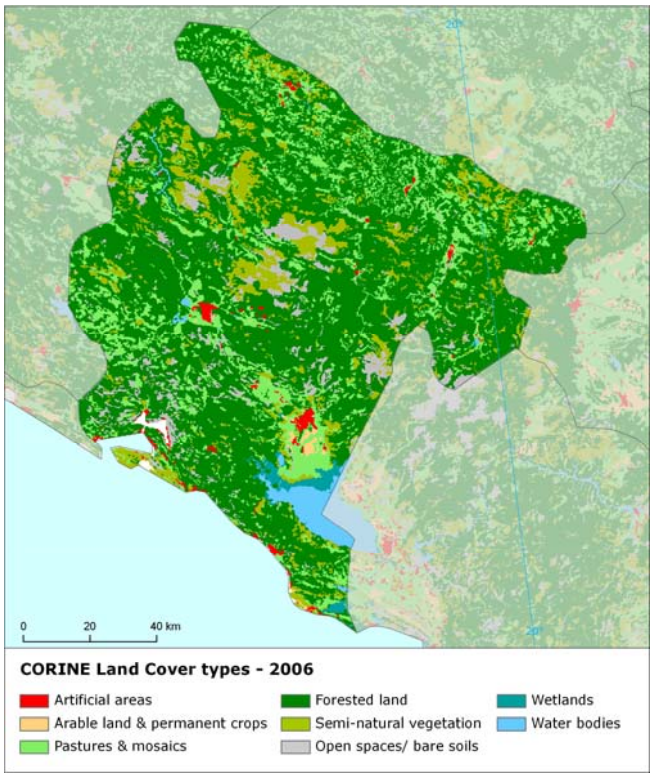
Montenegro

Land cover 2006

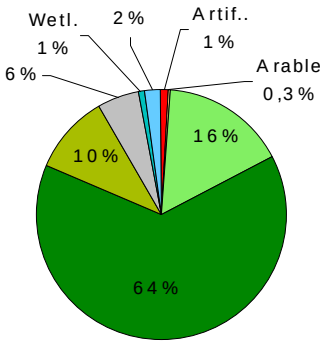
Overview of land cover & change 2000-2006

Although the intensity of land cover change in Montenegro was more than doubled compared to the previous period 1990-2000, the overall change dynamic in Montenegro landscape is still very low, compared to the other European countries. The acceleration of land cover change has been caused mainly by increased intensity of conversions of forested land and open spaces/bare soils and also by accelerated artificial land take.
Forested land, pastures and semi-natural vegetation are the land cover types with prevailing consumption of initial area, in contrast, artificial surfaces, together with open spaces/bare soils and arable/crop land show increase in net change balance.
The development of mountainous landscape of Montenegro in 2000-2006 has been driven by forest creation and development and also by natural conversions represented mostly by forest/shrub fires and conversion of transitional woodland into sparsely vegetated areas. Forested land was the landscape type with highest change dynamic, characterized by total annual turnover. However, most of forested land turnover has been driven by internal changes between transitional woodland and standing forests reflecting regular forestry activities. Besides these natural landscape conversions, artificial land take with prevailing share of sprawl of economic sites and infrastructures (mostly over forested and pasture land) was the other main driver of land cover exchange in Montenegro.
Concerning the spatial distribution of change areas, artificial land take occurs mostly along the Adriatic coast, in surroundings of capital city Podgorica and also in mining region near Pljevlja city in northern Montenegro. Changes of forested landscape (other than recent felling and conversion) are situated mainly in western part of the country.

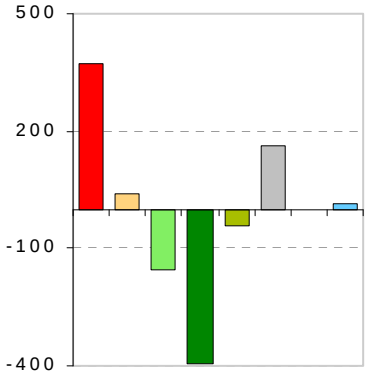
Note: The results presented here are based on a change analysis of 44 land cover types mapped consistently on a 1:100.000 scale across Europe over almost two decades 1990-2006 - see Corine land cover (CLC) programme for details.
Number of years between CLC2000-CLC2006 data for Montenegro: 6



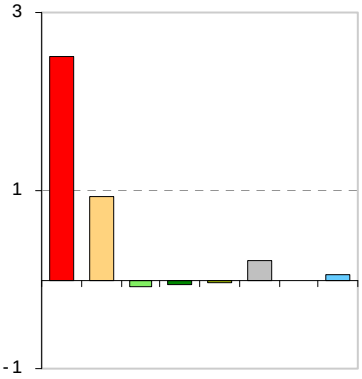
1.1. Land cover 2006 [% of total]



1.2. Net change in land cover 2000-2006 [ha]



1.3. Net change in land cover [% of initial year 2000]



Artificial areas
Arable land & permanent crops
Pastures & mosaics
Forested land
Semi-natural vegetation
Open spaces/ bare soils
Wetlands
Water bodies

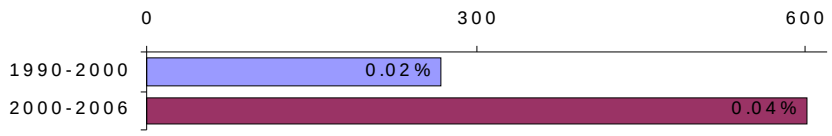
Summary balance table 2000-2006

	Artificial areas	Arable land & permanent crops	Pastures & mosaics	Forested land	Semi-natural vegetation	Open spaces / bare soils	Wetlands	Water bodies	TOTAL [hundreds ha]
Land cover 2000	**149**	**43**	**2221**	**8772**	**1415**	**759**	**129**	**254**	**13742**
Consumption of initial LC	0	0	2	31	0	2	0	0	36
Formation of new LC	4	0	1	27	0	3	0	0	36
Net Formation of LC	**4**	**0**	**-2**	**-4**	**0**	**2**	**0**	**0**	**0**
Net formation as % of initial year	*2.5*	*0.9*	*-0.1*	*0.0*	*0.0*	*0.2*	*0.0*	*0.1*	
Total turnover of LC	**4**	**0**	**3**	**59**	**0**	**5**	**0**	**0**	**72**
Total turnover as % of initial year	*2.8*	*0.9*	*0.1*	*0.7*	*0.0*	*0.7*	*0.0*	*0.1*	*0.5*
Land cover 2006	**152**	**43**	**2220**	**8768**	**1415**	**761**	**129**	**255**	**13742**

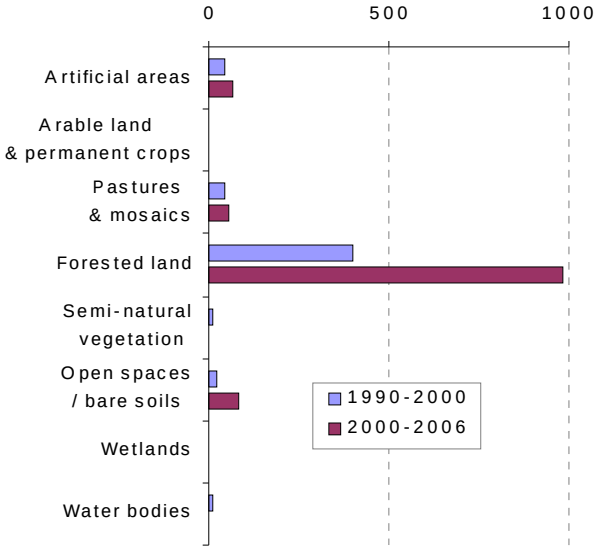
Montenegro

Land cover trends comparison 1990-2000 vs. 2000-2006

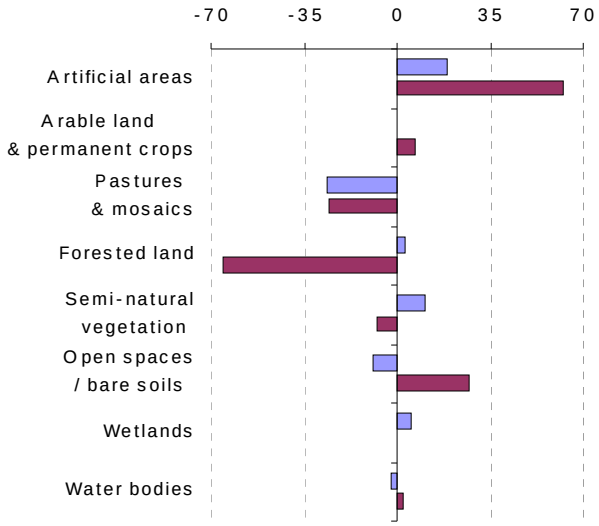
2.4. Annual land cover change [ha/year, % of total area]



2.5. Annual turnover of LC types [ha/year]

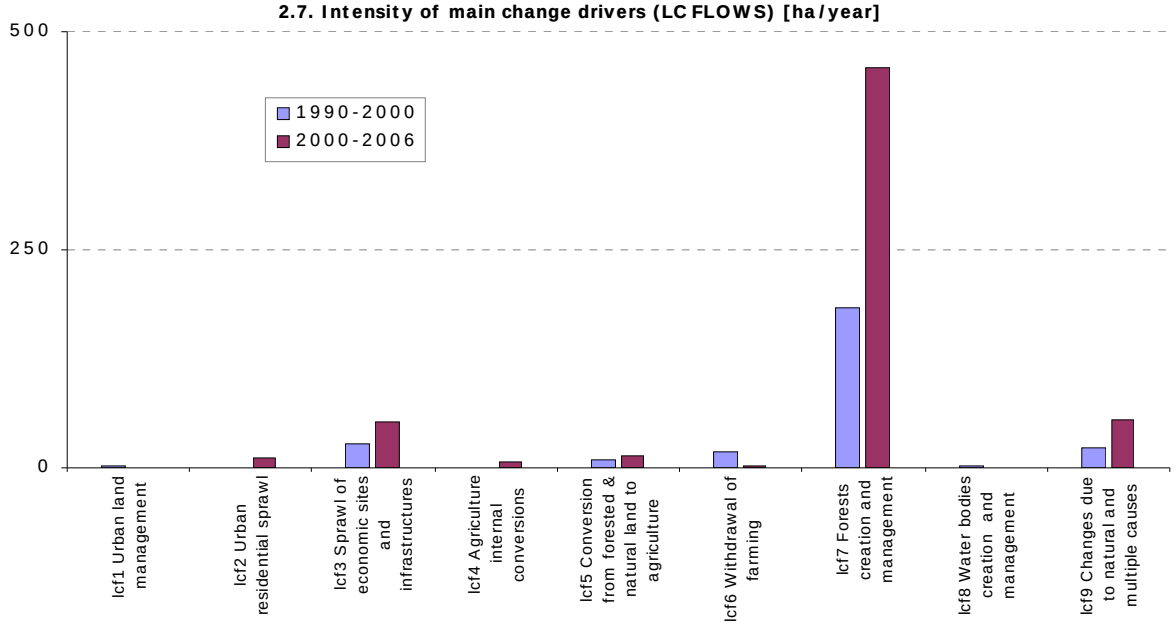


2.6. Net annual change of LC types [ha/year]



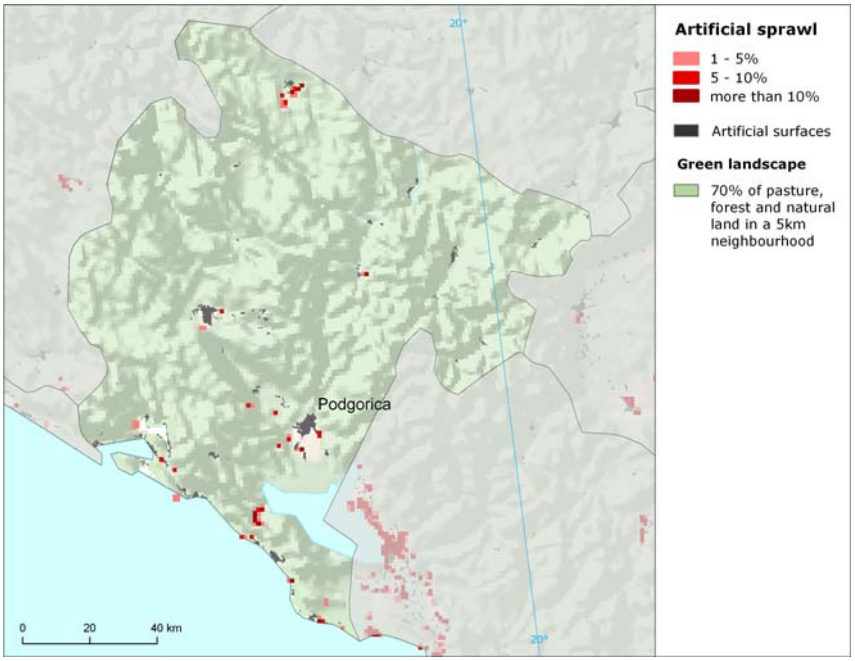
Summary trend figures	1990-2000	2000-2006
Annual land cover change [ha/year]	**269**	**602**
Annual land cover change as % of initial year	**0.02%**	**0.04%**
Land uptake by artificial development as mean annual change [ha/year]	30	65
Agricultural land uptake by urban and infrastructures development as mean annual change [ha/year]	15	31
Net uptake of forests and semi-natural land by agriculture as mean annual change [ha/year]	-15	13
Net conversion from pasture to arable land and permanent crops as mean annual change [ha/year]	0	7
Forest & other woodland net formation as mean annual change [ha/year]	3	-66
Dry semi-natural land cover net formation as mean annual change [ha/year]	1	32
Wetlands & water bodies net formation as mean annual change [ha/year]	3	3

2.7. Intensity of main change drivers (LC FLOWS) [ha/year]

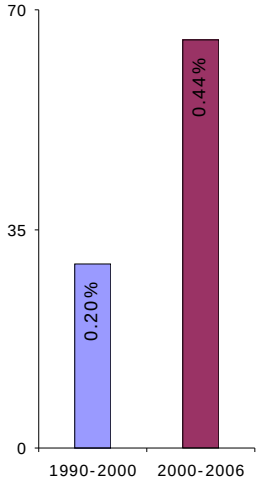


Montenegro

Artificial areas



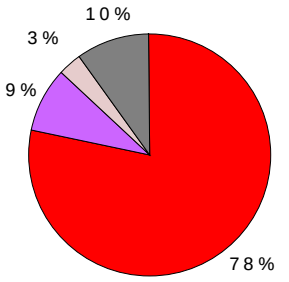
3.8. Artificial land take [ha/year, % of initial year]



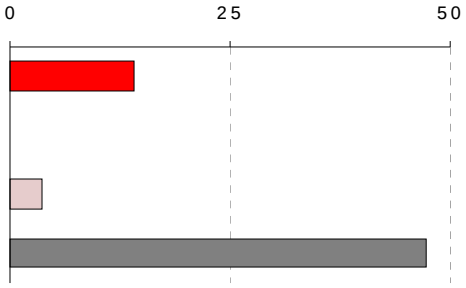
Extension of construction sites and residential sprawl

During 2000-2006, artificial sprawl in Montenegro significantly accelerated compared to previous period. Land take has more then doubled been driven mainly by accelerated extension of construction sites (39%), which indicates potential of further artificial development, together with sprawl of mine and quarrying areas (21%) or dumpsites (12%) and diffuse residential sprawl (19%). Comparing to the previous period, the main difference in land take structure in the country is the significantly increased intensity of construction sites extension and as well as increase of diffuse residential sprawl.
Concerning land cover uptaken by artificial sprawl, these are dominated by agricultural mosaics and pastures (48%), followed by forested land (37%) and semi-natural vegetation (8%) or open spaces/bare soils areas (7%) to a lesser extent.
Development and infilling of urban areas disappeared from artificial exchange, the same could be said about conversion from developed areas to agriculture or water bodies. The only driver which has consumed artificial areas is transitional woodland creation over former mineral extraction sites.

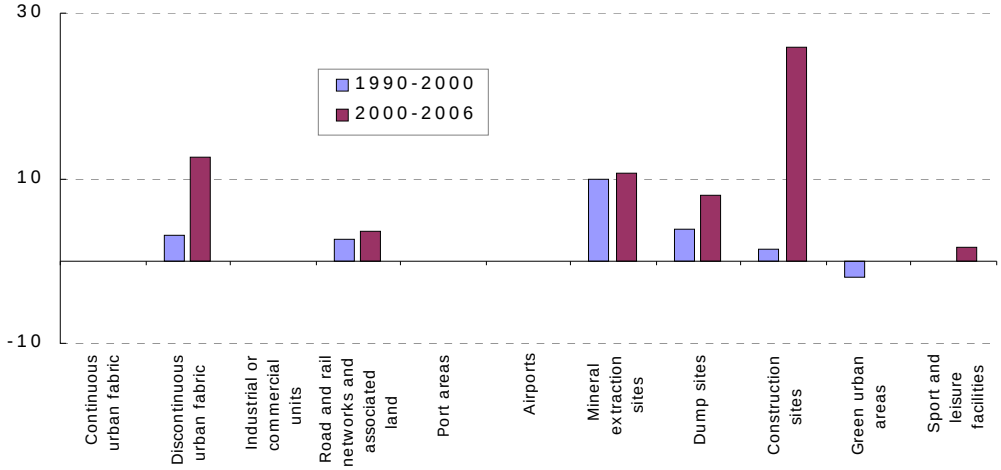
3.9. Artificial surfaces 2006 [% of total area]



3.10. Artificial land take 2000-2006 [ha/year]

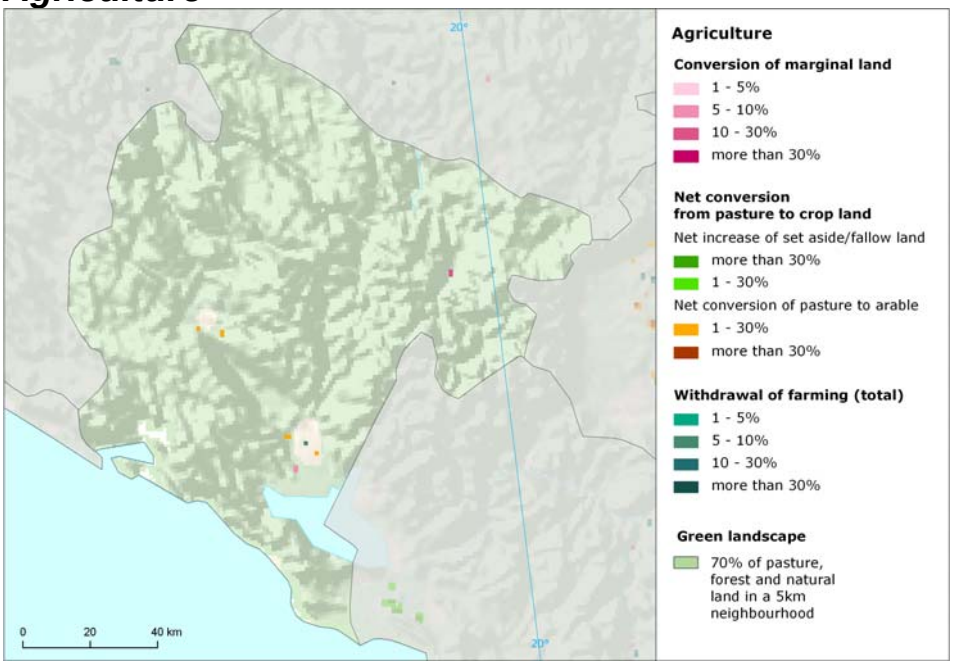


3.11. Mean annual artificial change by class [ha/year]



Montenegro

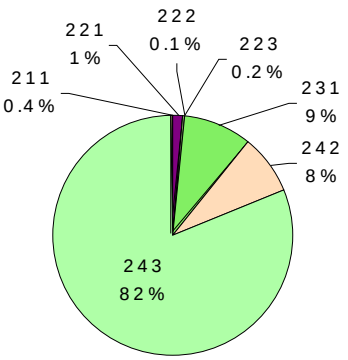
Agriculture



Artificial consumption of mosaics and pastures

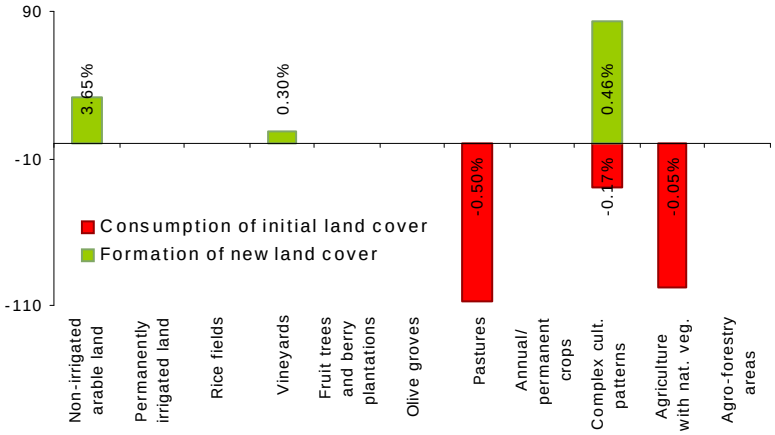
Agricultural land, which covers only about 16% of total Montenegro area, is dominated by agriculture land with natural vegetation (more than 80% of total agricultural land cover) followed by pasture, permanent crop land and vineyards with only negligible share of arable land. Small percentage of agricultural land in Montenegro corresponds to low share of agricultural conversions on total land cover exchange. The development of agricultural land has been driven mostly by external exchange of land cover with artificial surfaces and natural land, with insignificant conversion from pasture to arable land. Conversion from semi-natural land cover to agriculture prevails over withdrawal of farming; however, the major driver of agricultural consumption is artificial land take, driven mainly by sprawl of discontinuous urban fabric, followed by construction and mineral extraction sites extension and development of transportation networks. Concerning the change balance of particular agricultural classes, arable land together with complex cultivation patterns and vineyards have slightly positive balance of net change, in contrast, pastures and agriculture with natural vegetation have significant decrease of area, which has been caused mainly through consumption of these agricultural classes by artificial land take.

4.12. Agricultural areas 2006 [% of total area]

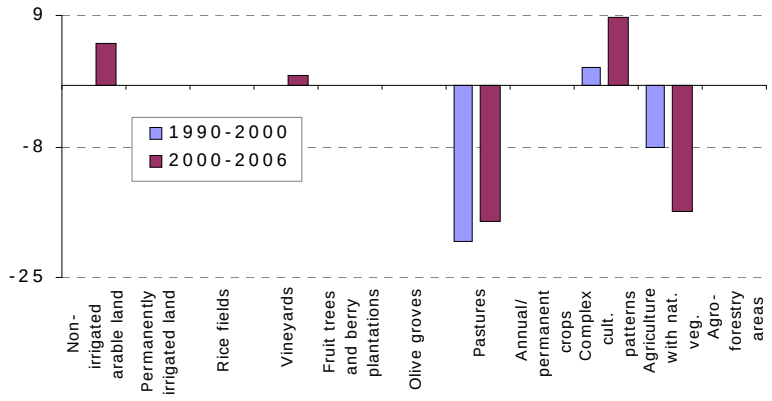


211 Non-irrigated arable land
212 Permanently irrigated land
213 Rice fields
221 Vineyards
222 Fruit trees and berry plantations
223 Olive groves
231 Pastures
241 Annual crops associated with permanent crops
242 Complex cultivation patterns
243 Agriculture land with significant areas of natural vegetation
244 Agro-forestry areas

4.13. Development of agricultural areas 2000-2006 – detailed balance [ha]

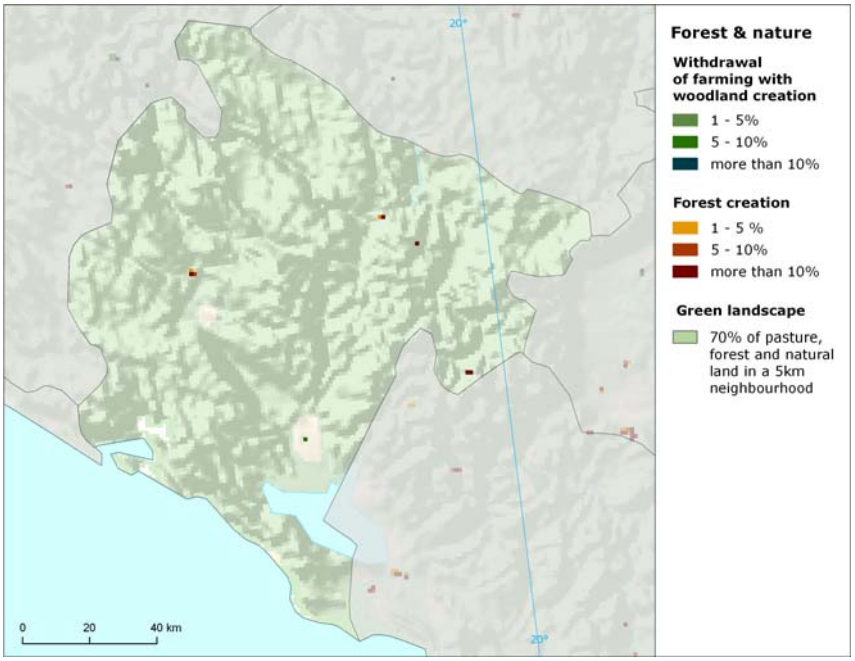


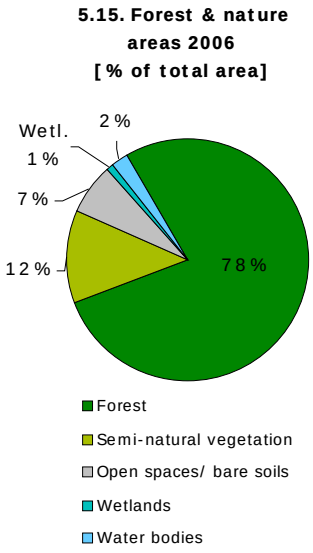
4.14. Mean annual agricultural change by class [ha/year]



Montenegro

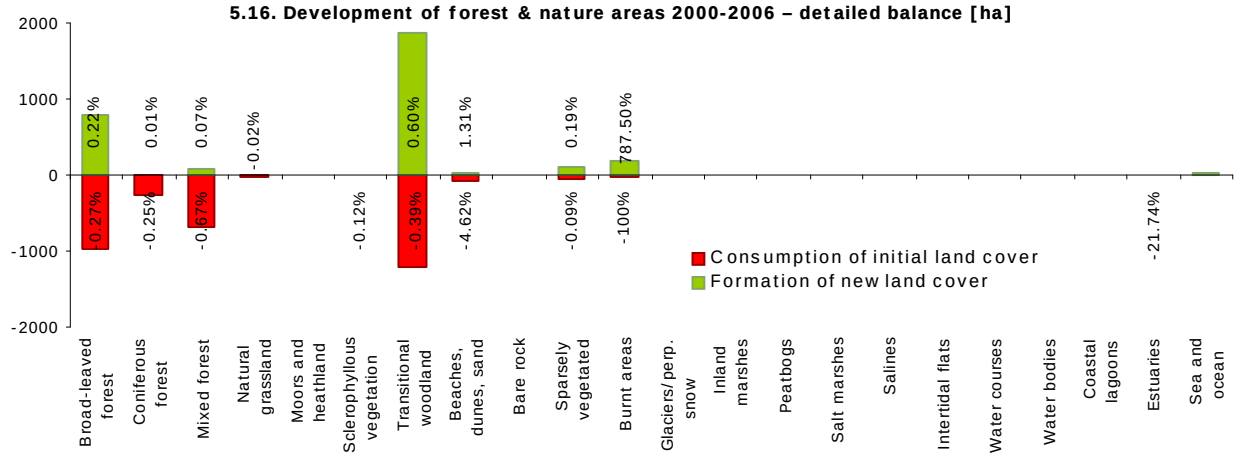
Forest & nature

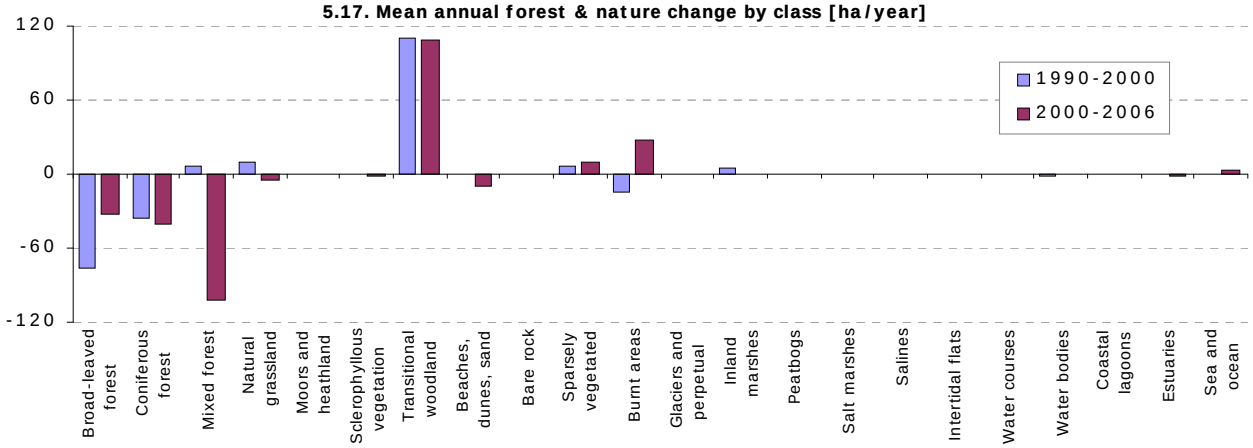




Natural land consumption by construction, mine and dump sites; forest and shrub fires, conversion of transitional woodland into sparsely vegetated areas

Natural land in Montenegro consists mainly of forested areas (with prevailing share of broad-leaved forest and transitional woodland) and of natural grasslands and sparsely vegetated areas.
Main changes of natural land cover are due to recent transitions between standing forests and transitional woodland as result of forestry activities. Besides these internal forest conversions, forest and shrub fires and semi-natural creation, represented by transitional woodland conversion into sparsely vegetated land, are the most significant flows of natural land cover exchange in the country. The main driver of natural land cover consumption in Montenegro is artificial land take represented mostly by sprawl by construction, mineral extraction and dump sites extension.

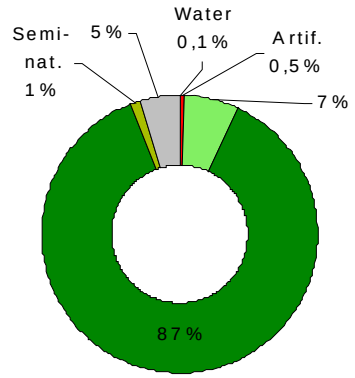




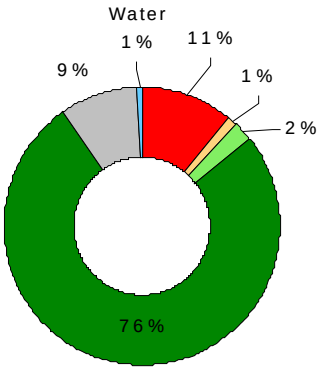
Annex: Land cover flows and trends

Land cover flows 2000-2006

6.18. Consumption of land cover 2000-2006 [% of total change area]

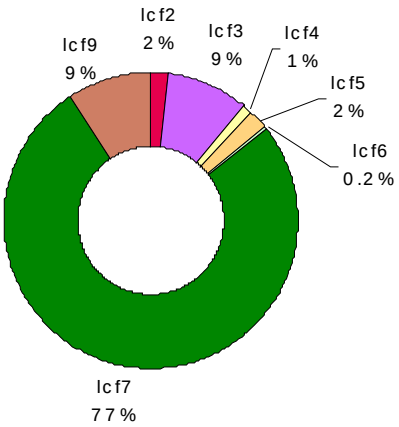


6.19. Formation of land cover 2000-2006 [% of total change area]



Artificial areas | Arable land & permanent crops | Pastures & mosaics | Forested land
Semi-natural vegetation | Open spaces/ bare soils | Wetlands | Water bodies

6.20. Drivers of change (LC FLOWS) 2000-2006 [% of total change area]

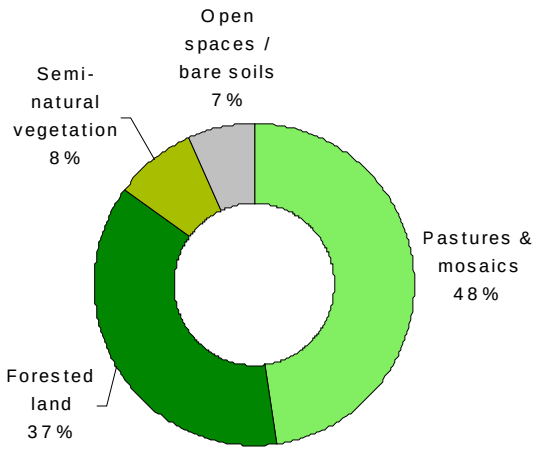


- lcf1 Urban land management
- lcf2 Urban residential sprawl
- lcf3 Sprawl of economic sites and infrastructures
- lcf4 Agriculture internal conversions
- lcf5 Conversion from forested & natural land to agriculture
- lcf6 Withdrawal of farming
- lcf7 Forests creation and management
- lcf8 Water bodies creation and management
- lcf9 Changes due to natural and multiple causes

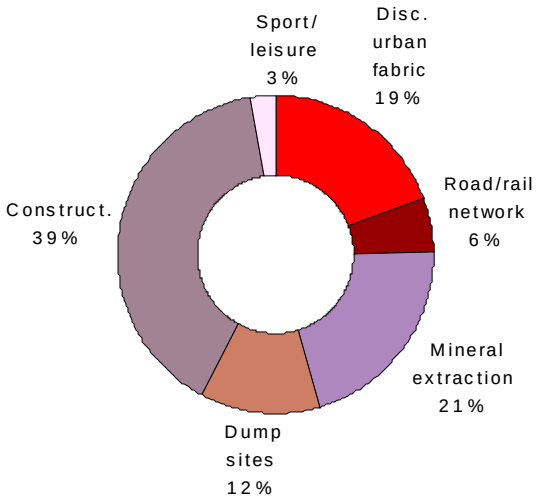
Montenegro

Artificial areas

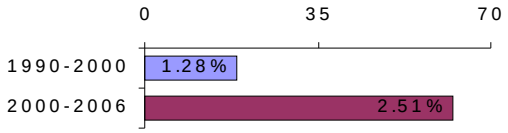
7.21. Consumption by artificial land take 2000-2006 [% of total]



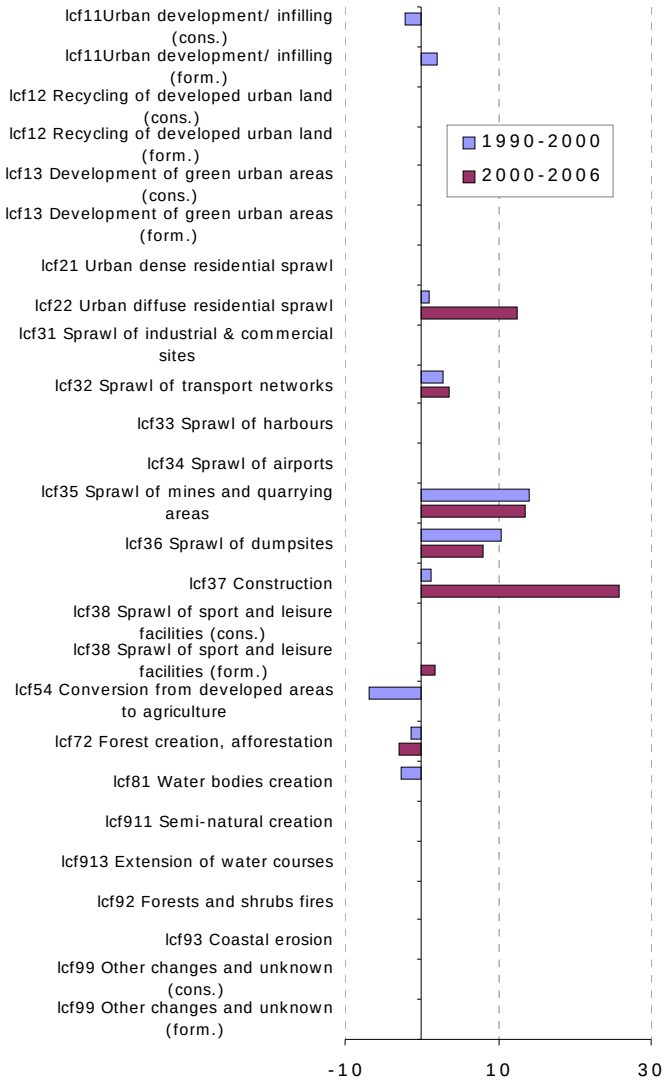
7.22. Formation by artificial land take 2000-2006 [% of total]



7.23. Net formation of artificial area [ha/year, % of initial year]



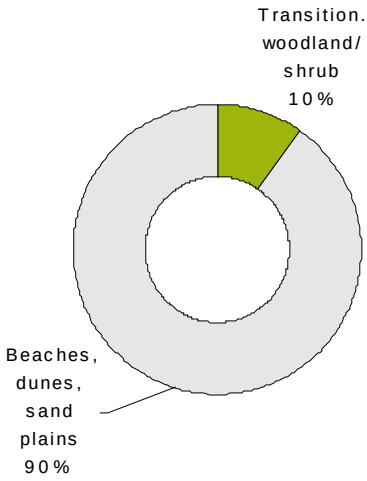
7.24. Artificial development by change drivers (LC FLOWS) [ha/year]



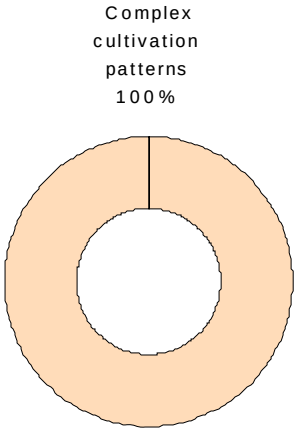
Montenegro

Agriculture

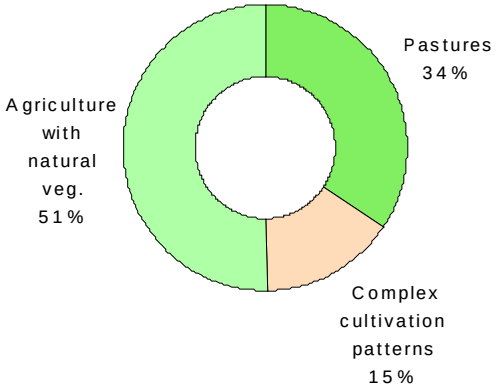
8.25. LC consumed by agriculture 2000-2006 [% of total]



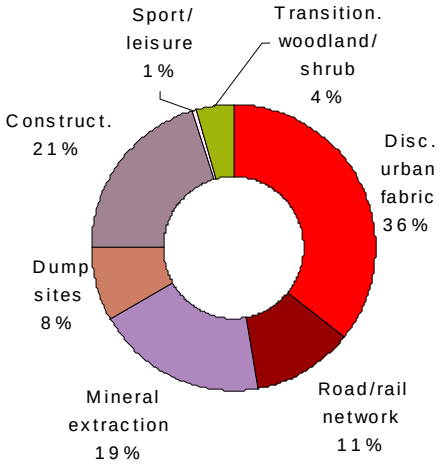
8.26. Formation of agricultural land from non-agriculture 2000-2006 [% of total]



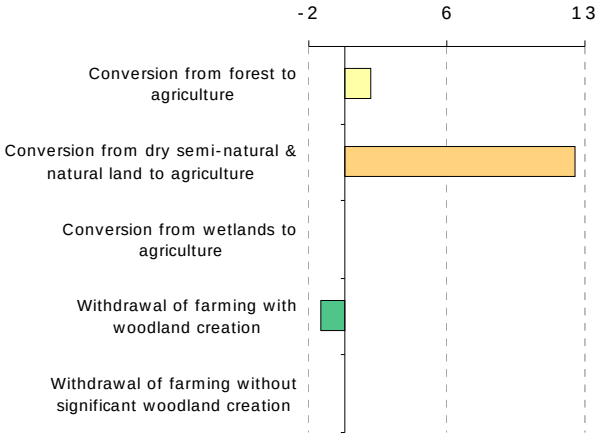
8.27. Consumption of agricultural land by non-agriculture 2000-2006 [% of total]



8.28. Formation of non-agricultural land from agriculture 2000-2006 [% of total]



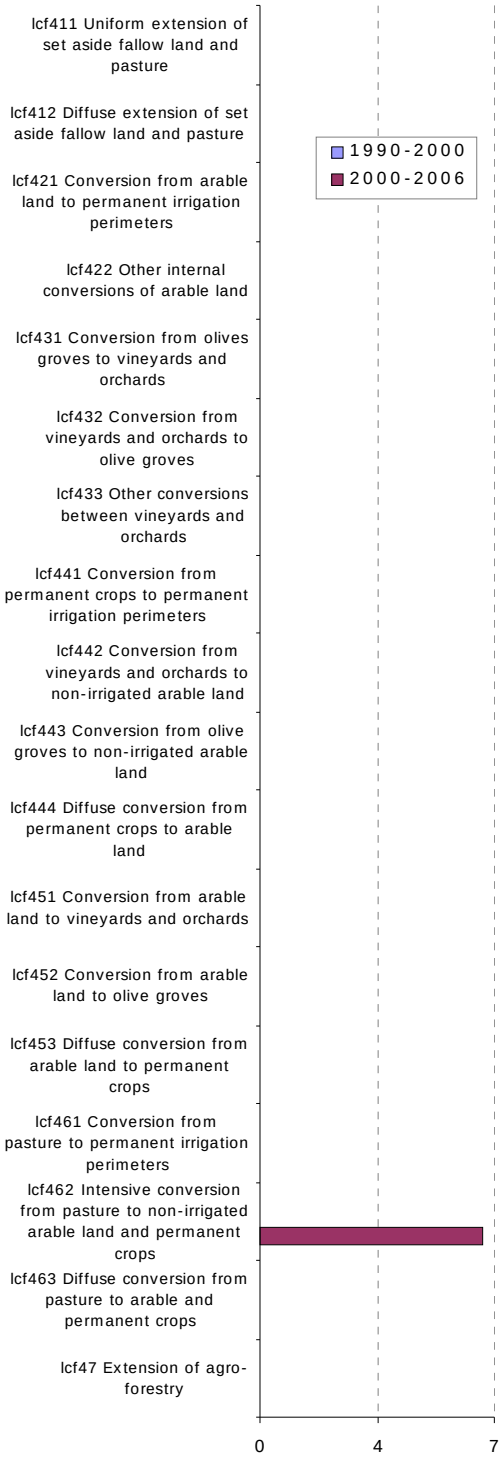
8.29. Main annual conversions between agriculture and forests & semi-natural land 2000-2006 [ha/year]



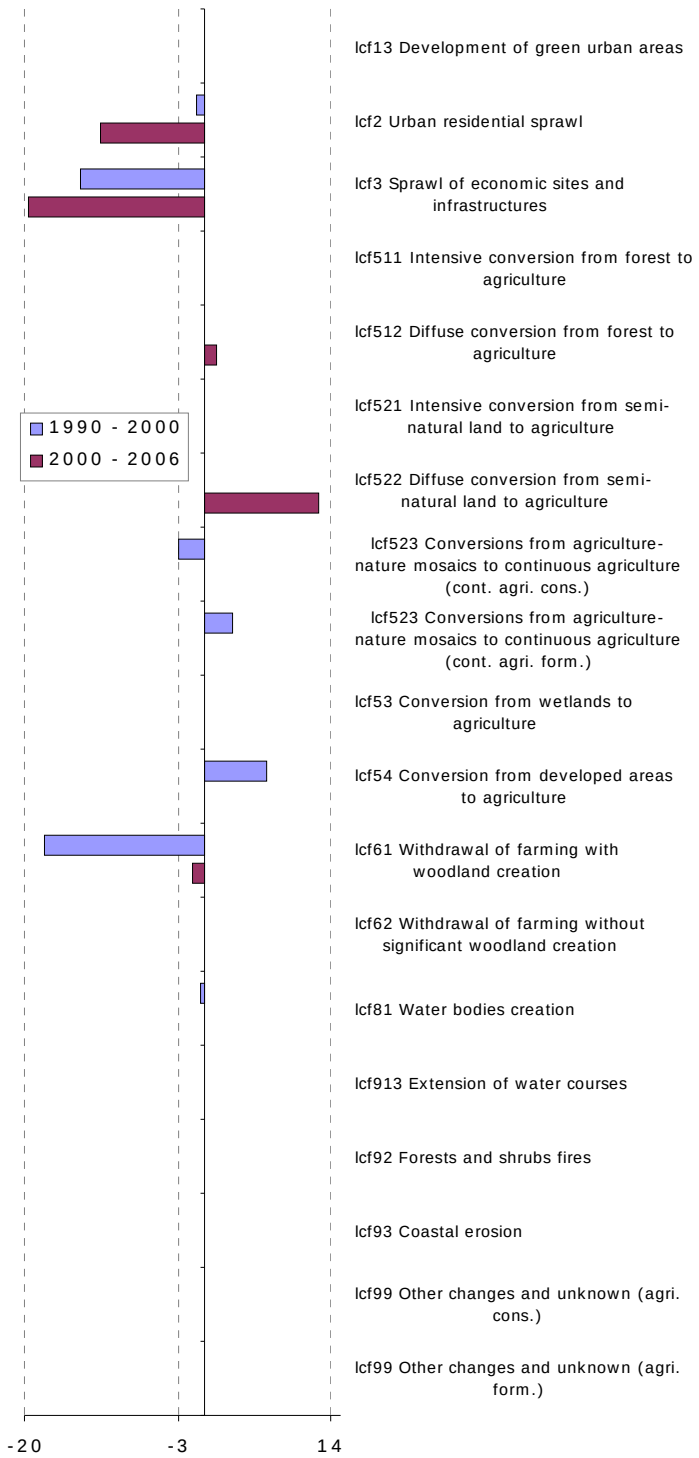
8.30. Mean annual conversion between arable land and pasture [ha/year]

Montenegro

9.31. Mean annual agriculture internal conversions [ha/year]



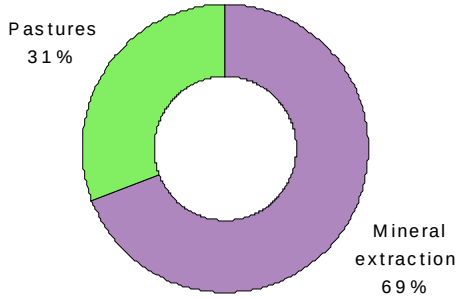
9.32. Mean annual conversions between agriculture and other LC types [ha/year]



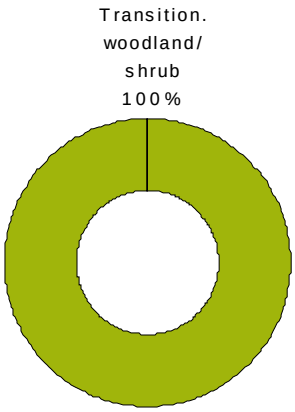
Montenegro

Forest & nature

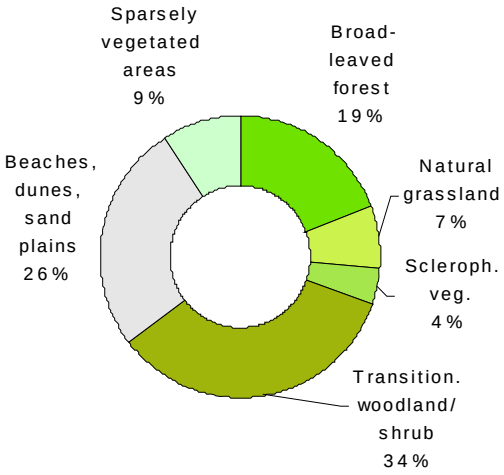
10.33. LC consumed by forest & nature 2000-2006 [% of total]



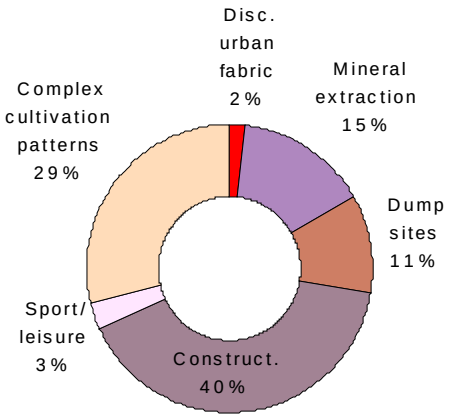
10.34. Formation of forest & nature land from non-forest /nature 2000-2006 [% of total]



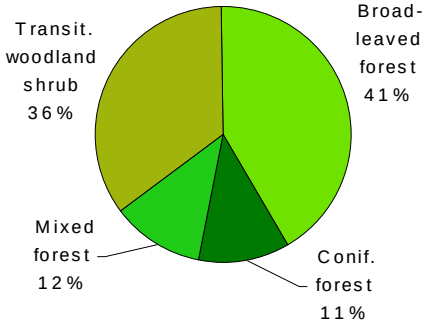
10.35. Consumption of forest & nature land by non-forest/nature 2000-2006 [% of total]



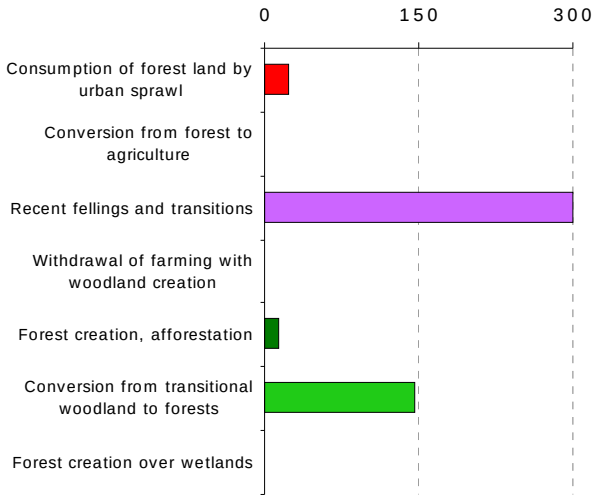
10.36. Formation of non-forest/nature land from forest & nature 2000-2006 [% of total]



10.37. Forested land 2006 [% of total area]



10.38. Main trends in woodland & forests consumption/formation 2000-2006 [ha/year]



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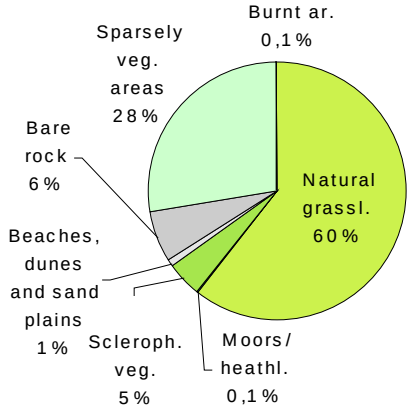
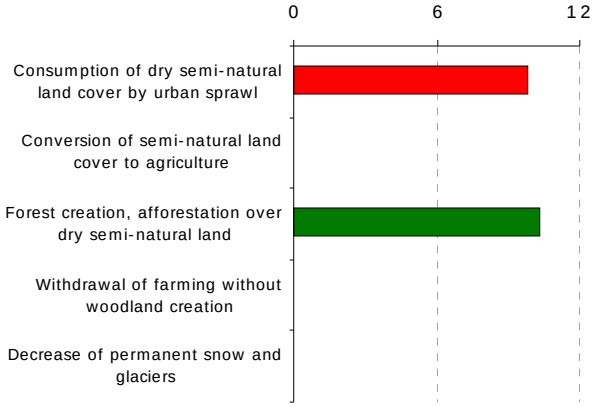
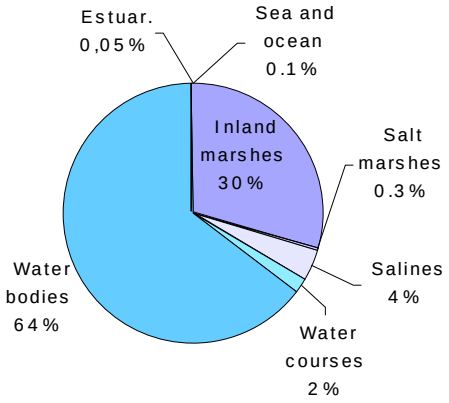
11.39. Dry semi-natural areas 2006 [% of total area]



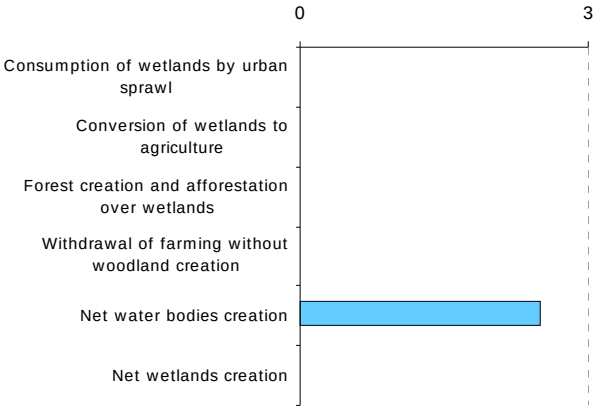
11.40. Main trends in dry semi-natural land consumption/formation 2000-2006 [ha/year]



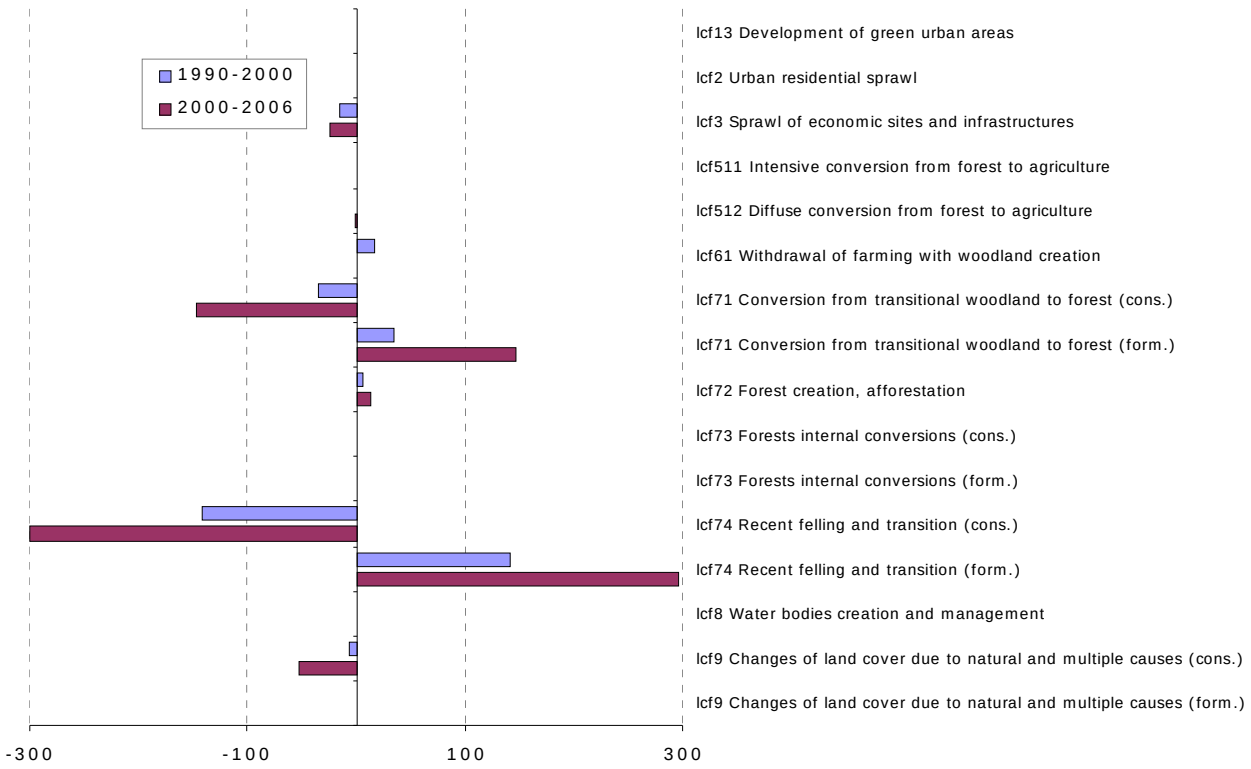
11.41. Wetlands & water 2006 [% of total area]



11.42. Main trends in wetlands & water consumption/formation 2000-2006 [ha/year]



11.43. Mean annual conversions of forest & other woodland [ha/year]



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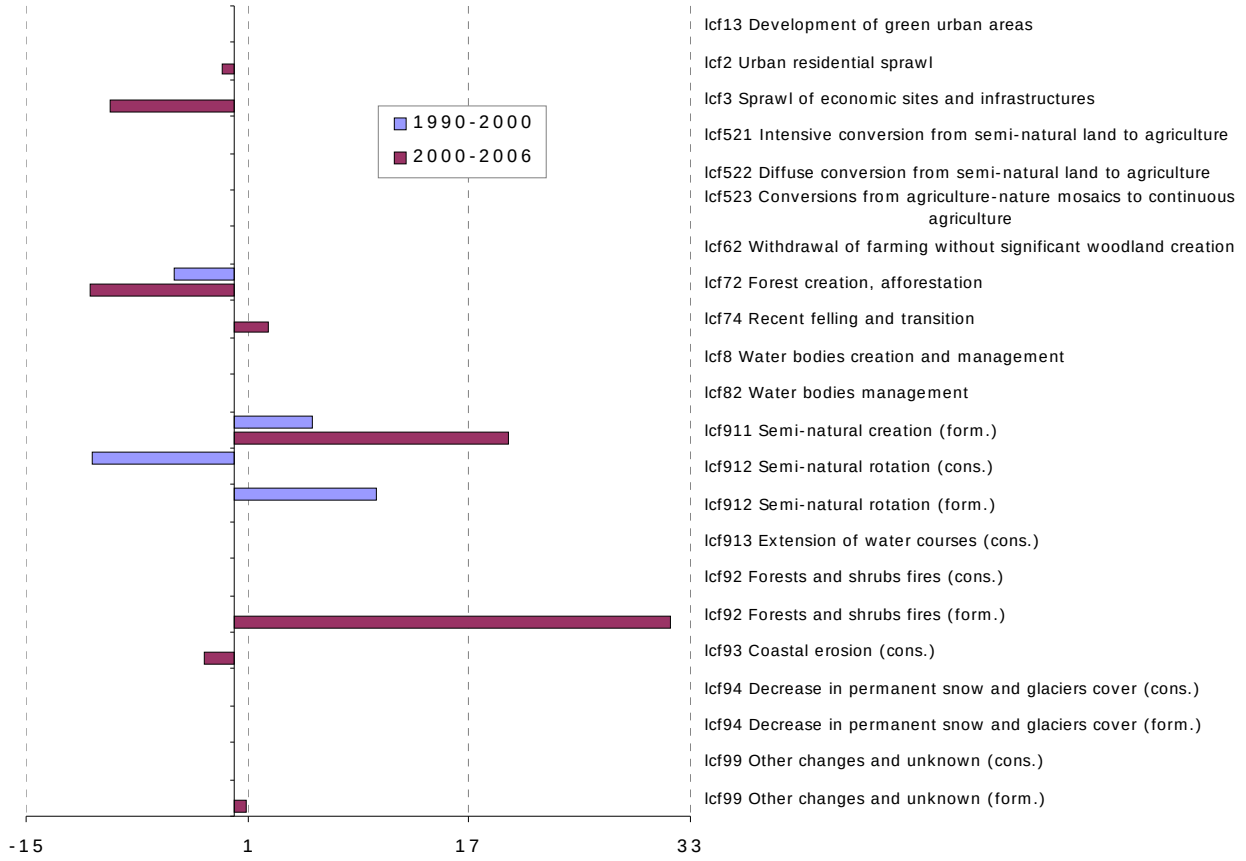
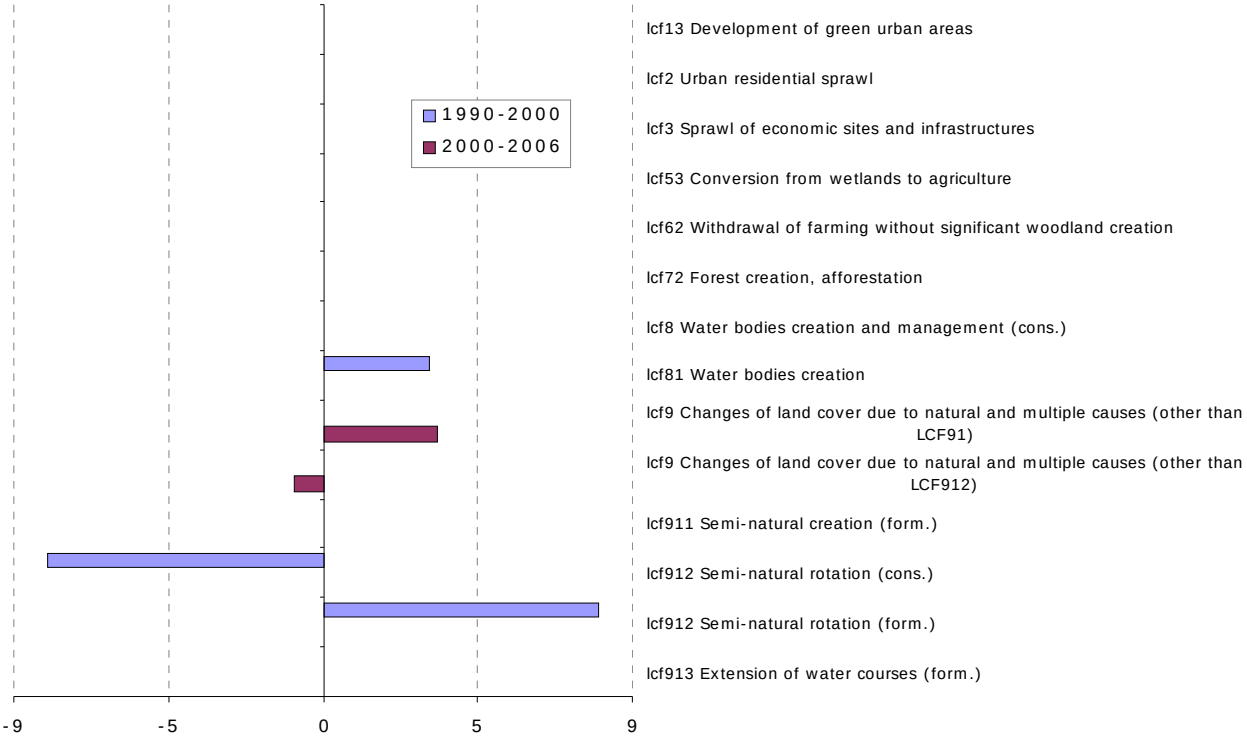
12.44. Mean annual conversions of dry semi-natural LC [ha/year]



12.45. Mean annual conversions of wetlands and water LC [ha/year]



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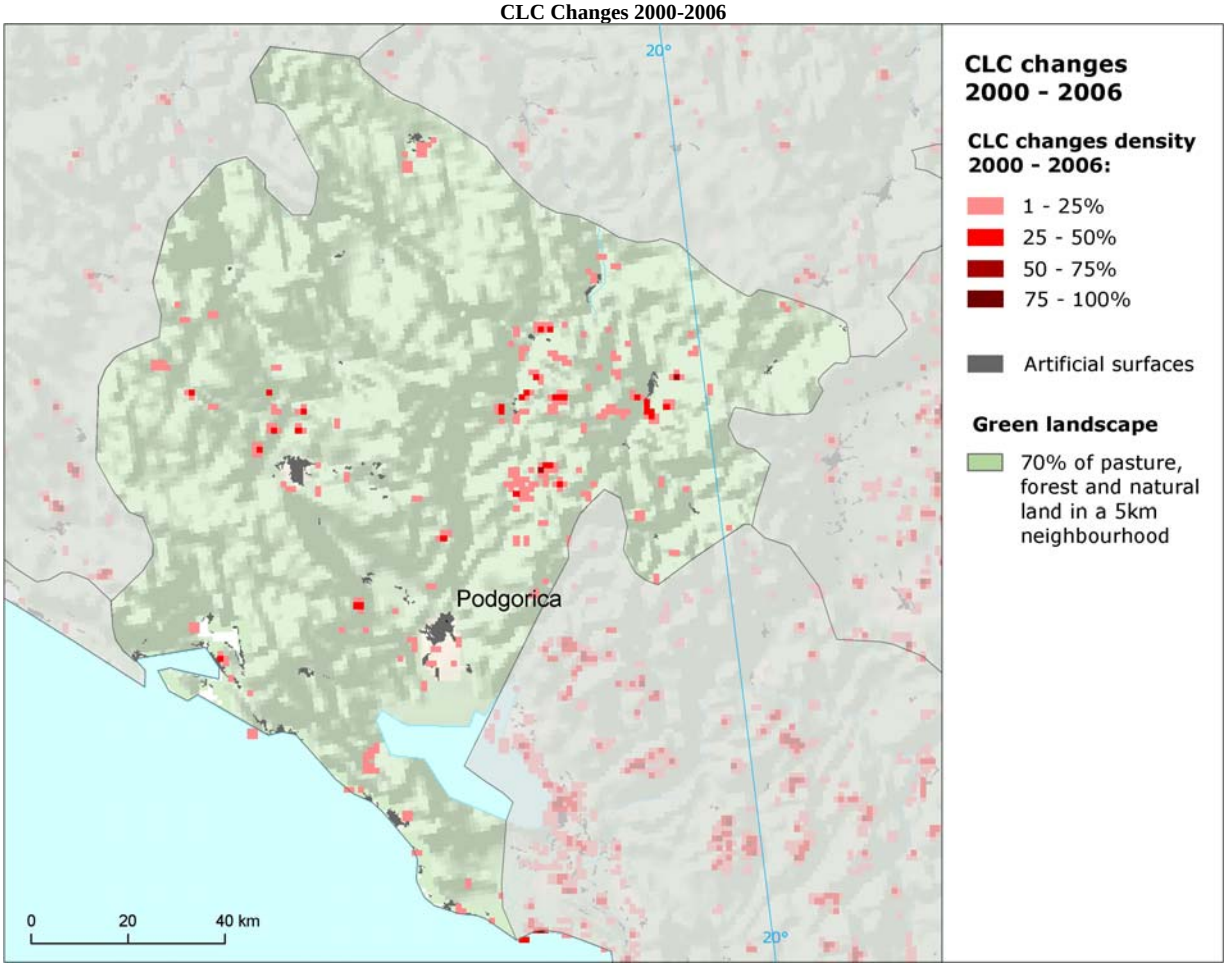
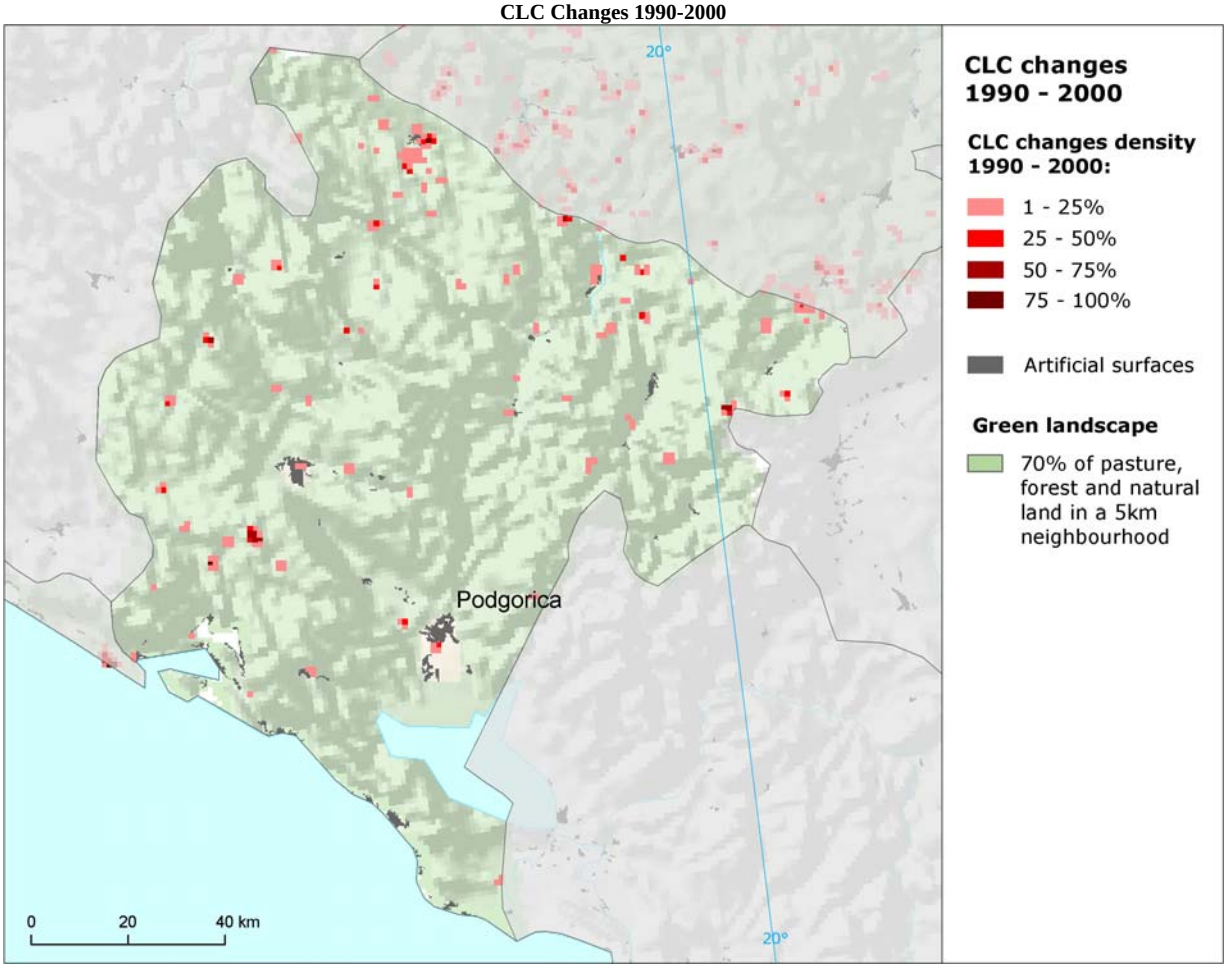
CLC Changes 2000-2006



CLC Changes 1990-2000



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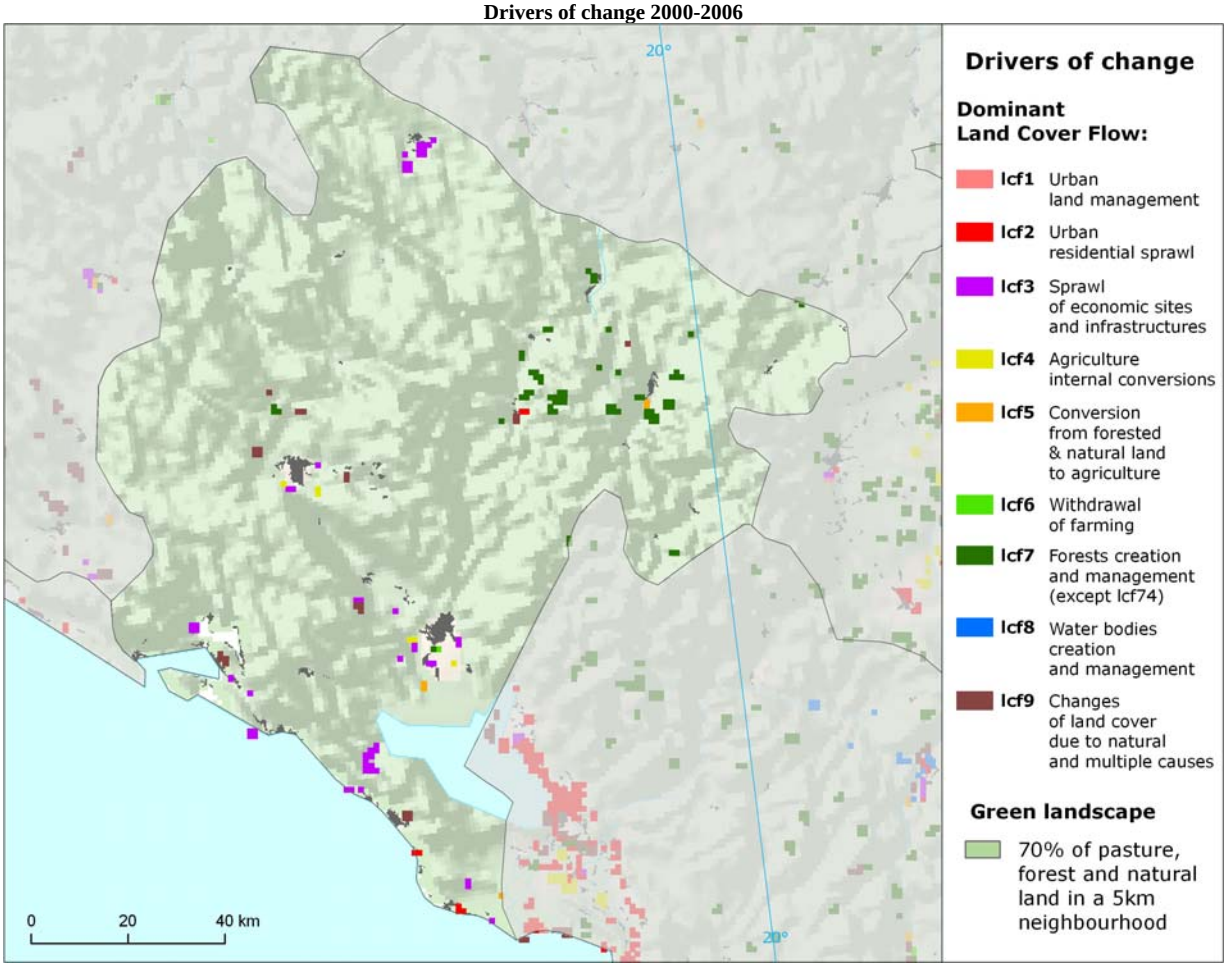
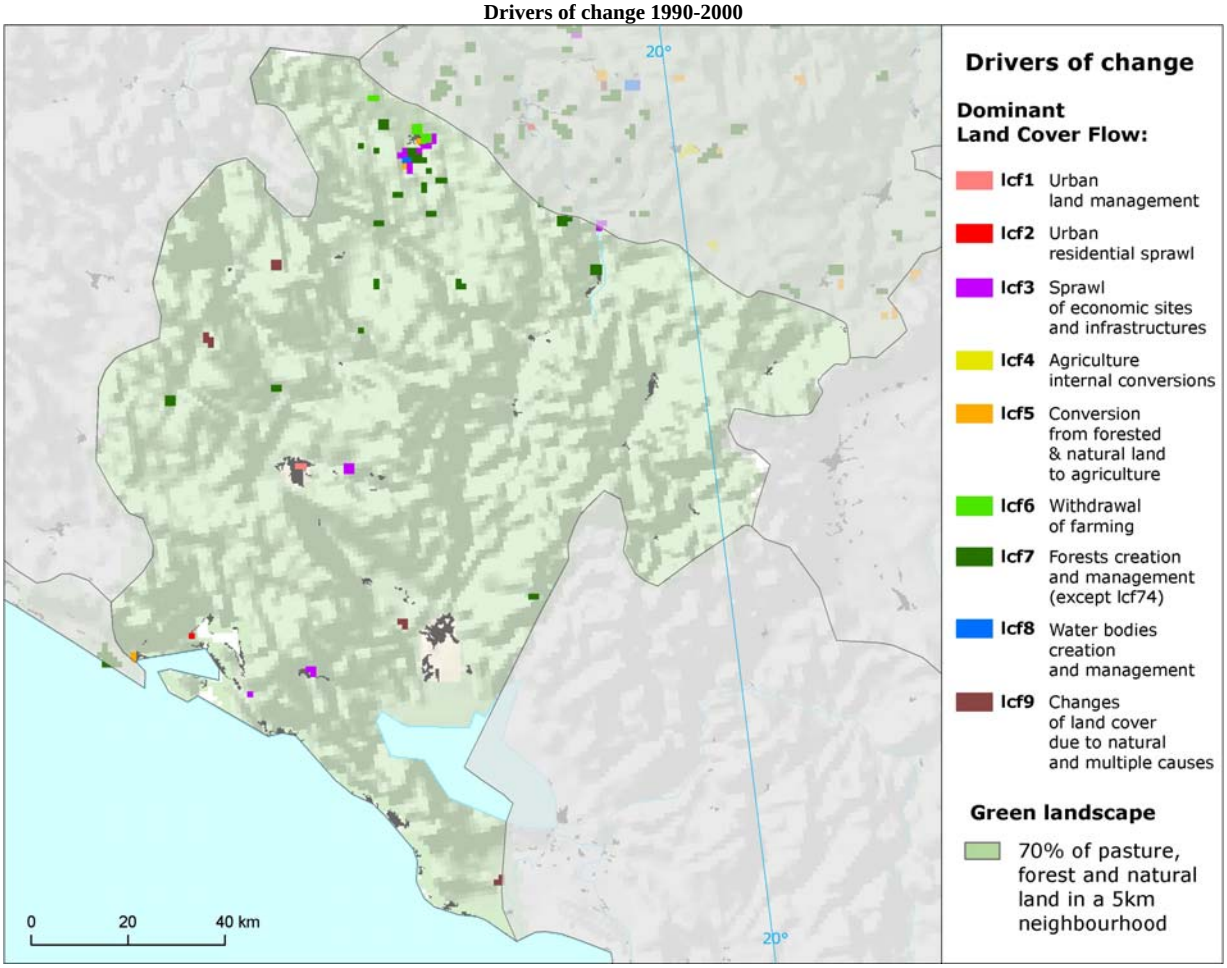
Drivers of change 2000-2006



Drivers of change 1990-2000



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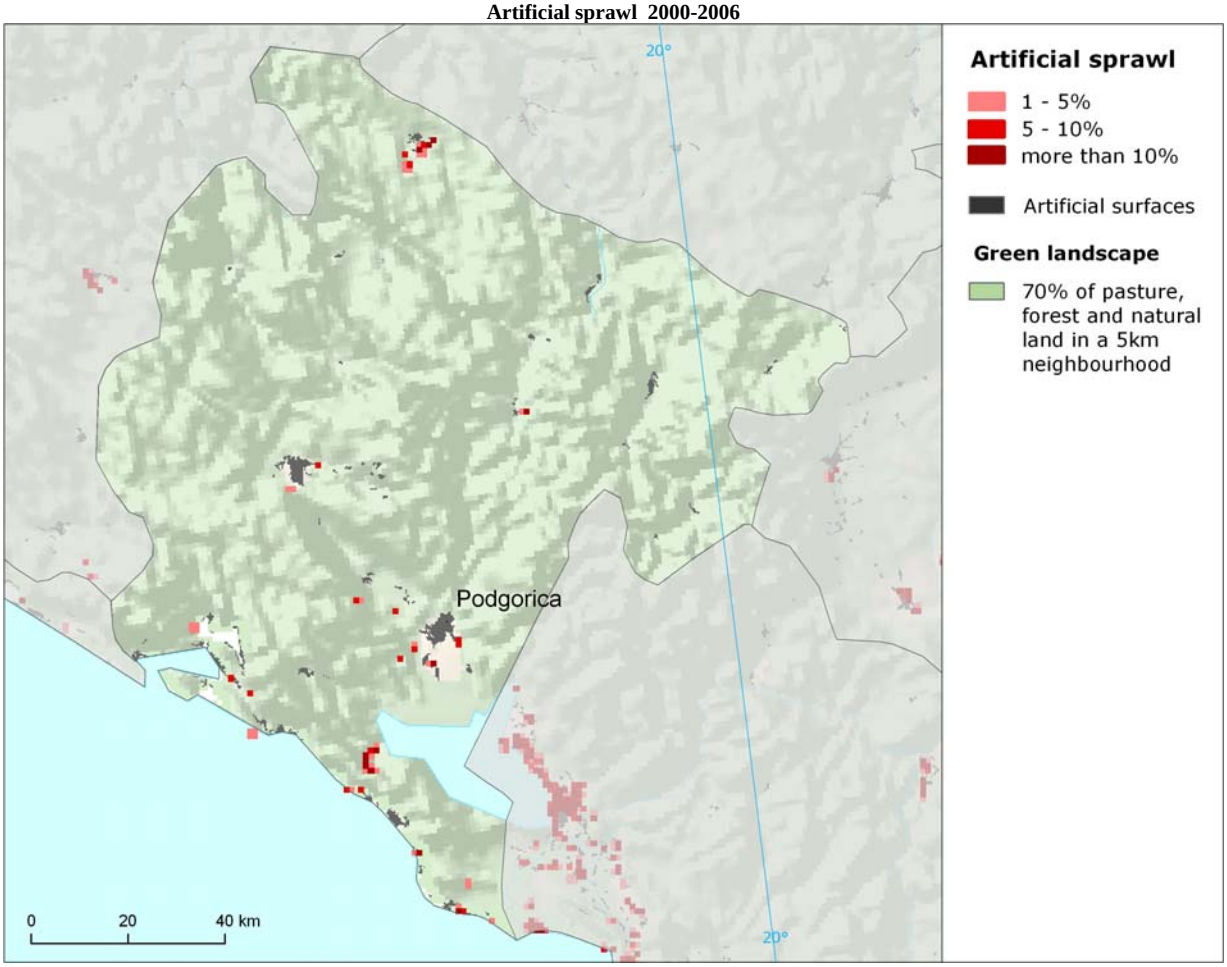
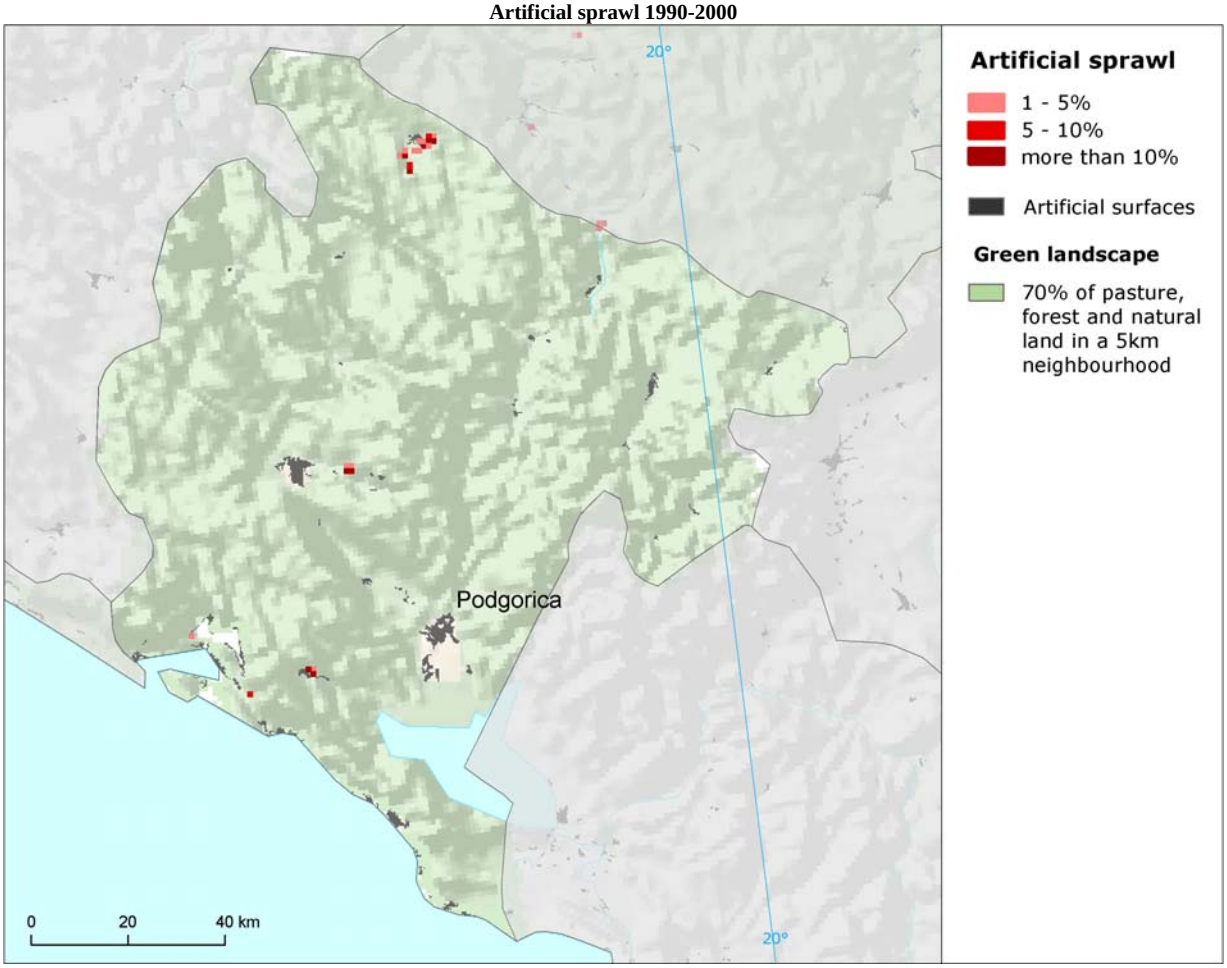
Artificial sprawl 2000-2006



Artificial sprawl 1990-2000



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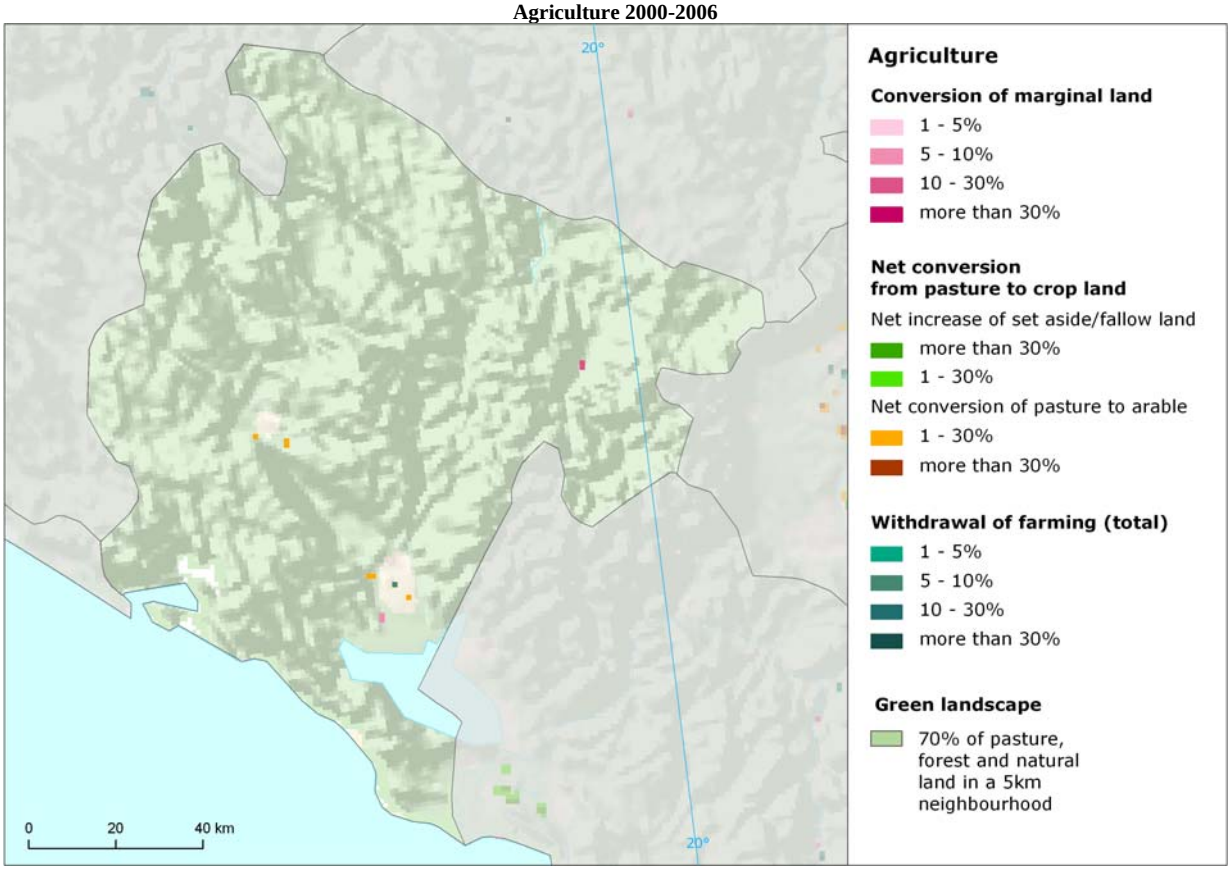
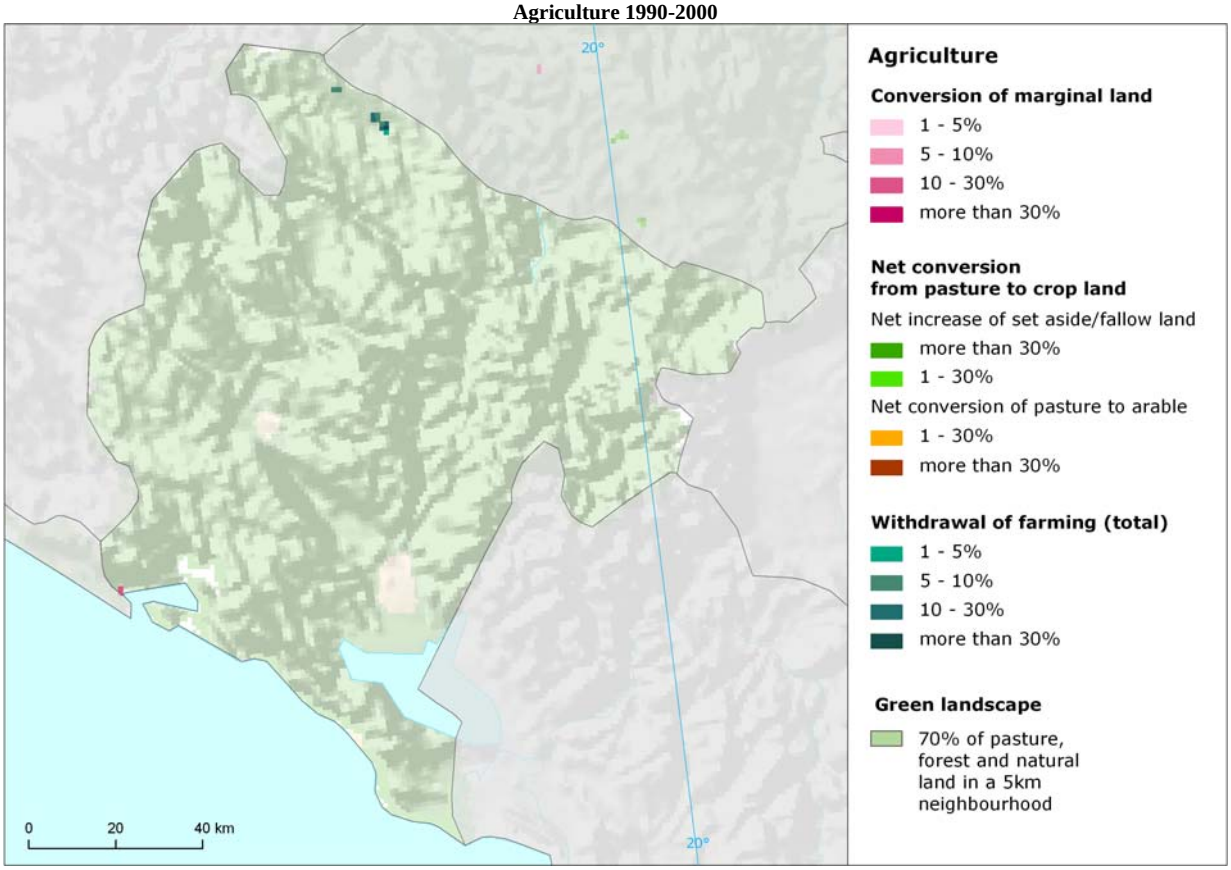
Agriculture 2000-2006



Agriculture 1990-2000



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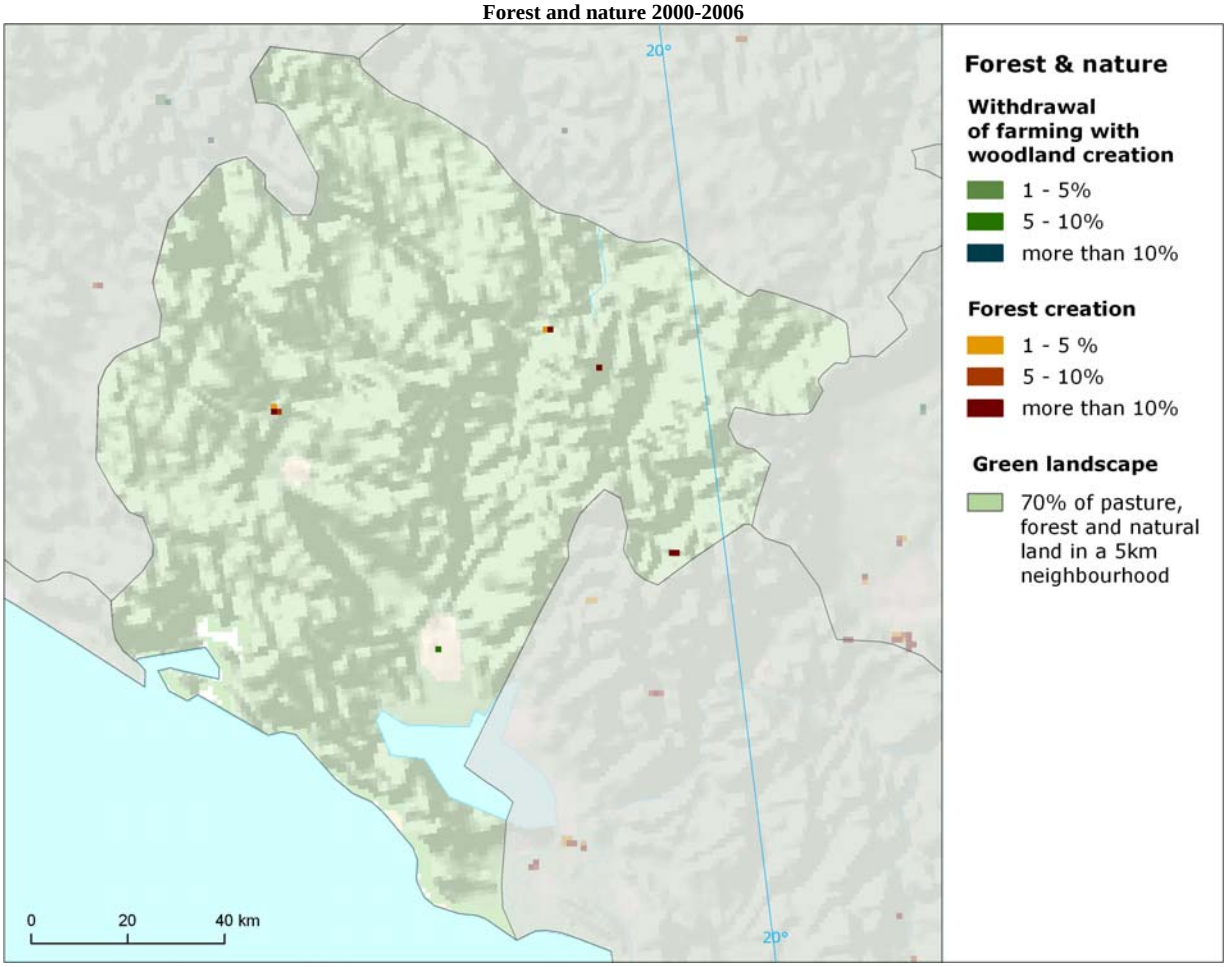
Forest and nature 2000-2006



Forest and nature 1990-2000