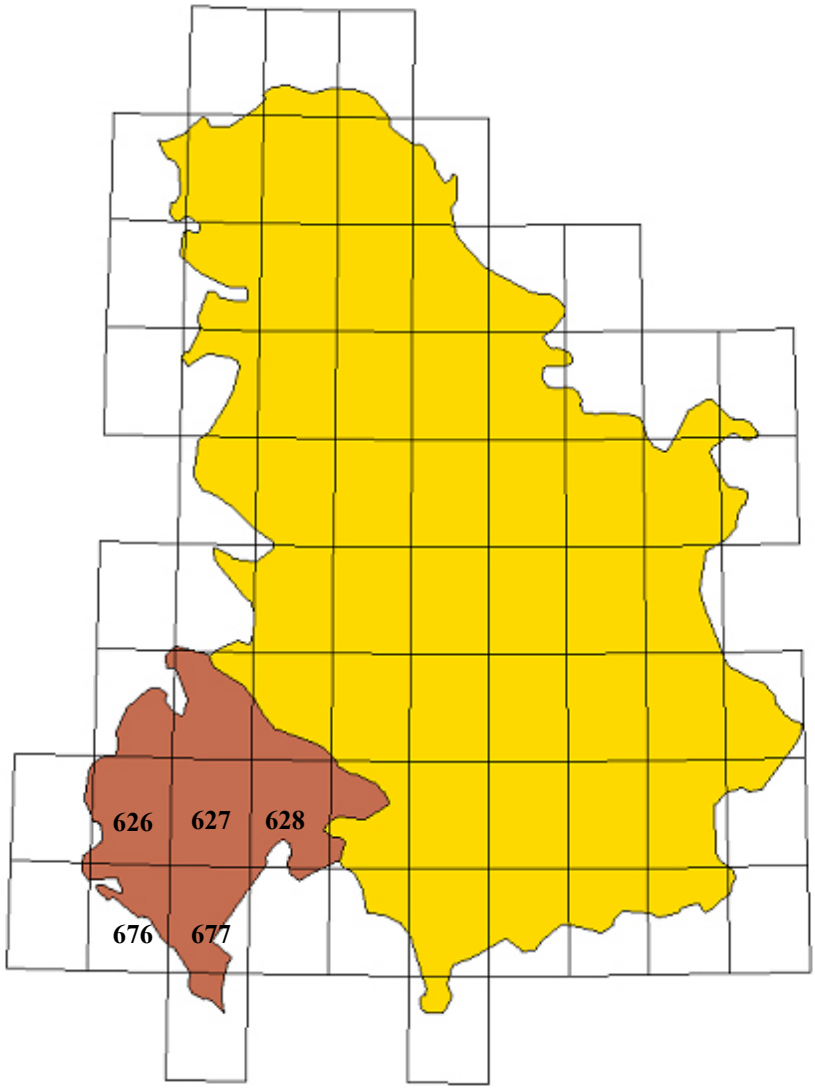

Figure 1. Working units at scale 1:100.000 in Serbia (yellow) and Montenegro (brown). Interpretation work (or field trip) was going on working units marked with numbers.

3. Training Agenda

Place of the training:

Venue was the building of Geological Survey of Montenegro: Cetinski put bb 81000 Podgorica.
2 powerful PCs with large screen were purchased and one more installed to serve the project. The computers are connected in a local network and also to be connected to the Internet in the near future.
A room was also furnished and made available by the Institute for the interpreters. (Figure 2.)

1st November 16.30-19.00

Following arrival at 16.30 discussion with S. Radusinovic, operational project leader on current issues especially concerning work organisation and data availability.

2nd November 8.00-17.00

Discussion of problems emerging (lack of data, less satisfactory technical knowledge of software).
Installation of new computers and setting up software and work files on them.
Practicing the use of interpretation software InterView100.
Receiving satellite image data from EvroGeomatica for intended interpretation area.

3rd November 8.30-18.00

Improvement of satellite image and copying on new computers.
Working on one working unit per interpreter, assisted by BK. Discussion on identification of land cover categories.

4th November 8.30-21.00

Working on one working unit per interpreter, assisted by BK.
Correction and discussion of thematic mistakes and uncertainties.
Discussion of general and interpreter-specific recommendations.
Discussion of organisational, financial and contract issues with V. Dubljevic, director and S. Radusinovic, operational leader of project.

5th November 8.00-14.00

Field checking of interpretation results in the region between Podgorica and Niksic. (Figure 6.)

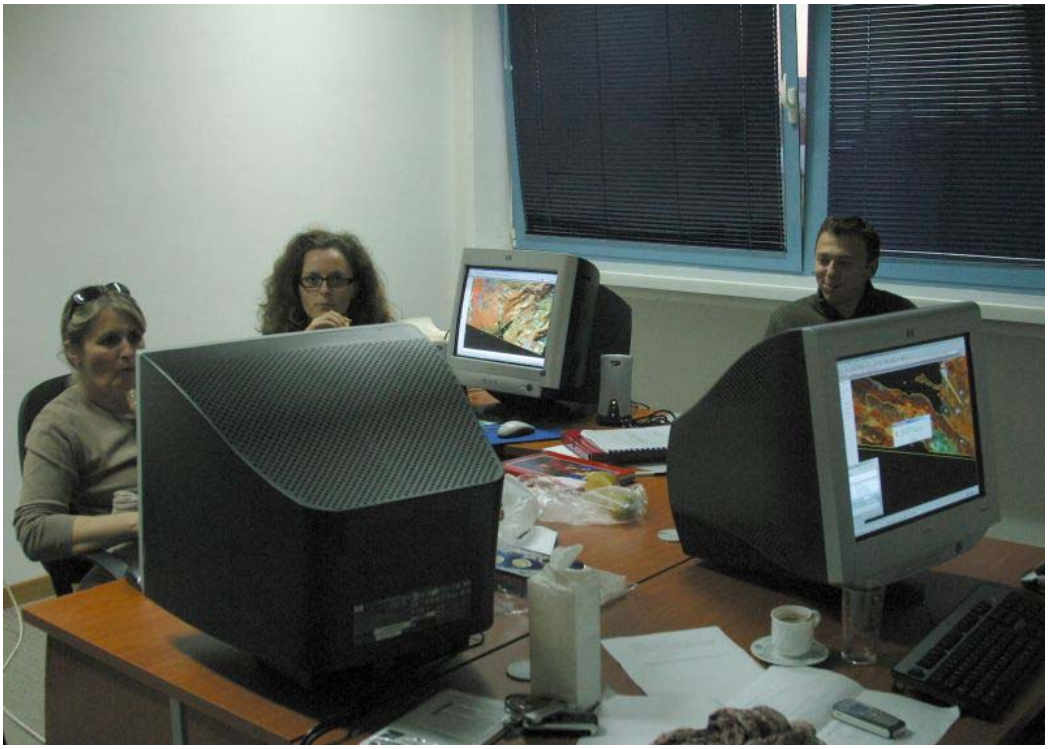

Figure 2. Interpreters' room with computers purchased for purpose of CLC2000

4. Participants

The following 3 operational interpreters participated the training:

- Neda Devic (Geological Survey of Montenegro)
- Bozica Jovanovic (Geological Survey of Montenegro)
- Tijana Danilovic (Geoprojekt, D. O. O. Podgorica)

Dragan Radojević (Geological Survey of Montenegro), who will be responsible for technical and organisational issues also participated the interpretation training.

Slobodan Radusinovic (Geological Survey of Montenegro) is responsible for operational issues of the project.

Overview of current organisational issues was done with Vladan Dubljevic, director of Geological Survey of Montenegro.

Participant on CLC2000 Technical Team side: Barbara Kosztra (FÖMI)

5. Practical exercises

5.1 General

First day was spent partly with acquiring data on order to be able to start interpretation. Georeferenced scanned topographic maps at scale 1:25000 were sent by EvroGeomatica for working units previously selected for training. Regrettably, IMAGE2000 data are not yet made available for the area (EvroGeomatic is responsible for this, but the say to have problems with national distributor of the data.). In order to overcome this, data used for Croatian CLC2000 project were sent by EvroGeomatica. Data proved to be of insufficient quality for photointerpretation. Some image enhancement was asked to be done and enhanced image was sent by EvroGeomatica again, because no image processing capabilities existed on the site. No aerial photos were used.

Some additional technical training was required by interpreters, this was also organised on the first day.
The interpretation areas, previously selected were divided up among interpreters. Interpreters worked on 5 working units during mission (see Fig. 1):

626 Niksic (Interpreter: B.J.) mostly mosaic of bare limestone rocks, bushy vegetation, grassland and low-canopy forest, with polje-s under mixed agricultural cultivation, small villages on karstic terrain, forests. Second largest city of Montenegro, the mostly industrial Niksic is to be found on the working unit as well.

627 Danilovgrad (B.J.) Forested area mixed with rocky terrains and sparsely vegetated areas. Larger poljes of mostly extensive agriculture.

628 Ivanograd (D.R.) Mountain area with forests, bare rocks, ravines. Smaller patches of agriculture mixed with natural vegetation.

676 Prevlaka (N. D.) The coastal area of the Kotor-bay is Mediterranean landscape with small-scale mosaic of 333, 321, 323, 324, 311, 313. Conifers and scattered villages are typical of coastal areas. More into the inland 323 disappears, some agriculture is present. The working unit contains the old capital, Cetinje as well.

677 Podgorica (T.D.) Large city and surrounding industry, large parcels of permanent crops, Skadar-lake and surrounding wetlands.

During the first day of interpretation mostly general advices were given on interpreters's work. It was recognised that interpreters have a satisfying knowledge of the CLC nomenclature, however some more preparation should have been done in the use of interpretation software (InterView100, developed by FÖMI) use. The training had to concentrate on technical as well as thematic issues of interpretation.
Most common general issues to improve were as follows:

- Interpreters should not forget about recommended working scale (1:25000);

- Interpreters should always consider the required detail of CLC: minimum mapping unit is 25 ha. Identifying any homogeneous patches within polygon already drawn must be a reason for further dividing up of that polygon. (Especially for B.J. and T.D.)
- The basis of interpretation should be the satellite image, while topographic map should serve as source of thematic information, not so much as source of outlines;
- As many as possible available data source should be used for identification of land cover;
- Further field checking might be required as natural vegetation types are often extreme difficult to identify on the images;
- Interpretation should go gradually from one corner along the working unit, as drawing "island" polygons first, then filling in the space between them can be a source of topology errors;
- How precisely polygon borders should be drawn;
- Why and how to add comments to polygons;
- Interpretation should not stop at working unit or country border, but should continue about 0.5 km over the border.

5.2 Specific questions of landscapes types

Specific problems encountered by interpreters were discussed on the second day:

- Scattered houses with terraces of agricultural cultivation are found all around in the karstic areas. These have a long tradition in the region and often they are the sole representatives of human activity in this region. For their importance we agreed that if these can be discovered to some extent on the satellite image, they should be interpreted as class 242 or 243, with the help of topographic map; (Figure 3.)
- Field trip revealed that agricultural areas in the poljes are almost always mixed with natural features. Hedges, alleys, small patches of forest or wetland can be found among parcels of agriculture. In most of the cases 243 is the recommended category (Figure 4.);
- Field trip also revealed that most of the patches identified as arable land based on the image, are pastures (231) in reality. This might be due to poor colour of the image used.
- Mosaic of small patches of 333, 324, 321, 311 should be interpreted as 324, where delineation of homogeneous patches is not possible. (Figure 5.)
- Deciduous forests (311) are often hard to distinguish from shrub, especially where forests are not dense. Forestry maps could be consulted and field checking might help a lot in identifying 311 on rocky terrain.

The use of multitemporal imagery is much needed due to difficulties of identification of natural vegetation types. Free downloaded 1990 and 2000 Landsat TM images proved to be very useful during interpretation training mission to Belgrade. EvroGeomatica is asked to make these type of data available to the Montenegrin partner.

6. Conclusions and recommendations

6.1 Conclusions

The execution of the CLC2000 project has started both from the human aspects (training of interpreters) and the technical point of view (purchase of computers) in the Geological Survey of Montenegro.

The mission concentrated both on technical and thematic issues.
There were a few common general problems in the interpreters' work, which were all improved after two days of working together.

- Usually interpreters used too large-scale (>1:50000) view leading to insufficient detail of interpretation;
- Size of minimum mapping unit (25 ha) was often ignored, most of interpreters need to go more in detail with interpretation, divide up polygons as far as separable CLC objects exist within them.

Figure 3. Traditional terraces on karstic terrain (243)

Figure 4. Agricultural landscape on the *polje*-s (243)

Figure 5. Small-scale mosaic of shrub, natural grassland, sparsely vegetated area and trees (324)

The real advantage of Montenegrin team is the thorough knowledge of the territory. Due to interpreters' considerable field experience, in many cases thematic questions could be cleared simply by their earlier knowledge of the area considered. However, due to poor colour of the image available for the training many uncertainties were left, which can be cleared mostly by field checking, consultation of forestry data or any other thematic data.

It can be stated the interpreters selected for the job all seem to have gained sufficient expertise in technical and thematic issues, thus obviously be able the fulfil their tasks. 4 working units began to be worked on. If IMAGE2000 data are made available on time, keeping deadlines should not be a problem for the team.

6.2 Recommendations

- Scattered houses with terraces of agricultural cultivation are found all around in the karstic areas. These have a long tradition in the region and often they are the sole representatives of human activity in this region. For their importance we agreed that if these can be discovered to some extent on the satellite image, they should be interpreted as class 242 or 243, with help of topographic map;
- The use of multi-temporal imagery is vital in the karstic area (practically the whole territory). EvroGeomatica is asked to make the Montenegrin team available all Landsat TM images at their disposal (in addition to IMAGE90 and IMAGE2000, free downloaded images from NASA if the acquisition dates are different).
- Field checking is inevitable in many cases. A preliminary field checking could be useful in identifying questionable land cover patch types and using this knowledge after.
- Thematic maps - and if available - aerial photographs should be made available for the interpreters.

7. Difficulties encountered during the mission

The lack of proper imagery (concerning photointerpretation) proved to be a great shortcoming during the mission. Poor colour of image available left many questions unanswered during the mission (Figure 6.).

8. Materials collected

Some screenshots of interpretation examples and some field photographs have been collected.

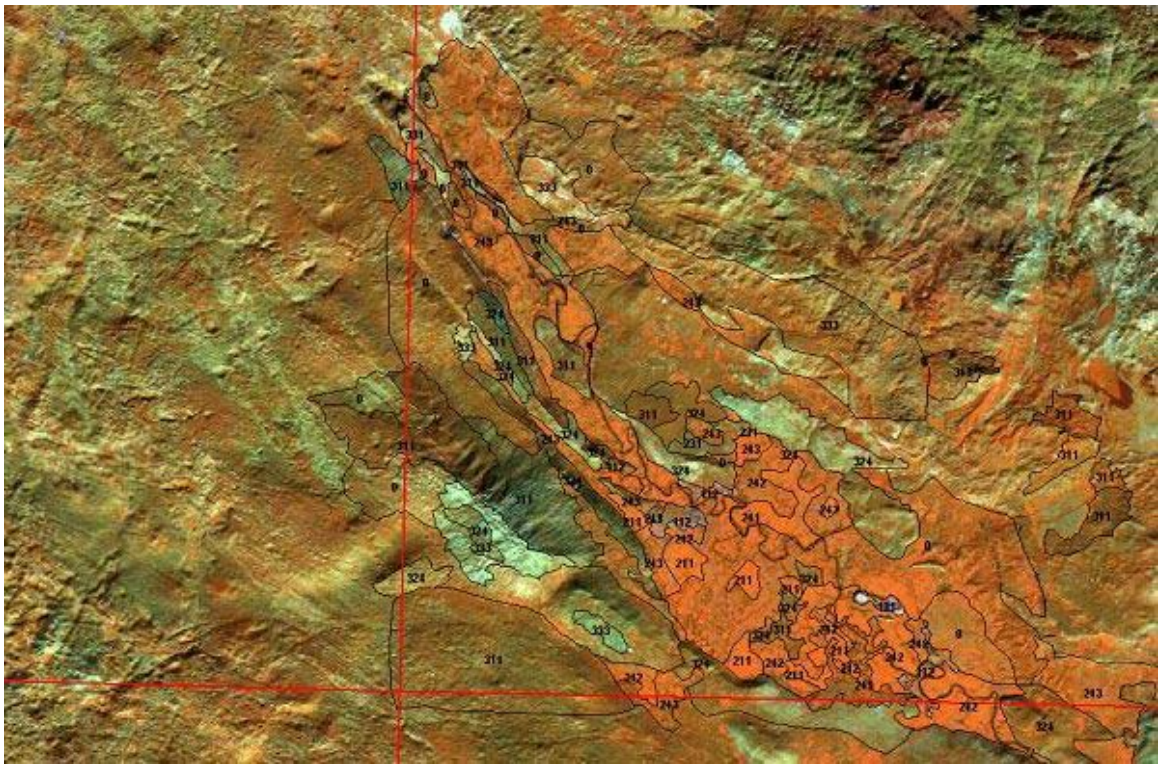

Figure 6. Example of image available for the training. The area is that of subject to field checking.

9. Summary of actions to be undertaken

- Signing of subcontract between EvroGeomatica and Geological Survey is the most urging task, as the lack of legal binding creates a lot of uncertainties for those participating the job. **Responsibles: Ivan Nestorov**, project manager EvroGeomatica and **Vladan Dubljevic**, director, Geological Survey, Montenegro
- The work cannot be started operationally before proper CLC2000 imagery (cut up to working units and optimised concerning colours) and scanned topographic maps are received by the Montenegro team. EvroGeomatica is requested to take actions to solve this task as soon as possible. **Responsible: Dragutin Protic**
- Montenegrin team should take steps to get access to national thematic databases (forestry, agriculture, nature conservation – vegetation maps). **Responsible: Dragan Radojević**
- As proposed in point 5.5 of the training report (CLC2000 Training Report in Serbia and Montenegro, 2-6 July 2005), it was requested to provide aerial photographs (as close to the year 2000 as possible) for the project as "national contribution". Therefore we request again the European Integration Office (**Natasa Veljkovic**) to make efficient actions into this direction. Without aerial photographs the required thematic quality of CLC2000 will be hard to achieve.

10. Next foreseen mission in the country

First verification mission and change detection training is due when 50% CLC2000 coverage of Montenegro is completed.

11. Annexes