Poland

Land cover 2012

Overview of land cover & change 2006-2012

The comparison of annual change rates for the last three observing periods shows significant acceleration of the land cover development in Poland in the period 2006-2012. However, in comparison with other European countries, the overall land cover change rate of 0.17% is still relatively low, safely below the European average.

The overall acceleration of the land cover development intensity is caused by the acceleration of forest creation and management as well as by withdrawal of farming and artificial development. All these flows show considerably higher intensity than in both previous periods. The only flows which continuously lose their intensity are internal agricultural conversions and also the conversion from forested or natural land to agriculture, which indicates an overall slowdown of the agricultural development dynamics.

The artificial development in Poland is driven mostly by extensive highway construction, which seems to be spread all over the country. But there can be also be observed dense concentrations of artificial development around all major cities in Poland. The annual land take rate rapidly increased, compared to the previous period 2000-2006 and also to the period 1990-2000 and all major compounds of the artificial development occur with higher intensity in the latest period. Compared to the European average, with the annual land take rate of 0.49% of initial artificial area, the land take in Poland is significantly faster.

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 more than a decade between 2000-2006-2012 - see Corine land cover (CLC) programme for details.

Number of years between CLC2006-CLC2012 data for Poland: 6

<table>
<thead>
<tr>
<th>Summary balance table 2006-2012</th>
<th>Artificial areas</th>
<th>Arable land &amp; permanent crops</th>
<th>Pastures &amp; mosaics</th>
<th>Forested land</th>
<th>Semi-natural vegetation</th>
<th>Open spaces/ bare soils</th>
<th>Wetlands</th>
<th>Water bodies</th>
<th>TOTAL [hundreds ha]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land cover 2006</td>
<td>17341</td>
<td>138166</td>
<td>48904</td>
<td>101578</td>
<td>387</td>
<td>154</td>
<td>1119</td>
<td>5402</td>
<td>313051</td>
</tr>
<tr>
<td>Consumption of initial LC</td>
<td>85.5</td>
<td>565.6</td>
<td>385.0</td>
<td>1997.5</td>
<td>29.6</td>
<td>0.5</td>
<td>1.4</td>
<td>3068</td>
<td>3068</td>
</tr>
<tr>
<td>Formation of new LC</td>
<td>570.9</td>
<td>97.1</td>
<td>62.9</td>
<td>2306.5</td>
<td>1.7</td>
<td>0.2</td>
<td>1.2</td>
<td>27.2</td>
<td>3068</td>
</tr>
<tr>
<td>Net Formation of LC</td>
<td>485.4</td>
<td>-468.5</td>
<td>-322.1</td>
<td>309.0</td>
<td>-27.8</td>
<td>-2.5</td>
<td>0.7</td>
<td>25.8</td>
<td>0</td>
</tr>
<tr>
<td>Net formation as % of initial year</td>
<td>2.8</td>
<td>-0.3</td>
<td>-0.7</td>
<td>0.3</td>
<td>-7.2</td>
<td>-1.6</td>
<td>0.1</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>Total turnover of LC</td>
<td>656.4</td>
<td>662.6</td>
<td>447.9</td>
<td>4304.0</td>
<td>31.3</td>
<td>2.9</td>
<td>1.8</td>
<td>28.6</td>
<td>6135</td>
</tr>
<tr>
<td>Total turnover as % of initial year</td>
<td>3.8</td>
<td>0.5</td>
<td>0.9</td>
<td>4.2</td>
<td>8.1</td>
<td>1.9</td>
<td>0.2</td>
<td>0.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Land cover 2012</td>
<td>17826</td>
<td>137698</td>
<td>48581</td>
<td>101887</td>
<td>359</td>
<td>151</td>
<td>1119</td>
<td>5428</td>
<td>313051</td>
</tr>
</tbody>
</table>
2.4. Annual land cover change
[ha/year, % of total area]

2000-2006: 0.10%
2006-2012: 0.16%

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

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

Summary trend figures 2000-2006 2006-2012

<table>
<thead>
<tr>
<th>Category</th>
<th>2000-2006</th>
<th>2006-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual land cover change [ha/year]</td>
<td>29890</td>
<td>51129</td>
</tr>
<tr>
<td>Annual land cover change as % of initial year</td>
<td>0.10%</td>
<td>0.16%</td>
</tr>
<tr>
<td>Land uptake by artificial development as mean annual change [ha/year]</td>
<td>3338</td>
<td>8420</td>
</tr>
<tr>
<td>Agricultural land uptake by urban and infrastructures development as mean annual change [ha/year]</td>
<td>3211</td>
<td>7575</td>
</tr>
<tr>
<td>Net uptake of forests and semi-natural land by agriculture as mean annual change [ha/year]</td>
<td>-3337</td>
<td>-6190</td>
</tr>
<tr>
<td>Net conversion from pasture to arable land and permanent crops as mean annual change [ha/year]</td>
<td>-18</td>
<td>168</td>
</tr>
<tr>
<td>Forest &amp; other woodland net formation as mean annual change [ha/year]</td>
<td>3220</td>
<td>5151</td>
</tr>
<tr>
<td>Dry semi-natural land cover net formation as mean annual change [ha/year]</td>
<td>-157</td>
<td>-506</td>
</tr>
<tr>
<td>Wetlands &amp; water bodies net formation as mean annual change [ha/year]</td>
<td>709</td>
<td>442</td>
</tr>
</tbody>
</table>

2.7. Intensity of main change drivers (LC FLOWS) [ha/year]
Accelerated sprawl, driven by highway construction

In comparison with both previous periods, artificial development in Poland accelerated rapidly. This acceleration is driven mostly by the extensive highway construction, but also by the acceleration of all other important compounds of artificial development. The sprawl of mines and quarrying sites is the second major driver of land take, followed by the sprawl of industrial or commercial sites and residential areas. There also occurs significant amount of urban land recycling in the period 2006-2012, which incorporates conversion from construction sites into transportation network and residential, commercial or industrial areas. There are a lot of highway segments under construction, distributed all over the country (e.g. between the capital city Warsaw and Lodz, the one connecting the northern coast with the central part of the country, or segments in the western Poland, between Szczecin and Zielona Gora and in the south-eastern Poland connecting Krakow and Przemysl). Otherwise, the artificial development is concentrated around most of the major cities in Poland, including capital city Warsaw, Gdansk, Poznan, Wroclaw, Szczecin or Katowice.
Agricultural land consumption, internal intensification

In contrast to other land cover flows in Poland, the development of agricultural land is in major decline, with significantly decreasing intensity of the change dynamics and increasing consumption of agricultural land by the artificial sprawl and withdrawal of farming. Geographically, there are two major concentrations of withdrawal of farming, in north-western Poland and north-eastern from the Krakow city, but there are also other patches with this conversion scattered over the country. Compared with these consumption flows, the intensity of internal agriculture development is rather low showing a continuously decreasing tendency. There can be observed a significant trend of agricultural land use intensification, with prevailing conversions from arable land to vineyards and orchards and intensive conversion from pasture to arable or crop land. On the other hand, the intensity of opposite extension of pasture significantly decreased, compared to the previous period. As a result pastures show negative net change balance, with almost 1% consumption of their initial area.

4.12. Agricultural areas 2012 [% 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


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

There are two major drivers of natural land development in Poland – internal forest conversions and withdrawal of farming – and both of them show significantly higher intensity recently, compared to both previous periods 1990-2000 and 2000-2006. The intensity of both directions of internal forest conversions – recent felling and forest creation, are comparable. The major source for the new woodland creation is the withdrawal of farming, mainly of pastures and agricultural areas with natural vegetation, with transitional woodland creation. This flow occurs with circa doubled intensity, compared to the period 2000-2006. Not only agricultural, but also natural grasslands are a frequent source of forest creation in the country. Concerning the other exchange of the natural land cover, there were observed several cases of the water bodies creation over former arable land areas or mineral extraction sites in Poland.
Annex: Land cover flows and trends

Land cover flows 2006-2012

6.18. Consumption of land cover 2006-2012 [% of total change area]

- Wetlands: 0.02%
- Open spaces: 0.1%
- Water bodies: 3%
- Semi-natural vegetation: 18%
- Open spaces/bare soils: 13%
- Arable land & permanent crops: 65%
- Pastures & mosaics: 1%
- Forested land: 6%

6.19. Formation of land cover 2006-2012 [% of total change area]

- Wetlands: 0.04%
- Water bodies: 3%
- Semi-natural vegetation: 0.1%
- Open spaces/bare soils: 0.01%
- Arable land & permanent crops: 75%
- Pastures & mosaics: 19%
- Forested land: 1%
- Water bodies: 2%

6.20. Drivers of change (LC FLOWS) 2006-2012 [% of total change area]

- LCF1 Urban land management: 63%
- LCF2 Urban residential sprawl: 1%
- LCF3 Sprawl of economic sites and infrastructures: 2%
- LCF4 Agriculture internal conversions: 3%
- LCF5 Conversion from forested & natural land to agriculture: 15%
- LCF6 Withdrawal of farming: 1%
- LCF7 Forests creation and management: 0.1%
- LCF8 Water bodies creation and management: 2%
- LCF9 Changes due to natural and multiple causes: 13%
Poland

Artificial areas

7.21. Consumption by artificial land take 2006-2012 [% of total]

Arable land & permanent crops 64%
Pastures & mosaics 22%
Forested land 14%
Semi-natural vegetation 0.03%
Wetlands 0.1%
Water bodies 0.1%

7.22. Formation by artificial land take 2006-2012 [% of total]

Disc. urban fabric 12%
Industrial/commerc. 11%
Road/rail network 12%
Port areas 0.1%
Airports 1%
Mineral extraction 25%
Construct. 39%
Dump sites 0.3%

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

2000-2006
2006-2012

0 3000 6000 9000

-2000 0 2000 4000

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

lc11 Urban development/ infilling (cons.)
lc11 Urban development/ infilling (form.)
lc12 Recycling of developed urban land (cons.)
lc12 Recycling of developed urban land (form.)
lc13 Development of green urban areas (cons.)
lc13 Development of green urban areas (form.)
lc21 Urban dense residential sprawl
lc22 Urban diffuse residential sprawl
lc31 Sprawl of industrial & commercial sites
lc32 Sprawl of transport networks
lc33 Sprawl of harbours
lc34 Sprawl of airports
lc35 Sprawl of mines and quarrying areas
lc36 Sprawl of dumpsites
lc37 Construction
lc38 Sprawl of sport and leisure facilities (cons.)
lc38 Sprawl of sport and leisure facilities (form.)
lc39 Extension from developed areas to agriculture
lc41 Forest creation, afforestation
lc51 Water bodies creation
lc52 Semi-natural creation
lc53 Extension of water courses
lc54 Forests and shrubs fires
lc55 Coastal erosion
lc99 Other changes and unknown (cons.)
lc99 Other changes and unknown (form.)
Poland

Agriculture

8.25. LC consumed by agriculture 2006-2012 [% of total]

<table>
<thead>
<tr>
<th>Category</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural grass.</td>
<td>1</td>
</tr>
<tr>
<td>Broad-leaved forest</td>
<td>3</td>
</tr>
<tr>
<td>Coniferous forest</td>
<td>3</td>
</tr>
<tr>
<td>Mixed forest</td>
<td>0.3</td>
</tr>
<tr>
<td>Sport/leisure</td>
<td>1</td>
</tr>
<tr>
<td>Dump sites</td>
<td>2</td>
</tr>
<tr>
<td>Construct.</td>
<td>7</td>
</tr>
<tr>
<td>Mineral extraction</td>
<td>10</td>
</tr>
<tr>
<td>Industrial/commercial</td>
<td>2</td>
</tr>
<tr>
<td>Transition, woodland/shrub</td>
<td>72</td>
</tr>
</tbody>
</table>

8.26. Formation of agricultural land from non-agriculture 2006-2012 [% of total]

<table>
<thead>
<tr>
<th>Category</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-irrigated arable</td>
<td>62</td>
</tr>
<tr>
<td>Pastures</td>
<td>34</td>
</tr>
<tr>
<td>Disc. urban fabric</td>
<td>7</td>
</tr>
<tr>
<td>Industrial/commercial</td>
<td>7</td>
</tr>
<tr>
<td>Road/rail network</td>
<td>6</td>
</tr>
<tr>
<td>Airports</td>
<td>0.2</td>
</tr>
<tr>
<td>Mineral extraction</td>
<td>13</td>
</tr>
<tr>
<td>Dump sites</td>
<td>0.1</td>
</tr>
<tr>
<td>Construct.</td>
<td>21</td>
</tr>
<tr>
<td>Sport/leisure</td>
<td>0.1</td>
</tr>
<tr>
<td>Broad-leaved forest</td>
<td>0.1</td>
</tr>
<tr>
<td>Coniferous forest</td>
<td>0.2</td>
</tr>
<tr>
<td>Mixed forest</td>
<td>0.1</td>
</tr>
<tr>
<td>Transition. woodland/shrub</td>
<td>44</td>
</tr>
<tr>
<td>Water bodies</td>
<td>2</td>
</tr>
</tbody>
</table>

8.27. Consumption of agricultural land by non-agriculture 2006-2012 [% of total]

<table>
<thead>
<tr>
<th>Category</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-irrigated arable</td>
<td>57</td>
</tr>
<tr>
<td>Pastures</td>
<td>28</td>
</tr>
<tr>
<td>Fruit trees/ berry plantations</td>
<td>0.2</td>
</tr>
<tr>
<td>Agriculture with natural veg.</td>
<td>13</td>
</tr>
<tr>
<td>Complex cultivation patterns</td>
<td>2</td>
</tr>
<tr>
<td>Agriculture</td>
<td>13</td>
</tr>
</tbody>
</table>

8.28. Formation of non-agricultural land from agriculture 2006-2012 [% of total]

<table>
<thead>
<tr>
<th>Category</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial/commercial</td>
<td>7</td>
</tr>
<tr>
<td>Road/rail network</td>
<td>6</td>
</tr>
<tr>
<td>Airports</td>
<td>0.2</td>
</tr>
<tr>
<td>Mineral extraction</td>
<td>13</td>
</tr>
<tr>
<td>Dump sites</td>
<td>0.1</td>
</tr>
<tr>
<td>Construct.</td>
<td>21</td>
</tr>
<tr>
<td>Sport/leisure</td>
<td>0.1</td>
</tr>
<tr>
<td>Broad-leaved forest</td>
<td>0.1</td>
</tr>
<tr>
<td>Coniferous forest</td>
<td>0.2</td>
</tr>
<tr>
<td>Mixed forest</td>
<td>0.1</td>
</tr>
<tr>
<td>Transition. woodland/shrub</td>
<td>44</td>
</tr>
<tr>
<td>Water bodies</td>
<td>2</td>
</tr>
</tbody>
</table>

8.29. Main annual conversions between agriculture and forests & semi-natural land 2006-2012 [ha/year]

<table>
<thead>
<tr>
<th>Category</th>
<th>2000-2006</th>
<th>2006-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conversion from forest to agriculture</td>
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<td>500</td>
</tr>
<tr>
<td>Conversion from dry semi-natural &amp; natural land to agriculture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conversion from wetlands to agriculture</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>Withdrawal of farming with woodland creation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawal of farming without significant woodland creation</td>
<td></td>
<td>2000</td>
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</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Category</th>
<th>2000-2006</th>
<th>2006-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension of pasture, set aside and fallow land</td>
<td></td>
<td>800</td>
</tr>
<tr>
<td>Conversion from pasture to arable and permanent crops</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9.31. Mean annual agriculture internal conversions [ha/year]

- lcf411 Uniform extension of set aside fallow land and pasture
- lcf412 Diffuse extension of set aside fallow land and pasture
- lcf421 Conversion from arable land to permanent irrigation perimeters
- lcf422 Other internal conversions of arable land
- lcf431 Conversion from olives groves to vineyards and orchards
- lcf432 Conversion from vineyards and orchards to olive groves
- lcf433 Other conversions between vineyards and orchards
- lcf441 Conversion from permanent crops to permanent irrigation perimeters
- lcf442 Conversion from vineyards and orchards to non-irrigated arable land
- lcf443 Conversion from olive groves to non-irrigated arable land
- lcf444 Diffuse conversion from permanent crops to arable land
- lcf451 Conversion from arable land to vineyards and orchards
- lcf452 Conversion from arable land to olive groves
- lcf453 Diffuse conversion from arable land to permanent crops
- lcf461 Conversion from pasture to permanent irrigation perimeters
- lcf462 Intensive conversion from pasture to non-irrigated arable land and permanent crops
- lcf463 Diffuse conversion from pasture to arable and permanent crops
- lcf47 Extension of agro-forestry

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

- lcf13 Development of green urban areas
- lcf2 Urban residential sprawl
- lcf3 Sprawl of economic sites and infrastructures
- lcf511 Intensive conversion from forest to agriculture
- lcf512 Diffuse conversion from forest to agriculture
- lcf521 Intensive conversion from semi-natural land to agriculture
- lcf522 Diffuse conversion from semi-natural land to agriculture
- lcf523 Conversions from agriculture-nature mosaics to continuous agriculture (cont. agri. cons.)
- lcf523 Conversions from agriculture-nature mosaics to continuous agriculture (cont. agri. form.)
- lcf53 Conversion from wetlands to agriculture
- lcf54 Conversion from developed areas to agriculture
- lcf61 Withdrawal of farming with woodland creation
- lcf62 Withdrawal of farming without significant woodland creation
- lcf81 Water bodies creation
- lcf913 Extension of water courses
- lcf92 Forests and shrubs fires
- lcf93 Coastal erosion
- lcf99 Other changes and unknown (agri. cons.)
- lcf99 Other changes and unknown (agri. form.)
Poland

Forest & nature

10.33. LC consumed by forest & nature 2006-2012 [% of total]

- Agriculture with natural veg. 22%
- Minerals extraction 2%
- Dump sites 1%
- Construct. 0.2%
- Non-irrigated arable 35%
- Pastures 39%
- Fruit trees/berry plantations 0.1%

10.34. Formation of forest & nature land from non-forest /nature 2006-2012 [% of total]

- Broad-leaved forest 0.2%
- Coniferous forest 0.4%
- Mixed forest 0.3%
- Transition. woodland/shrub 93%
- Water bodies 6%
- Sea and ocean 0.2%

10.35. Consumption of forest & nature land by non-forest/nature 2006-2012 [% of total]

- Broad-leaved forest 8%
- Coniferous forest 37%
- Mixed forest 15%
- Natural grassland 0.4%
- Inland marshes 0.3%
- Sea and ocean 0.2%
- Water bodies 0.3%
- Water courses 0.1%
- Transition woodland/shrub 40%

10.36. Formation of non-forest/nature land from forest & nature 2006-2012 [% of total]

- Industrial/commerc. 3%
- Road/rail network 18%
- Airports 2%
- Port areas 0.3%
- Sport/leisure 0.2%
- Construct. 28%
- Dump sites 1%
- Mineral extraction 26%

10.37. Forested land 2012 [% of total area]

- Conifer. forest 55%
- Broad-leaved forest 15%
- Mixed forest 24%
- Transit. woodland/shrub 6%

10.38. Main trends in woodland & forests consumption/formation 2006-2012 [ha/year]

- Consumption of forest land by urban sprawl
- Conversion from forest to agriculture
- Recent fellings and transitions
- Withdrawal of farming with woodland creation
- Forest creation, afforestation
- Conversion from transitional woodland to forests
- Forest creation over wetlands
11.39. Dry semi-natural areas 2012 [% of total area]

- Natural grassland 63%
- Moors and heath 8%
- Beaches, dunes and sand plains 10%
- Bare rock 4%
- Sparsely vegetated areas 16%
- Burnt areas 0.2%

11.40. Main trends in dry semi-natural land consumption/formation 2006-2012 [ha/year]

- Consumption of dry semi-natural land cover by urban sprawl
- Conversion of semi-natural land cover to agriculture
- Forest creation, afforestation over dry semi-natural land
- Withdrawal of farming without woodland creation
- Decrease of permanent snow and glaciers

11.41. Wetlands & water 2012 [% of total area]

- Water bodies 60%
- Water courses 12%
- Peatbogs 1%
- Inland marshes 16%
- Coastal lagoons 11%

11.42. Main trends in wetlands & water consumption/formation 2006-2012 [ha/year]

- Consumption of wetlands by urban sprawl
- Conversion of wetlands to agriculture
- Forest creation and afforestation over wetlands
- Withdrawal of farming without woodland creation
- Net water bodies creation
- Net wetlands creation

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

- lcf13 Development of green urban areas
- lcf2 Urban residential sprawl
- lcf3 Sprawl of economic sites and infrastructures
- lcf511 Intensive conversion from forest to agriculture
- lcf512 Diffuse conversion from forest to agriculture
- lcf61 Withdrawal of farming with woodland creation
- lcf71 Conversion from transitional woodland to forest (cons.)
- lcf71 Conversion from transitional woodland to forest (form.)
- lcf72 Forest creation, afforestation
- lcf73 Forests internal conversions (cons.)
- lcf73 Forests internal conversions (form.)
- lcf74 Recent felling and transition (cons.)
- lcf74 Recent felling and transition (form.)
- lcf8 Water bodies creation and management
- lcf9 Changes of land cover due to natural and multiple causes (cons.)
- lcf9 Changes of land cover due to natural and multiple causes (form.)
Poland

CLC Changes 2006-2012

CLC changes 2006 - 2012

CLC changes density 2006 - 2012:
- 1 - 25%
- 25 - 50%
- 50 - 75%
- 75 - 100%

Artificial surfaces

Green landscape
- 70% of pasture, forest and natural land in a 5km neighbourhood

CLC Changes 2000-2006

CLC changes 2000 - 2006

CLC changes density 2000 - 2006:
- 1 - 25%
- 25 - 50%
- 50 - 75%
- 75 - 100%

Artificial surfaces

Green landscape
- 70% of pasture, forest and natural land in a 5km neighbourhood