



European Topic Center  
Terrestrial Environment

Under contract with the

European Environment Agency



# CLC2000 2<sup>nd</sup> Verification Serbia and Montenegro

## Mission Report

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

29-30 May 2006

**Ref.: Verification Mission Report 2/2006**

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## 1. Activities linked to the preparation of the verification mission

This was the 60<sup>th</sup> verification mission undertaken by the CLC2000 Technical Team, and the second verification mission organised for Serbia and Montenegro.

CLC2000 in Serbia and Montenegro is implemented under the CARDS programme in two locations: Beograd (Serbia) and Podgorica (Montenegro). Training and verification activities are organised in these two locations. The total surface of Montenegro has been prepared for CLC2000 verification (see map 1). Additionally the first 3 CLC-change map sheets have also been presented.

### 1.1 Verification procedure

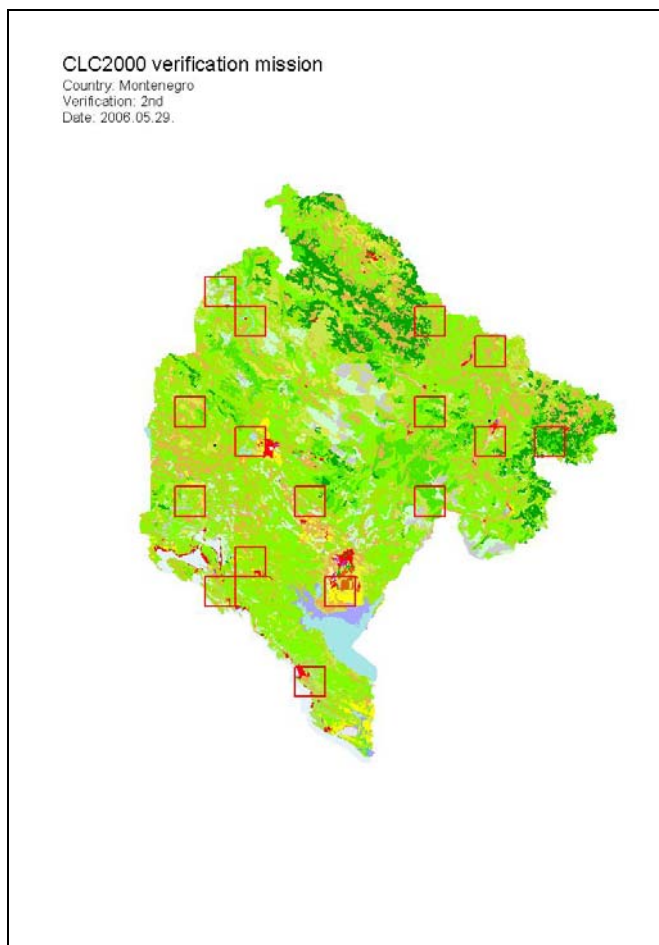
The verification mission was conducted by following the standard verification procedure, defined by CLC2000 Technical Team:

- Verification of about 10 % of the total area.
- Verification was carried out on a sample of verification units selected by the CLC2000 TT.
- 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 Montenegro, 2nd verification

### 1.3 Selection of verification units

Selected verification units can be seen on Map 1 and in Table 1.

Table 1. Summary of the verification activities

Working units	No. of verification units
Berane	3
Cetinje	2
Danilovgrad	1
Gacko	2
Niksic	3
Pec	1
Pljevlja	+
Podgorica	2
Prijepolje	2
Ulcinj	+
<b>Total:</b>	<b>15+</b>

All the selected verification units have been checked. For working units marked with (+) there were no pre-selected verification unit(s) available.

## 2. Mission Agenda

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

### 29<sup>th</sup> May 2006

08.00 - 18.00

Introduction (TT)

Verification (TT)

Discussion (TT, NT)

### 30<sup>th</sup> May 2006

08.00 - 20.00

Field trip

## 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:

- George Büttner
- 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. 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 has usually been performed only for area(s) outlined by the verification unit(s). In case of the presence of a systematic error was suspected, areas outside the verification unit were also investigated.

Written verification comments (which are part of the protocol, see Annex 1) produced by TT were provided to the national team in order to start corrections immediately.

### 4.2 General conclusions concerning results in Montenegro

The TT concluded that the Montenegrin CLC2000 database is good; it has improved a lot following the first verification. Remarks of the TT on the 1<sup>st</sup> verification have been considered.

The summarized technical evaluation is as follows:

- Code validity is right, 4 wrong codes in CLC-change
- Size limits (25 ha minimum) were kept rather well, 2 small polygons in CLC-change.
- The 100 meter width parameter is respected.

The summarized thematic evaluation concerning CLC2000:

- Not enough details in some semi-natural areas: e.g. inside 321: missing 333 and/or 332; inside 324: missing 321 and/or 312, 313.
- Alternating use of 323 and 324 on the coast is questionable (Cetinje).
- Better separation of 242 and 243 is expected in some places.
- Some rivers (or sections of rivers) > 100 m is missing (Podgorica).
- Similar small patches inside a forest are coded as 321 and 243 (Prijepolje).
- An abandoned saline have to be classified according to the actual land cover (421).
- Missing built-up area (Cetinje).

The summarized thematic evaluation concerning CLC-changes:

- Land Cover in Montenegro at the working scale of CORINE seemed to be rather stable. But interpreters outlined lots of differences between the 1990 and 2000 imagery, as CLC-changes. These relate mostly to seminatural classes, e.g. 324-31x, 31x-324, 31x-333, 324-333, etc.
- One impossible change has been found 331-242 (gravel/sand turned to agricultural mosaic): (Danilovgrad)
- In some cases the true change process has been exaggerated: e.g. 312-333
- One missing change polygon has been found (131 existed in 1990, but disappeared by 2000). (map sheet Niksic).
- Temporary change due to water level changes in reservoirs is classified as CLC change.

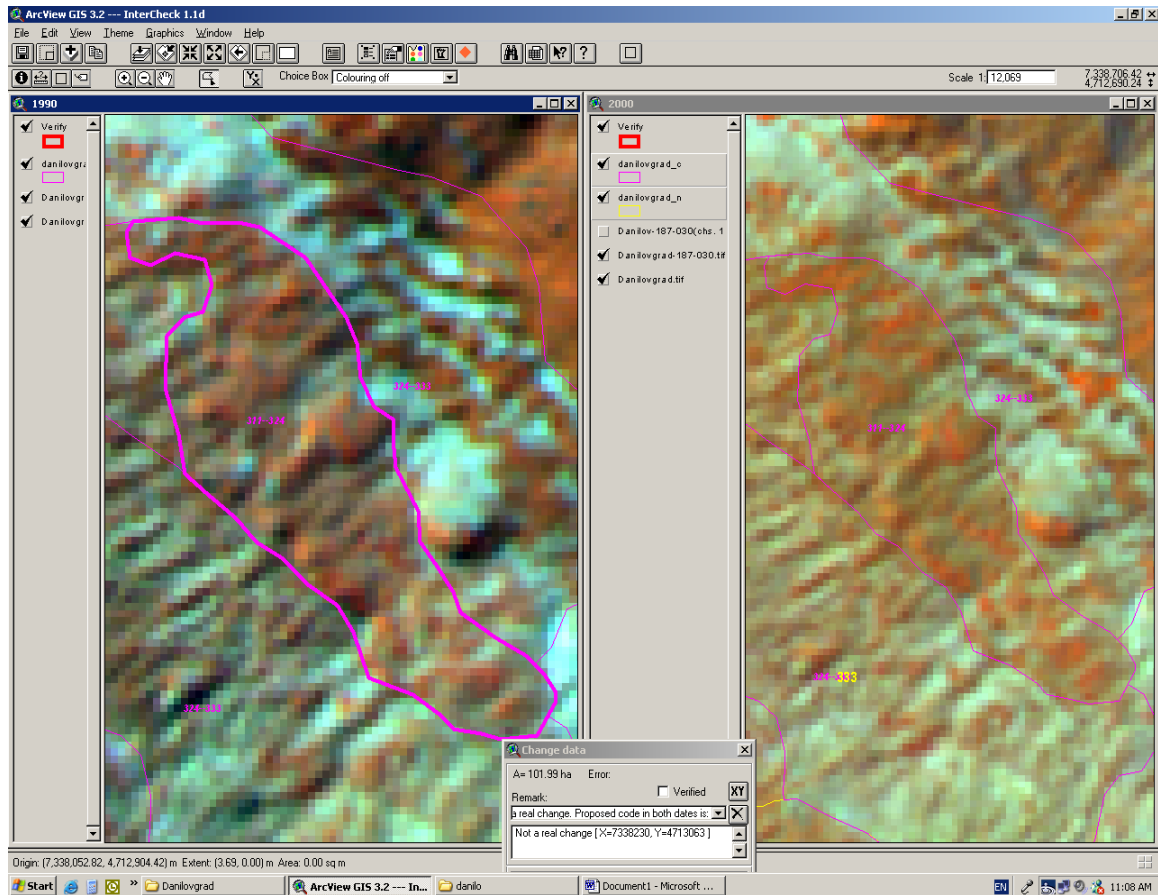


Fig. 1. Typical mistake in CLC-Montenegro: Colour differences between images (left: 1990, right: 2000) interpreted as land cover change. No change in the reality.

Table 2. Summary results of verification, Montenegro

Working unit	No. of verification units checked	CLC2000 database	CLC-change database
Berane	3	Accepted	
Cetinje	2	Accepted	
Danilovgrad	1	Accepted	Conditionally accepted
Gacko	2	Accepted	
Niksic	3	Accepted	Conditionally accepted
Pec	1	Accepted	
Pljevlja	+	Accepted	Conditionally accepted
Podgorica	2	Accepted	
Prijepolje	2	Accepted	
Ulcinj	+	Accepted	

Conditionally accepted means: the mapsheet is accepted if the proposed corrections are made

#### 4.4 Field trip

A field trip has been organised North of Podgorica to see separation of seminatural classes: forests (324, 311, 312, 313), natural grassland (321), sparsely vegetated areas (333) and bare rocks (332). Itinerary was as follows: Podgorica - Moraca valley - Mojkovac - Tara valley - Zabljak - Durmitor mts. - Niksic-Podgorica.

## 5. Recommendations concerning continuation of CLC2000 in the country

Study detailed remarks related to CLC2000 (see Annex 2). In InterChange software CLC2000 should be improved parallel with mapping changes:

- Improve details in some cases of semi-natural areas: e.g. inside 321: 333 and/or 332 can be delineated. Inside 324 polygons of 321 and/or 312, 313 can be delineated.
- Concerning built-up area consider that the maps are rather old, so remote sensing data should have a preference.
- Check (with vegetation map or in the field) neighbour polygons with 323 and 324 code on the coast.
- Improve separation of 242 and 243 in some places.
- All rivers (or sections of rivers) exceeding the 100 m width have to be interpreted.
- Small patches inside forest (with some houses and human activities) are proposed to classify as 243 (and not 321). (Example seen on mapsheet: Prijepolje.)

Proposed corrections in CLC-change:

- Only real changes are to be mapped. Satellite images in 1990 and 2000 can be different in colour because of many reasons: seasonal difference, atmospheric difference, 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. E.g. 331-242.
- In case of clear-cutting or forest damage the recommended change is: 31x-324 (and not 31x-333).
- Temporary changes e.g. due to water level changes in reservoirs are not CLC changes.

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

## **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 2nd verification in Serbia is planned in middle of June.  
The last verification is scheduled for late summer.

## **10. Proposals for further verification missions in any countries**

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## **11. Annexes**

- Annex 1. Detailed verification protocols