



European Topic Center
Terrestrial Environment

Under contract with the

European Environment Agency



CLC2000 Verification in Serbia and Montenegro

Mission Report

**Belgrade, Serbia
(EvroGeomatica)**

**Podgorica, Montenegro
(Geological Survey of Montenegro)**

16-19 January 2006

Ref.: Verification Mission Report 1/2006

27th January 2006

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1. Activities linked to the preparation of the verification mission

This was the 59th verification mission undertaken by the CLC2000 Technical Team, and the first verification mission organised for Serbia and Montenegro.

CLC2000 in Serbia and Montenegro is implemented under the CARDS programme. About 73 % of the total surface of Serbia (without Kosovo) and about 56 % of the total surface of Montenegro has been prepared for the verification (see maps 1 and 2). Only CLC2000 has been produced so far, because there is no CLC90 in the country. In later phase of the project, both teams will produce CLC-changa database as well as CLC90 by using satellite images taken around 1990.

1.1 Verification procedure

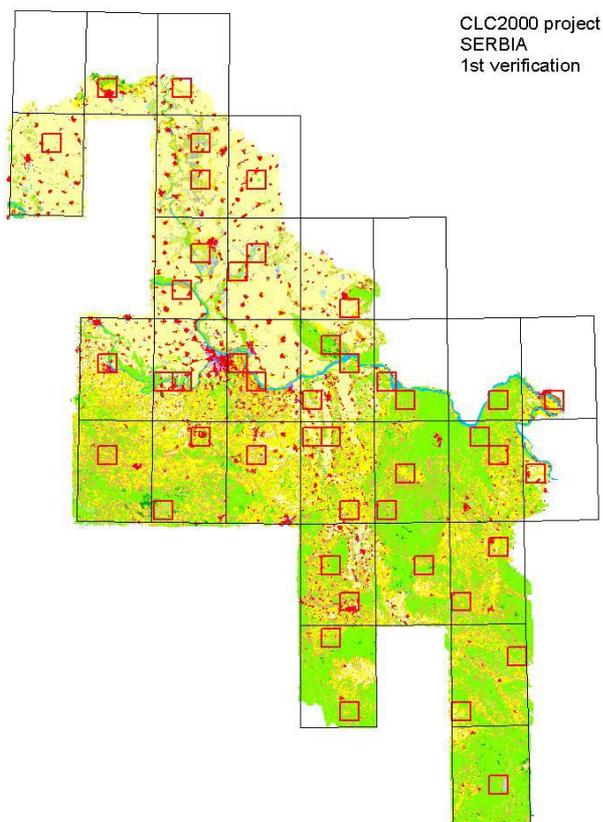
The verification mission was conducted by following the standard verification procedure, defined by CLC2000 Technical Team (TT):

- Verification of about 10 % of the total area.
- Verification was carried out on a sample of verification units selected by the CLC2000 TT.
- 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 CLC2000 coverage and the verification units in Serbia.

As the Serbian and Montenegrin team works in two locations, the verification has been organised in two places.

I. SERBIA

1.3 Selection of verification units

Verification units have been selected for the 1st verification as indicated in Table 1.

Table 1. 1st CLC2000 verification in Serbia

Working units	No. of verification units
Subotica	1
Segedin	1
Sombor	1
Kikinda	2
Zombolj	1
Vrsac	1
Alibunar	2
Zrenjanin	2
Sabac	1
Beograd	2
Smederevo	2
Pozarevac	3
Veliko Gradiste	2
Orsava	1
Kladovo	1
Negotin	1
Bor	2
Zagubica	2
Lapovo	3
Kragujevac	1
Lazarevac	2
Valjevo	1
Kursumlija	2
Bela Palanka	2
Vlasotince	1
Krusevac	2
Aleksinac	1
Zajecar	2
Total:	45

All selected verification units have been checked.

2. Mission Agenda

Place of the verification mission: an office long-term rent by EvroGeomatica in Beograd, Serbia

16th January 2006

09.00 - 18.50

Introduction (TT)

Verification (TT)

17th January 2006

08.30 - 14.00

Verification (TT)

14.10 – 15.20 Discussion of results (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:

- Jan 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 has 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) Visual evaluation inside verification units.

The first three checks (from a) to c)) 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, but need improvements.

The summarized technical evaluation is as follows:

- Code validity is generally right, except one 0 coded polygon (Bor)
- One polygon smaller than 25 ha have been found (Sombor)

The summarized thematic evaluation concerning CLC2000:

- Some CLC 242 polygons with houses, density less than 300 m, recommended to change into class 112.
- It is important to separate the class 112 from some polygons of class 242.
- In some places the class 112 is mixed with the classes 121 and 141.
- An important observation is the classes 242 and 211 and 242 and 221 are not enough precisely separated.
- The separation between classes 231 and 321 needs correction in many places.
- Some polygons with regular shapes inside forests should be classified as the class 324, not 321.
- Some large areas of 211 should be corrected the class 231.
- The boundary between class 242 and 243 and 311, 312 and 313 and 332 and 333 needs improvements.
- Some large polygons of the classes 311 and 324 must be separated.
- The classification of channel as the class 122 needs correction.

Table 2. Summary results of verification, Serbia

Working unit	No. of verification units checked	CLC2000 Database
Subotica	1	Accepted
Segedin	1	Accepted
Sombor	1	Accepted
Kikinda	2	Conditionally accepted ^x
Zombolj	1	Accepted
Vrsac	1	Accepted
Alibunar	2	Accepted
Zrenjanin	2	Accepted ^x
Sabac	1	Accepted
Beograd	2	Accepted
Smederevo	2	Accepted
Pozarevac	3	Accepted
Veliko Gradiste	2	Accepted
Orsava	1	Accepted
Kladovo	1	Accepted
Negotin	1	Accepted
Bor	2	Conditionally accepted ^x
Zagubica	2	Accepted
Lapovo	3	Accepted
Kragujevac	1	Accepted
Lazarevac	2	Accepted
Valjevo	1	Accepted
Kursumlija	2	Accepted
Bela Palanka	2	Accepted
Vlasotince	1	Accepted
Krusevac	2	Accepted
Aleksinac	1	Accepted
Zajecar	2	Accepted

^x there is a need for a very detailed checking of the whole working unit

4.3 Metadata

Metadata were checked.

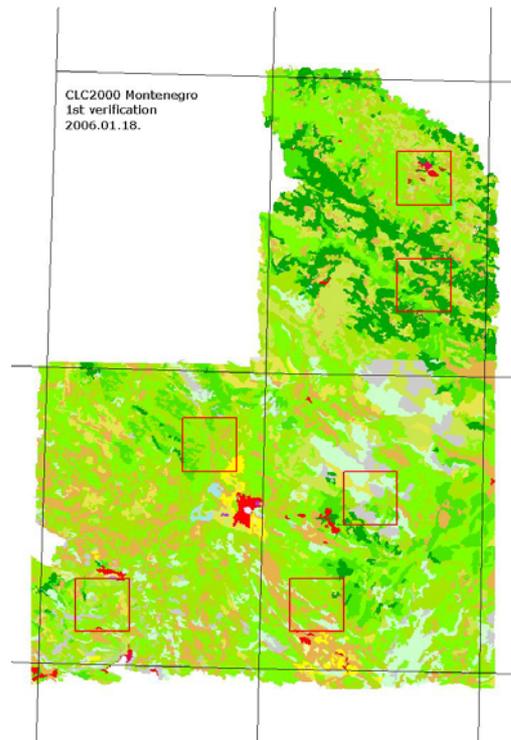
5. Recommendations concerning continuation of CLC2000 in Serbia

- Study detailed remarks related to CLC2000 (see Annex 1).
- The field checking and ancillary data can help to obtain more precise separation of the classes 211, 231, 242 and 221.
- Areas of natural grassland (321) should be revised. The human impact on these areas should be minimal (e.g. remote from larger settlements, no agricultural activities, steep slopes, etc.).
- Shaded areas should be interpreted carefully by using topographic maps (mainly in steep valleys).
- Using of topographic maps can help to eliminate omissions of e.g. class 112, or misinterpretation of discontinuous urban fabric (112 into 141) and channels (511 into 122), moreover to delineate the class 112 more precise, etc.

The entire area has to be revised and corrected (not only areas with remarks) especially concerning critical problems.

A small interface programme have been sent to Dragutin Protic, which will allow the team to read the remarks of the TT into the InterView environment (the photointerpretation sw they are using) in order to realise the corrections proposed by the TT.

II. MONTENEGRO



Map 2. The preliminary CLC2000 coverage and the verification units in Montenegro.

1.3 Selection of verification units

Verification units have been selected for the 1st verification as indicated in Table 3.

Table 3. 1st CLC2000 verification in Montenegro

Working units	No. of verification units
Niksic	2
Danilovgrad	2
Pljevlja	2
Total:	6

All the selected verification units have been checked.

2. Mission Agenda

Place of the verification mission: Geological Survey of Montenegro: Cetinski put bb 81000 Podgorica.

18th January 2006

08.00 - 13.00

Introduction (TT)

Verification (TT)

Discussion (TT, NT)

3. Participants

The following experts participated in the meeting:

From the Montenegrin national team:

- Slobodan Radusinovic, technical manager

- Neda Devic, photointerpreter
- Bozica Jovanovic, photointerpreter
- Tijana Danilovic, photointerpreter

From the CLC2000 Technical Team:

- Jan 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 has been very careful, so the TT could start working immediately. Topographic maps were always available in digital format. The checking process was as follows:

- e) Checking validity of codes and neighbouring polygons with the same code (merge errors) in CLC2000.
- f) Checking size errors in CLC2000.
- g) Checking CLC2000 statistics (to reveal non-relevant codes).
- h) Visual evaluation inside verification units.

The first three checks (from a) to c)) 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 2 includes detailed verification comments produced by TT.

4.2 General conclusions concerning results in Montenegro

The TT concluded that the Montenegrin CLC2000 database is good, but need improvements.

The summarized technical evaluation is as follows:

- Code validity is right.
- Size limits (25 ha minimum) were kept rather well.
- The 100 meter width parameter is not always respected.

The summarized thematic evaluation concerning CLC2000:

- Correct the class 111 into the class 112 in some places.
- The size of some polygons (the class 112) is overestimated.
- The boundary between classes 211, 231, 242 and 243 needs improvements.
- The separation between classes 231 and 321 needs correction in a many places.
- The class 241 should be corrected into the class 211 or 243 and the class 244 into the class 243.
- The forest landscape needs more precise delineation of the classes 311, 312, 313 and 324.
- The class 333 should be separated from the class 332 in some polygons.

Table 4. Summary results of verification, Montenegro

Working unit	No. of verification units checked	CLC2000 Database
Niksic	2	Accepted
Danilovgrad	2	Conditionally accepted ^x
Pljevlja	2	Accepted

^x there is a need for a very detailed checking of the whole working unit

5. Recommendations concerning continuation of CLC2000 in Montenegro

- Study detailed remarks related to CLC2000 (see Annex 2).
- The field checking and ancillary data can help to obtain more precise separation of the classes 211, 231, 242 and 221.
- Natural grassland (321) should be revised. The human impact on these areas should be minimal (e.g. remote from larger settlements, no agricultural activities, steep slopes, etc.).
- Shaded areas should be interpreted carefully by using topographic maps (mainly in steep valleys).
- Using of topographic maps can help to delineate the class 112 more precisely.
- Exact use of the interpretation element “colour” can help to delineate the forest classes 311, 312 and 313 more precisely (the coniferous forest manifests in dark brown colour in the spectral bands combination 4 – 5 – 3 with colours green – red – blue).

The entire area has to be revised and corrected (not only areas with remarks) especially concerning critical problems.

A small interface programme have been sent to Dragutin Protic, which will allow the team to read the remarks of the TT into the InterView environment (the photointerpretation sw they are using) in order to realise the corrections proposed by the TT.

6. Difficulties encountered during the mission and proposed solutions

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7. Materials collected

A few examples of typical mistakes were collected.

8. Summary of actions to be undertaken

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9. Next foreseen mission in the country

The Technical Team will visit both teams in February for a short training on mapping Land Cover changes.

10. Proposals for further verification missions in any countries

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11. Annexes

- Annex 1 Detailed verification protocol for Serbia
- Annex 2. Detailed verification protocol for Montenegro