MAIN LAND-USE PATTERNS IN THE EU WITHIN 2015-2030

Agricultural land and forest & natural vegetated (F&NV) areas are the largest land groups in the EU, each one accounting for more than 40% of the EU territory. They are expected to marginally shrink between 2015 and 2030, while built-up areas are likely to expand by more than 3%, reaching 7% of the EU territory by 2030.

In 2015 France had the largest absolute built-up area in the EU – more than 5 million ha, 17% of the EU total, followed by Germany (4.2 million ha, 14%) and Italy (2.9 million ha, 10%). In relative terms (built-up as share in total territory), the densely populated Malta, Belgium and the Netherlands topped the list with 35%, 22% and 21% respectively.

By 2030 built-up will proportionally expand across the EU. Italy will see the largest absolute increase (+144 thousand ha), followed by Germany (+128 thousand ha) and Poland (+121 thousand ha). The highest relative growth of around 6% is expected for Romania and Belgium. A more substantial contraction of about 1% is likely in Bulgaria and Croatia.

At regional level, high built-up shares are observed where capitals and other major cities are located, in traditional touristic hotspots and in heavily industrialised zones. Built-up is projected to continue expanding in and around most capitals and other major cities, albeit at different extents. Spain, France, Greece, Croatia, Ireland and Estonia will see large inter-regional differences, i.e. regions with more than 10% growth or decline in built-up. Shrinkage in built-up is also projected for vast areas in Portugal, Latvia,

Lithuania and Bulgaria. Many regions in Northern Romania, Hungary and Southern Poland are likely to experience a noticeable expansion of built-up.

F&NV areas are widely presented in less populated and/or mountainous and/or cold climate zones, where other land covers are less suitable. Consequently, the F&NV cover is particularly dominant in Sweden (17% EU share) and Finland (13%), with more than 70% of their territories being allocated to F&NV areas in 2015. Together with Spain and France, they accounted for more than 50% of the whole EU's F&NV cover. Estonia, Latvia, Austria, Slovenia, Croatia and Greece had more than half of their territories covered by F&NV areas.

Within 2015-2030 forests will expand (especially due to afforestation) at the expense of natural vegetated areas, but the cutback in the latter (-4.8 million ha) will be greater than the growth in the former (+1.4 million ha). Hence, the F&NV cover will shrink in a number of EU Member States, including in all the leading ones. The decline in Spain and France will be particularly pronounced – around 1 million ha in each of them. The F&NV cover is projected to significantly expand only in Poland (+3.7%). The deepest relative decreases are expected in the group with the lowest (below 15%) share of F&NV areas: Malta (-17.5%), the Netherlands (-10.6%) and Denmark (-8.4%).

The general trends at regional level will largely follow the ones at national level.

Nearly 600 thousand ha of abandoned land are projected to re-cultivate into F&NV areas.

1. CONTEXT

Land is a finite resource and its use directly connects human activities and natural environment. Many socio-economic activities, production and ecological systems co-exist simultaneously on the same area. The continuously increasing demand for land from various sides does not only exacerbate the competition for land, but it also alters the natural state and functions of land.

Europe has a diverse mosaic of landscapes where the impact of various land-use changes over the years is

clearly visible. The EU land is being intensively used, with around 80% being devoted to settlements, infrastructures, agriculture and forestry. Land use patterns and changes are influenced by a broad range of inter-related factors, such as population dynamics, global markets, economic trends, topographic and climatic specifics, etc.

Changes in land use patterns do not occur homogeneously throughout Europe. Many environmental, economic and social phenomena take place at local scale and cannot be adequately captured by pan-European land-use models. During

the last decades great efforts have been invested to better seize land-use developments and trends at a finer disaggregation level. In the following analysis, a land use indicator is being proposed to illustrate the land evolution in the EU based on the projections in the LUISA Territorial Reference Scenario 2017 (Jacobs-Crisioni et al., 2017). The indicator is further disaggregated for built-up and forest & natural vegetated areas. A detailed analysis of the land-use trends in agricultural areas has already been provided in the study "Facts and Trends in the EU Rural Areas within 2015-2030", (Perpiña Castillo et al., 2018).

2. DATA AND METHODS

The modelling approach focuses on aggregated results in order to limit the amount of presented data and hence, concentrate on the key trends. The three main land-use groups are: 1) built-up areas 2) agricultural land[1] and 3) forest and other natural vegetated areas. Projections at national and regional level for all EU Member States over the period 2015-2030 are provided.

The indicator for built-up areas measures the land surface occupied by built-up areas as share of total land in the country/region and the percentage change between 2015 and 2030. This aggregated built-up class includes urban residential areas, land devoted to economic activities (industrial and commercial) and green urban areas[2].

The indicator for forested lands and natural vegetated areas provides the land occupied by forested areas[3] regardless of their utilisation. Other natural vegetated areas – transitional woodland-shrub, moors and heathland, Sclerophyllous vegetation and natural grassland – are also included in the computation. The changes in forested areas are derived for the period 2015-2030. The dynamic evolution of forests is approximated by distinguishing between mature (>25 years) and young (<25 years) forests. The future land demand for forests is determined by extrapolating the national trends of

afforestation and deforestation as reported under the United Nations Framework Convention on Climate Change (UNFCCC).

3. OVERALL EU LAND-USE EVOLUTION WITHIN 2015-2030

By 2015 the EU-28 mainland was 436 million ha. Agricultural land and forest & natural vegetated areas occupied nearly equal surface – 185.8 million ha (42.6% of all land) and 187.1 million ha (42.9%) respectively, thereby accounting for more than 85% of EU's territory. Built-up areas amounted to 29.4 million ha (6.7%), while the other (fixed) land uses[4] were estimated at 32.1 million ha (7.3%). The rough estimate of the abandoned agricultural land was 1.4 million ha, i.e. 0.3% of all land (Perpiña Castillo et al., 2018).

The projected evolution in the EU land breakdown is summarised in Figure 1. The largest categories – agricultural land and forest & natural vegetated areas will shrink by 1.1% and 1.8% respectively, bringing them to virtually equal absolute and relative values – 183.7 million ha, 42.1% of all land. Conversely, built-up will expand noticeably by nearly 3.2% (more than 930 thousand ha). The highest relative growth is projected for the abandoned agricultural land – almost four times, i.e. by 4.2 million ha (Perpiña Castillo et al., 2018). As the other land uses have been taken as static, no changes in their surface within 2015-2030 have been assumed.
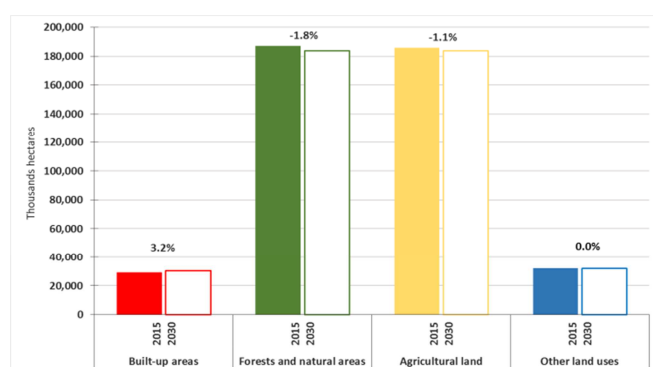

Figure 1: Projected evolution of the main land-use classes in the EU within 2015-2030

4. DYNAMICS OF BUILT-UP AREAS WITHIN 2015-2030

4.1. Evolution at national level

In 2015 France had the largest built-up area in the EU – more than 5 million ha, accounting for 17% of

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[1] Comprises arable land (including rice production), mixed crop-livestock, pasture/livestock grazing, permanent crop production systems and bioenergy crops

[2] The sum of the land uses classified from the CLC12 database as urban fabric including, CLC11X residential (continuous and discontinuous), CLC121 industrial/commercial land, and CLC 14X green urban areas, sport and leisure facilities, applying the LUISA base map as a starting point for the simulation. The LUISA base map is a refined, spatially and thematically improved map whereby information from multiple geo-data sources has been integrated with the original CLC 2012 in a sequential order, following certain rules and criteria.

[3] All areas dominated by broadleaved and/or coniferous trees

[4] Other land uses refer to non-modelled classes: water bodies, infrastructures (road and rail networks, ports and airports, mineral extraction, dump and construction sites, etc.) and other natural areas, which remain static in term of quantity and location within 2015-2030.

the EU total, followed by Germany (4.2 million ha, 14% of EU built-up), Italy (2.9 million ha, 10% of EU built-up), the United Kingdom (2.5 million ha), Poland (2.2 million ha), Spain (1.7 million ha) and Romania (1.5 million ha) – Figure 2. In relative terms, as built-up share in total national territory, the top four countries (France, Germany, Italy and the United Kingdom) ranged around 10%, which value was still above the EU average of 6.7%. Poland and Romania were around the EU average, while Spain was much below the EU average. The densely populated Malta, Belgium and the Netherlands, which were at the bottom of the absolute built-up ranking, topped the relative classification with 35%, 22% and 21% shares of built-up area in total territory respectively.
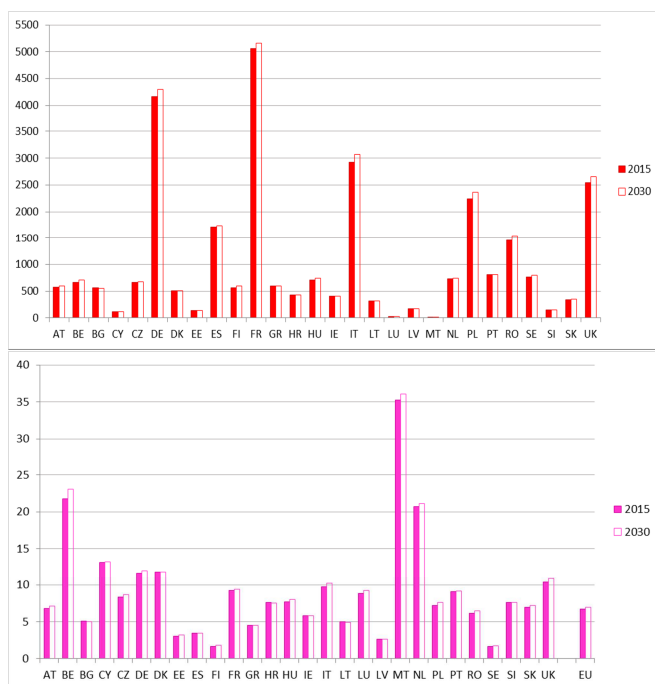

Figure 2: Absolute (top, in thousand ha) and relative (bottom, in % of total territory) built-up area by EU Member States in 2015 and 2030, as well as the total EU relative share in 2015 and 2030

By 2030 built-up will proportionally expand in the large majority of EU Member States – Figure 2 and Figure 3. No changes are, thus, projected either for the national shares in total EU built-up, or at the top of the absolute ranking. The highest relative growth of more than 6% is expected for Romania (+93 thousand ha), followed by Belgium (+39 thousand ha), while a more substantial contraction is likely in Bulgaria (–9.1 thousand ha) and Croatia (– 4.3 thousand ha). In absolute values, Italy will see the largest absolute expansion of built-up (+144 thousand ha), followed by Germany (+128 thousand ha) and Poland (+121 thousand ha). Growth in the sixth largest one in the absolute built-up classification – Spain will be noticeably delayed and amount to just

14 thousand ha. Changes are not expected in the relative ranking either, where Malta, Belgium and the Netherlands will further strengthen their leadership.

Figure 3: Relative change in built-up area by EU Member States within 2015-2030, in %

As regards the 2015-2030 dynamics in built-up cover by types, the urban residential areas will expand by almost 500 thousand ha (+2.2%), reaching 24 million ha. The land used for economic activities will also grow by +434 thousand ha (+11%), extending to 4.3 million ha. Green urban areas, destined mainly for leisure activities, account for almost 2 million ha both in 2015 and 2030.

4.2. Evolution at regional level

The breakdown of built-up areas at regional (NUTS 3) level[5] – Figure 4 – clearly (and not surprisingly) shows that higher shares are observed in regions that host major, often capital cities – Lisbon and Porto in
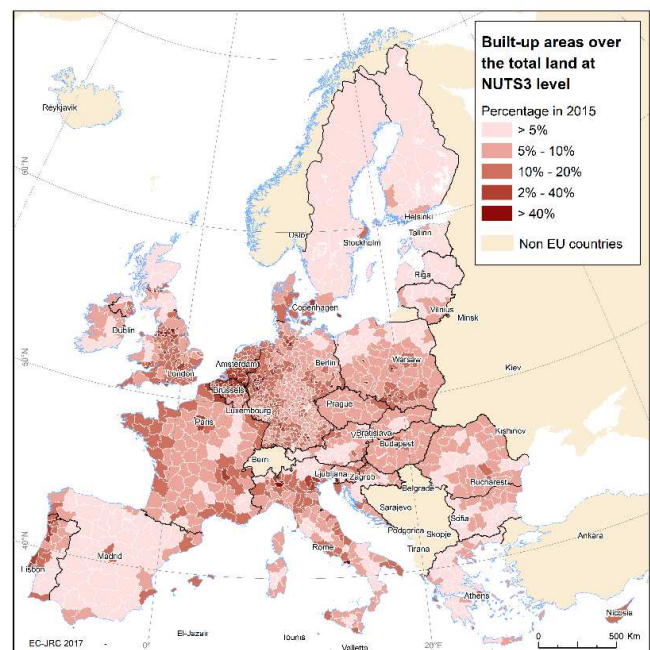

Figure 4: Share of built-up areas in relation to the total surface at NUTS 3 level in 2015

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[5] The size of NUTS 3 regions, which is not uniform across the EU, greatly influences the regional built-up shares.

Portugal, Madrid and Barcelona in Spain, Paris and Lyon in France, etc. Other areas with elevated built-up shares are the traditional touristic hotspots – Algarve in Portugal, Balearic Islands in Spain, the entire Spanish-French-Italian strip on the Mediterranean coast, etc. – as well as the heavily industrialised zones in Northern Italy, Western Germany, Northern France, Benelux, etc.

The regional dynamics within 2015-2030 (Figure 5) shows some important variations from the upward trends at national level. Built-up will continue expanding in and around most large cities and capitals, albeit at different extents. Quite a few countries – Spain, France, Greece, Croatia, Ireland, Estonia, etc. – will see large inter-regional differences, i.e. regions with high (more than 10%) growth or decline in built-up areas. Besides these countries, shrinkage in built-up is also projected for vast areas in Portugal, Latvia, Lithuania and Bulgaria. Conversely, a number of regions in Central and Eastern Europe, especially in Northern Romania, Hungary and Southern Poland, are likely to experience noticeable expansion of built-up. Mainland Sweden will undergo moderate, but stable growth in built-up, too.
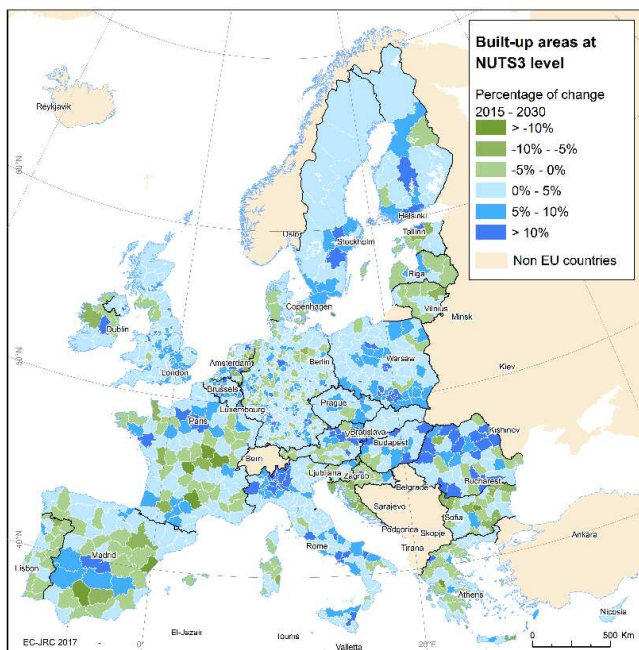

Figure 5: Percentage of change in built-up areas at NUTS 3 level within 2015-2030

4.3. Land conversion trends in built-up areas

The analysis of the likely evolution of built-up areas concludes with the conversion dynamics (Figure 6) by applying the method of land-use/cover flows, focusing on aggregated land conversions "from" or

"to" built-up areas. As shown in Figure 6, the transformation of agricultural land into built-up is projected to be, by far, the biggest one – more than 1.1 million ha, equal to around 3.7% of all built-up areas. The second largest conversion, but at quite a large distance from the leading one, is expected to be forest and natural vegetated areas into built-up – about 200 thousand ha. Approximately 18 thousand ha of abandoned land are projected to turn into built-up. The internal transformation between different built-up areas is likely to be negligible – less than 6 thousand ha. Land, which once has been built up, is generally not expected to convert into other land uses.
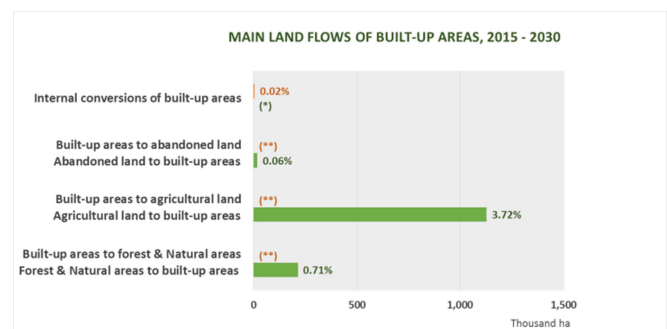

Figure 6: Conversion dynamics of built-up areas in the EU within 2015-2030. The shares are computed in relation to the total built-up area in 2030. Notes: (*) – same net amount of land; (**) – does not occur.

5. DYNAMICS OF FOREST & NATURAL VEGETATED AREAS WITHIN 2015-2030

5.1. Evolution at national level

Forest[6] and natural vegetated[7] (F&NV) areas are widely presented in less populated and/or mountainous and/or cold climate zones, where other land covers, such as build-up and agriculture, are less suitable. Owing to the favourable combination of these factors, F&NV cover is particularly dominant in Scandinavia. Sweden and Finland outpaced by far the remaining EU Member States with more than 70% of their territories being allocated to F&NV areas in 2015 – Figure 7. Altogether, the two countries accounted for 30% of the total F&NV cover in the EU[8]. Spain and France followed them with 12% and 9% respectively, bringing thereby the F&NV areas in those four countries to more than half of the whole EU cover. Estonia, Latvia, Austria, Slovenia, Croatia and Greece had more than half of their territories

[6] All areas dominated by broadleaved and/or coniferous trees regardless of use
[7] Transitional woodland - shrub, moors and heathland, Sclerophyllous vegetation and natural grassland
[8] Broken down into 17% share in Sweden and 13% share in Finland

covered by F&NV areas, too. At the other extremity were the Netherlands, Ireland and Denmark with shares of F&NV cover below 15%.
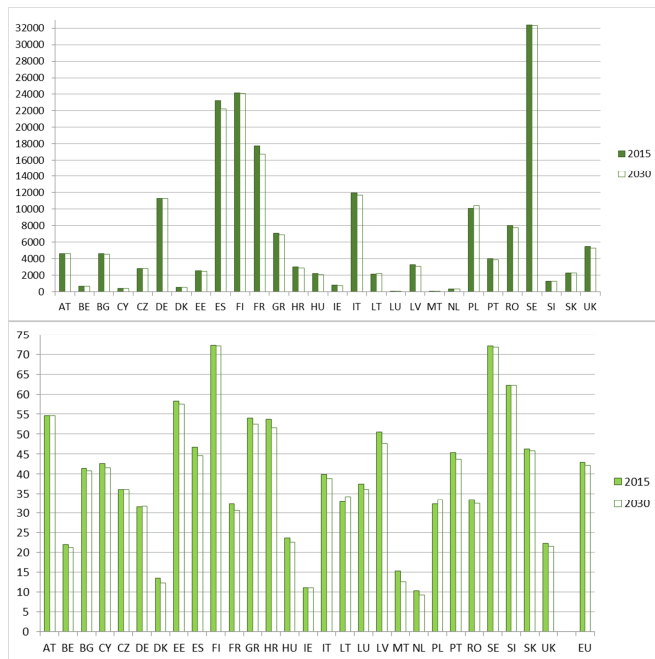

Figure 7: Absolute (top, in thousand ha) and relative (bottom, in % of total territory) forest and natural areas by EU Member States in 2015 and 2030, as well as EU relative share in 2015 and 2030

By 2030 the national shares in the total EU F&NV cover will basically remain unchanged. Sweden, Finland, Spain and France will retain their leadership, accounting for more than 50% of all F&NV areas. In line with the overall downward EU trend of -1.8%, the F&NV cover will shrink in all those four countries, as well as in a number of other EU Member States – Figure 8. The absolute decline in Spain and France will be particularly pronounced, ranging around 1 million ha in each of them. Other substantial (more than 200 thousand ha) reductions in F&NV areas will occur in Italy, Romania, the United Kingdom and Greece. The F&NV cover is projected to significantly expand only in Poland – by 370 thousand ha (+3.7%), followed at a large distance by the neighbouring Lithuania – 90 thousand ha (+4.4%, the highest relative growth EU-wide) and Germany – 30 thousand ha. The deepest
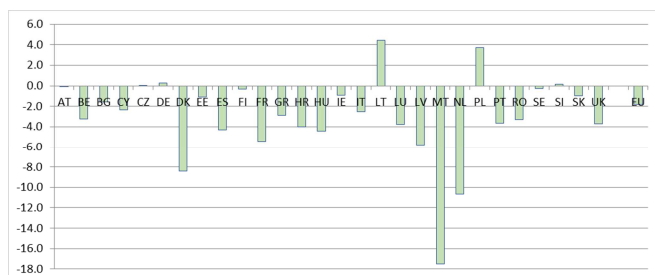

Figure 8: Relative change in forest & natural areas by EU Member States within 2015-2030, in %

relative cutbacks are expected in the group with the lowest share of F&NV areas – Malta (-17.5%), the Netherlands (-10.6%) and Denmark (-8.4%). As a result, Malta will join the club of countries with less than 15% share of F&NV cover in total territory.

The projected net land-use balance within 2015-2030 foresees an increase of 1.4 million ha in forests and transitional woodlands, mostly at the expense of agricultural land and natural vegetated areas. The cutback in natural vegetated areas (4.8 million ha) will be greater than the growth in forest and transitional woodland areas and consequently, the combined F&NV area in the EU will shrink by 3.4 million ha.

As regards the dynamics in the F&NV areas by types, the share of forests is projected to expand significantly – from 150 to 159 million ha (+6%) within 2015-2030. This will be mostly due to afforestation, so that young forests (aged below 25 years) will experience a massive increase of more than 16 million ha in all EU Member States apart from Italy (-4%) and Luxembourg (-0.3%). Conversely, mature forests (aged above 25 years) will shrink by 1.6%. As already indicated, the natural vegetated areas will drop EU-wide by more than a quarter, from nearly 15 million ha in 2015 down to around 11 million ha in 2030. It will, though, expand in few countries – Belgium, Germany, Poland, Czech Republic, Slovakia, Romania and Bulgaria.

5.2. Evolution at regional level

The trends at regional (NUTS 3) level largely follow the ones at national level – Figure 9. The vast majority of regions in Sweden and Finland are distinct with F&NV cover above 60%, as well as huge areas in Spain (Northwest and Southeast) and France (mostly Southeast). Similarly high levels are also observed in some parts of Estonia, Central / Western Portugal, the Apennines in Italy, the Alps in Italy, Austria and Slovenia, Slovakia and Croatia, Western Romania, Southwestern Bulgaria and the neighbouring Northern Greece, as well as in Western Greece. At the other end, with low extent of F&NV cover are peculiar the heavily populated industrial and business centres in Western Germany, Southern United Kingdom (England), the western parts of Belgium and the Netherlands, the Po Valley in Italy, as well as the sizeable areas dedicated to agriculture in Ireland, France, Poland, Hungary and Romania.
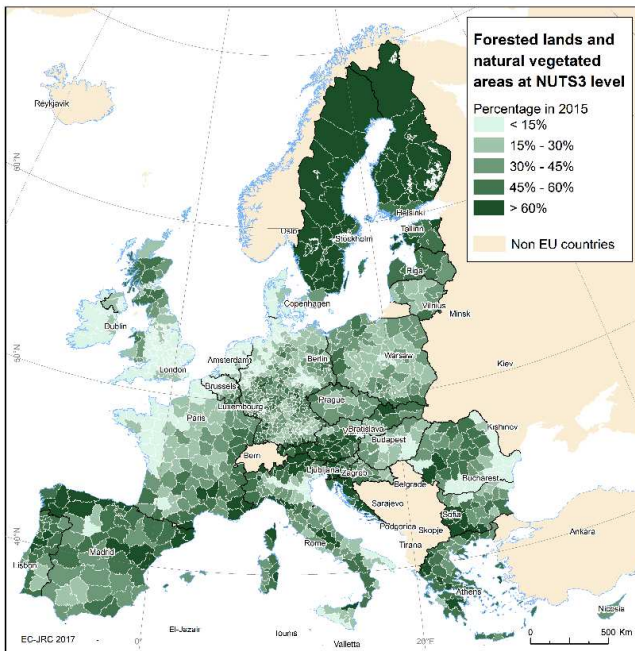
Figure 9: Share of forest & natural vegetated areas at regional level (NUTS 3) in 2015 in EU-28

As already indicated in the national level analysis, Polish and Lithuanian regions will enjoy a widespread incremental expansion of F&NV cover within 2015-2030 – Figure 10. Growth of similar magnitude is expected also for selected regions in Germany (also in line with the national level projections), Eastern Denmark, Northern parts of Ireland and Portugal, and the island of Menorca in Spain. The deepest relative declines in F&NV cover are forecast for Southwestern
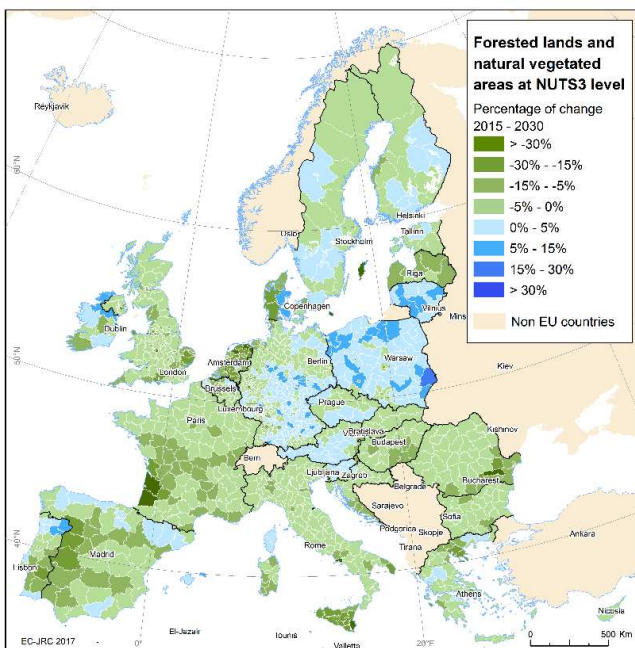

Figure 10: Percentage of change in forested lands and natural vegetated areas at regional level (NUTS3) between 2015 and 2030

France and Spain, Northern Netherlands, Western Denmark (opposite to the trend in the Eastern parts), Gotland Island in Sweden, Southern Italy (in particular Sicily) and Eastern Romania. It is worth nothing that Latvian regions are likely to face a noticeable reduction in F&NV cover, contrary to the expected evolutions in the neighbouring Lithuania.

5.3. Land conversion trends in forest & natural vegetated areas

Similarly to the built-up analysis, the assessment of the prospective evolution of F&NV areas concludes with the conversion dynamics (Figure 11), revealed along the method of land-use/cover flows.
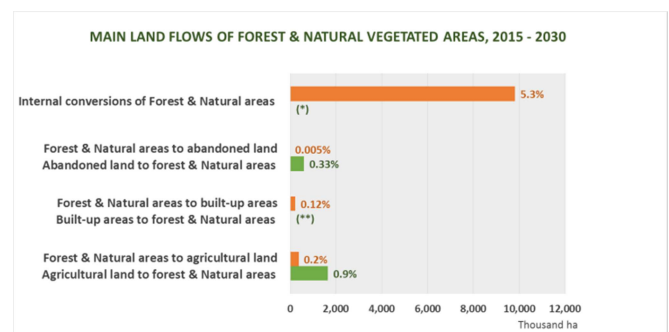

Figure 11: Conversion dynamics of F&NV areas in the EU within 2015-2030. The shares are computed in relation to the total F&NV area in 2030. Notes: (*) – same net amount of land; (**) – does not occur.

By far the largest (nearly 10 million ha, equal to more than 5% of all F&NV area) conversion is projected to be within the F&NV category e.g. from natural vegetated areas into forests. The second biggest transformation is expected to be agricultural land into F&NV (1.65 million ha). The reverse conversion will be much smaller (370 thousand ha) and consequently, the net growth of F&NV area at the expense of agricultural land will reach almost 1.3 million ha. A noticeable amount of abandoned land – nearly 600 thousand ha – is projected to re-cultivate into F&NV areas – an important and very positive evolution. As already mentioned in the built-up conversion dynamics, the expansion of built-up on F&NV areas will slightly exceed 200 thousand ha and no reverse land use change is expected.

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