



European Topic Center
Terrestrial Environment

Under contract with the

European Environment Agency



CLC2000 3rd Verification in Serbia

Mission Report

**Belgrade, Serbia
(EvroGeomatica)**

4-5 September 2006

Ref.: Verification Mission Report 4/2006

22nd September 2006

Submitted by J. Feranec, L. Mari

ETC-TE / Universitat Autònoma de Barcelona
Torre C5-S, 4a planta
Edifici C - Facultat de Ciències
Universitat Autònoma de Barcelona
08193 Bellaterra (Barcelona)
Spain

Tel. Secretariat: + 34 93 581 3518

Direct Tel.: + 34 93 581 3519

Fax.: +34 93 581 3545

<http://terrestrial.eionet.eu.int>

1. Activities linked to the preparation of the verification mission

This was the 62nd verification mission undertaken by the CLC2000 Technical Team, and the third verification mission organised for Serbia.

CLC2000 in Serbia and Montenegro is implemented under the CARDS programme. About 50 % of the total surface of Serbia (without Kosovo) has been prepared for the verification of changes (see map 1).

1.1 Verification procedure

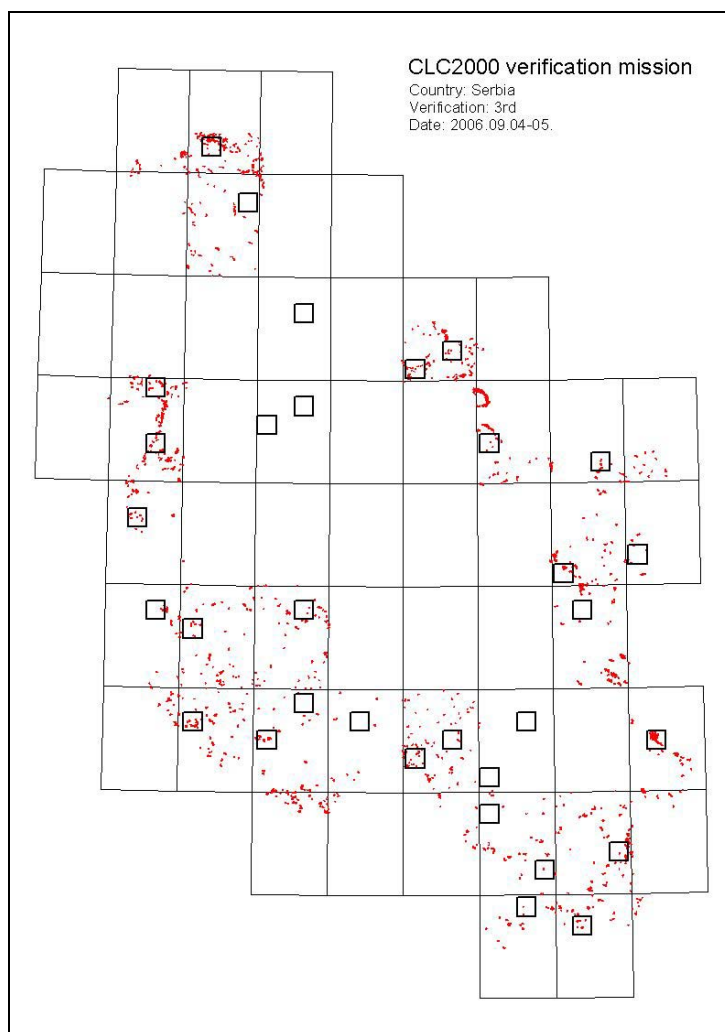
The verification mission was conducted by following the standard verification procedure, defined by CLC2000 Technical Team:

- Verification of about 10 % of the total area.
- Verification was carried out on a sample of verification units selected by the CLC2000 TT for the first verification.
- From a grid of 10x10 km, a minimum of 1 verification unit per working unit was checked allowing verification in all working units.
- The size of the verification units was 10 x 10 km, which was checked in a systematic way

1.2 Objectives of the verification

The objectives of the verification missions are manifold:

- To assist the national team to produce CLC2000 database and assure a homogenous implementation across Europe.
- Corrective goal: highlight specific problems occurred during the production, correcting the database if necessary and thereby assure a harmonised European CLC database.
- Provide the EEA with information about the overall quality of the work performed by the countries.



Map 1. The preliminary CLC-change coverage in Serbia and the units selected for 3rd verification.

1.3 Selection of verification units

32 verification units have been selected for the 3rd verification (See Table 1).

Table 1. Summary of the verification activities

Working units	No. of verification units
Subotica	1
Backa Topola	1
Zrenjanin	1
Vrsac	2
Bijeljina	2
Beograd	2
Veliko Gradiste	1
Orsava	1
Zvornik	1
Negotin	1
Bor	1
Visegrad	1
Uzice	1
Cacak	1
Zajecar	1
Prijepolje	1
Sjenica	2
Novi Pazar	1
Kursumlija	2
Nis	2
Pirot	1
Leskovac	2
Vlasotince	1
Kumanovo	1
Kriva Palanka	1
Total:	32

All the selected verification units have been checked.

2. Mission Agenda

Place of the verification mission: Laboratory of Cartography , Department of Geodesy, University of Belgrade, Bulevar Kralja Aleksandra 73, Beograd, Serbia

4th September 2006

09.00 - 18.00
Verification (TT)

5th January 2006

09.00 - 13.00
Verification (TT)

13.00 – 14.00 Discussion (TT, NT)

3. Participants

The following experts participated in the meeting:

From the Serbian national team:

- Dragutin Protic, technical manager

From the CLC2000 Technical Team:

- Ján Feranec

- László Mari

4. Summary conclusions of the verification

4.1 Method of verification

The InterCheck software running under ArcView 3.2 was used as a support tool for verification. The verification units were prepared and selected in advance by FÖMI. Preparation on behalf of the NT have been very careful, so the TT could start working immediately. Topographic maps were always available in digital format. The checking process was as follows:

- a) Checking validity of codes and neighbouring polygons with the same code (merge errors) in CLC2000.
- b) Checking size errors in CLC2000.
- c) Checking CLC2000 statistics (to reveal non-relevant codes)
- d) Checking validity of codes and neighbouring polygons with the same code (merge errors) in CLC-changes.
- e) Checking size errors in CLC-changes.
- f) Checking change statistics (to reveal invalid changes).
- g) Visual evaluation inside verification unit.

The first six checks [from a) to f)] were being performed for the entire working unit. Visual evaluation was mostly concentrated onto the verification units. In case of a few categories, polygons outside the verification unit were also investigated. Annex 1 includes detailed verification comments produced by TT.

4.2 General conclusions concerning results in Serbia

The TT concluded that the Serbian CLC2000 database is good. The CLC-change database however needs significant improvement.

The summarized technical evaluation is as follows:

- In CLC-change 10 merge errors are present.
- Three invalid codes were found in CLC-change (part of edited change polygons, forgotten to delete).

The summarized thematic evaluation concerning CLC-changes:

- The largest problem is the great number of non-real changes found in the CLC-change database. In many cases simple colour differences between IMAGE90 and IMAGE2000 have been interpreted as change. In other cases seasonal differences (e.g. due to different wetness status or topographic shadow) have been considered as land cover change. Large number of such false changes will introduce unreal processes in the environment of Serbia.
- Some examples of seasonal changes interpreted as land cover change: 511-324, 411-231, 211-242, 211-231 etc.
- Other group of mistakes are the exaggerated changes. These mostly relate to forests, e.g. 311-211, 311-231, 211-311, 231-311. If a forest is cut we prefer the use 324 code, i.e. 311-324. Considering forest development 10 years is a short period, therefore 324-311 type change is preferred.
- Some rather unusual changes were also found, e.g. 512-311, 322-311, 511-324, etc.

Table 2. Summary results of verification, Serbia

Working units	No. of verification units	CLC-change Database
Subotica	1	Rejected
Backa Topola	1	Rejected
Zrenjanin	1	Conditionally accepted
Vrsac	2	Rejected
Bijeljina	2	Rejected
Beograd	2	Conditionally accepted
Veliko Gradiste	1	Accepted
Orsava	1	Accepted
Zvornik	1	Rejected
Negotin	1	Accepted
Bor	1	Rejected
Visegrad	1	Accepted
Uzice	1	Conditionally accepted
Cacak	1	Conditionally accepted
Zajecar	1	Conditionally accepted
Prijepolje	1	Accepted
Sjenica	2	Conditionally accepted
Novi Pazar	1	Accepted
Kursumlija	2	Rejected
Nis	2	Accepted
Pirot	1	Accepted
Leskovac	2	Accepted
Vlasotince	1	Accepted
Kumanovo	1	Accepted
Kriva Palanka	1	Accepted

“Conditionally accepted” means that there are lots of mistakes but correction is relatively easy.

4.3 Metadata

Metadata were in process of finishing.

5. Proposed corrections in CLC-change

- Study detailed remarks related to CLC-change (see Annex 1).
- Only real changes are to be mapped. Satellite images in 1990 and 2000 can be different in colour because of many reasons: seasonal differences, differences in the atmosphere, different precipitation, etc. During image comparison, not only colour has to be considered, but texture and pattern as well. In the practice many of the delineated changes have to simply delete.
- Always think about the process when delineating a change. Avoid changes, which are impossible in short term.
- In case of clear-cutting the recommended change is: 31x-324 (and not 31x-211).
- Similarly, in case of forest growth the recommended change is: 324-31x, or 321-324, or 231-324. Along rivers – in case of fast growing poplar plantations – exceptionally, 231-311-type change is also allowed.
- 243-242 and 242-243 changes seemed to be meaningless (seasonal differences only), therefore not recommended to use.
- Changes between agricultural classes (e.g. 231-211, 211-242) have to be applied carefully. 2xx-231 can be a real process, because people abandon their land in some regions of the country.
- Temporary changes e.g. due to water level changes in reservoirs are not CLC changes.

The entire area, all the delineated changes have to be revised and corrected (not only polygons with remarks of the TT).

6. Difficulties encountered during the mission and proposed solutions

--

7. Materials collected

A few examples of typical mistakes were collected.

8. Summary of actions to be undertaken

Due to the unexpectedly poor quality of the CLC-change database one more thematic check is proposed. Following the corrections according to point 5 above, a part of the database (selected later by the CLC2000 TT) has to be sent for remote verification.

Deadline for sending deliverables (seamless CLC2000, CLC-Change and CLC90 for Serbia and Montenegro) to ETC-TE: 15 October

9. Next foreseen mission in the country

As this was the third and last verification in the country, no more missions are foreseen.

10. Proposals for further verification missions in any countries

--

11. Annexes

- Annex 1: Detailed verification protocols