REVIEW OF JRC/EEA EU-LEVEL HNV FARMLAND METHODOLOGY

Agenda

09.30	Welcome and introduction (Chair: J-E Petersen, EEA)
09.45	Session 1: Review of country level work on HNV farming / farmland
09.45	Presentation by P. Pointereau, Solagro, on identifying HNV farmland in France
10.10	Presentation by UBA Vienna (M. Weiss) on outcome of review of available national data for refining rules on selection of CLC classes by biogeographic region, followed by discussion (Rapporteur: Yanka Kazakova, Bulgaria)
11.20	Brief coffee break
11.30	Session 2: Comparison of analysis of HRL grassland data with current HNV 'map'; review of satellite data opportunities - presentation by GISAT (Tomas Bartalos) followed by discussion (Rapporteur: Gebhard Banko, UBA Vienna)
12.45	*Lunch break*
13.45	Session 3: Options for including a land use intensity dimension into the spatial representation of HNV farmland
	Review of results based on JRC CAPRI model (M. Weiss, UBA Vienna + EEA), followed by discussion (Rapporteur: Clunie Keenleyside, UK)
15.40	Coffee break
16.00	Summing up by organisers and concluding discussion
16.45	End of workshop

European Environment Agency
European Topic Centre on Urban, Land and Soil Systems

ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

REVISING THE JRC/EEA EU-LEVEL HNV FARMLAND METHODOLOGY

SESSION 1

REVIEW OF AVAILABLE NATIONAL DATA FOR REFINING RULES ON SELECTION OF CLC CLASSES BY BIOGEOGRAPHIC REGION, FOLLOWED BY DISCUSSION

14 October 2019

European Environment Agency
European Topic Centre on Urban, Land and Soil Systems

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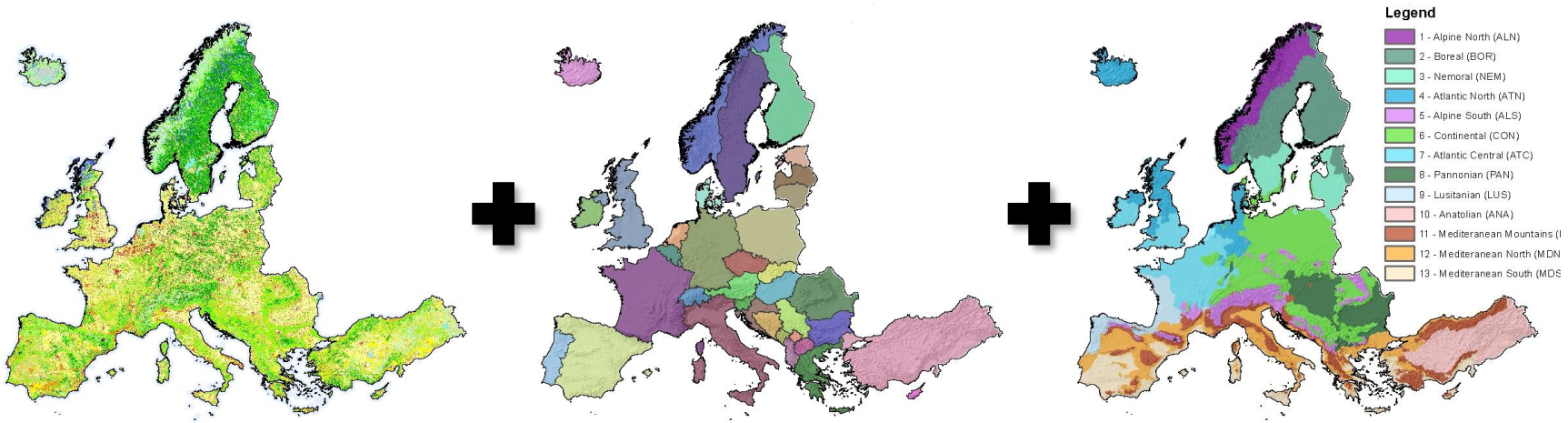
HNV – CURRENT JRC/EEA APPROACH, STEP 1: BASIC SELECTION OF CLC CLASSES



CLC classes for each country (EEA39) and Environmental zone (Metzger et al. 2018)

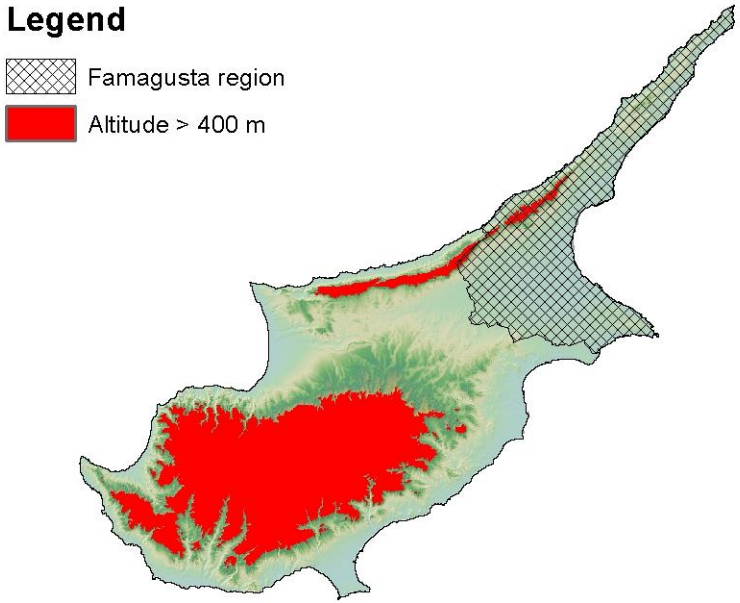
HNV - CURRENT JRC/EEA APPROACH, STEP 1 BASIC SELECTION OF CLC CLASSES

- Selection is based on country consultations
- In Germany selection for „Landscapes worthy of Protection“ instead of environmental zones
- Methodologies for HNV estimation in Croatia and Serbia have now been implemented based on national input
- HNV farmland for Switzerland submitted by national Swiss authorities

CLC classes	CLC	ALS	CON	MDM	PAN
Non-irrigated arable land	211	0	0	0	0
Permanently irrigated land	212	0	0	0	0
Rice fields	213	0	0	0	0
Vineyards	221	0	0	0	0
Fruit trees and berry plantations	222	0	0	0	0
Olive groves	223	0	0	0	0
Pastures	231	231	231	231	231
Annual crops associated with permanent crops	241	0	0	241	0
Complex cultivation patterns	242	242	242	242	242
Land principally occupied by agriculture	243	243	243	243	243
Agro-forestry areas	244	244	0	244	244
Natural grasslands	321	321	321	321	321
Moors and heathland	322	0	0	322	0
Sclerophyllous vegetation	323	0	0	323	0
Transitional woodland/shrub	324	0	0	0	0
Sparsely vegetated areas	333	0	0	0	0
Inland marshes	411	411	411	411	411
Peat bogs	412	0	0	0	0
Salt marshes	421	0	0	0	0

HNV – CURRENT JRC/EEA APPROACH, STEP 2: COUNTRY EXPERT RULES FOR EXCLUSION/INCLUSION

- Refinement of the draft land cover map on the basis of additional expert rules and country specific information
- Exclusion or inclusion of CLC classes within an environmental zone or region
- Expert rules relate to altitude, soil quality or other auxiliary data
  - Cyprus: Vineyards (221) are included above 400 m
  - Cyprus: Complex cultivation patterns (242) in coastal areas of can be intensive (especially Farmagusta administrative district) and therefore are excluded



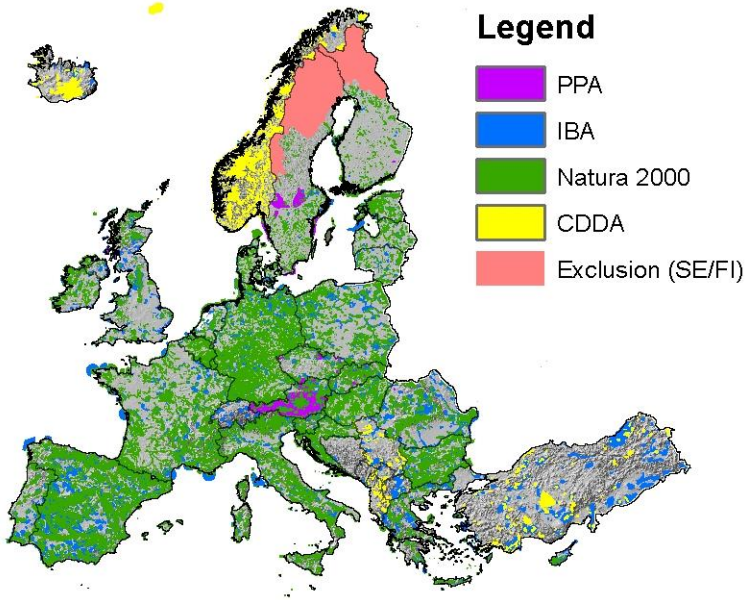
HNV – CURRENT JRC/EEA APPROACH, STEP 3: RE-SELECTION OF CLC IN SPECIAL AREAS

Code	CLC classes with potential for HNV	Standard re-selection	Portugal	Spain	Italy	Hungary	Croatia	Serbia
211	Non-irrigated arable land		x	x		x	x	x
212	Permanently irrigated arable land							x
213	Rice fields		x	x	x	x	x	x
221	Vineyards	x	x	x	x	x	x	x
222	Fruit trees and berry plantations	x	x	x	x	x	x	x
223	Olive groves	x	x	x	x	x	x	x
231	Pastures	x	x	x	x	x	x	x
241	Annual crops associated with permanent crops	x	x	x	x	x	x	x
242	Complex cultivation patterns	x	x	x	x	x	x	x
243	Land principally occupied by agriculture, with significant areas of natural vegetation	x	x	x	x	x	x	x
244	Agro-forestry areas	x	x	x	x	x	x	x
321	Natural grassland	x	x	x	x	x	x	x
322	Moors and heathland	x	x	x	x	x	x	x
323	Sclerophyllous vegetation	x	x	x	x	x	x	x
324	Transitional woodland-scrub							x
333	Sparsely vegetated areas							x
411	Inland marshes	x						
412	Peat bogs							
421	Salt marshes	x						

HNV – CURRENT JRC/EEA APPROACH, STEP 3: RE-SELECTION OF CLC-CLASSES IN SPECIAL AREAS

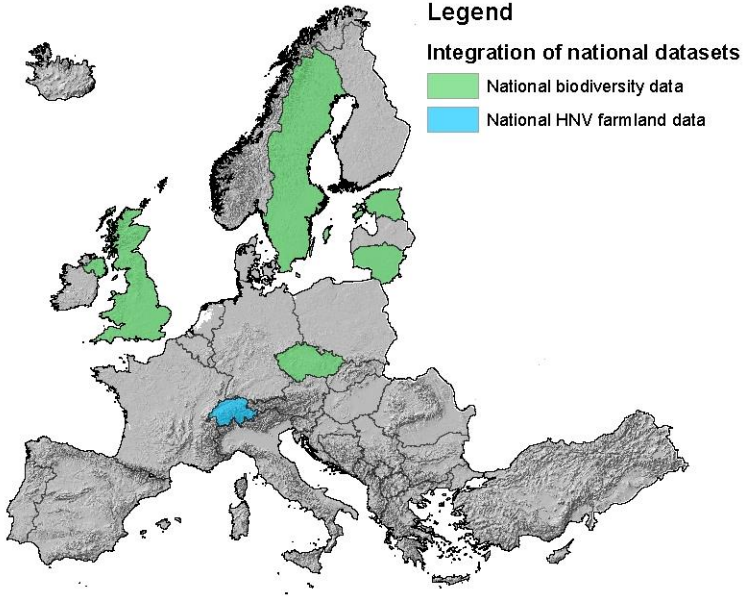
Four categories of special areas area considered:

- Prime Butterfly Areas
- Important Bird Areas
- Natura 2000 („Osterman list“, adapted 2017)
- CDDA (IUCN categories: Ia, Ib, II, IV, V, VI)
- In north of Scandinavia special areas are excluded according to national comments (Finland, Sweden)
- Some country expert rules for exclusion are also applied in special areas!



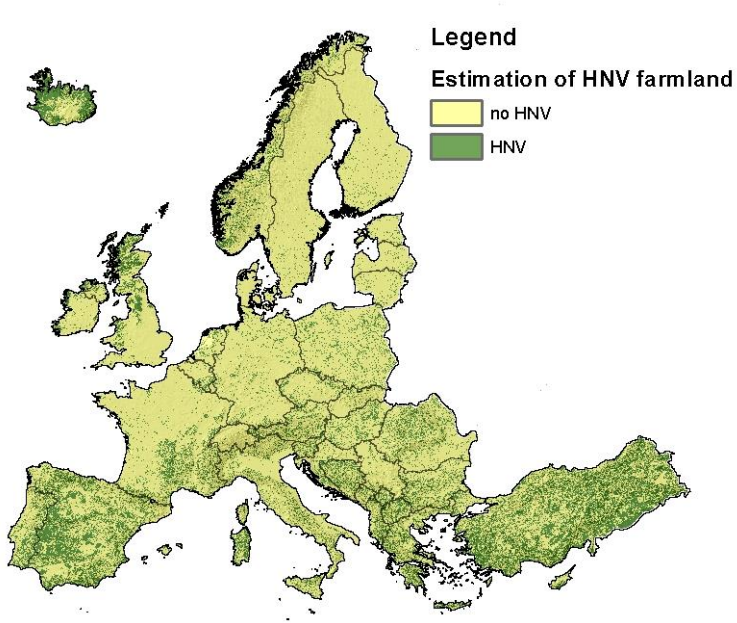
HNV – CURRENT JRC/EEA APPROACH, STEP 4 AND 5 INTEGRATION OF NATIONAL BIODIVERSITY/HNV DATA

- Step 4: Integration of national inventories /datasets relating agricultural biotopes or semi-natural grasslands in:
  - Czech Republic
  - Sweden
  - Estonia
  - Lithuania
  - England
- Step 5: Integration of national Swiss HNV farmland dataset



HNV – CURRENT JRC/EEA APPROACH OVERVIEW AND RESULT

1. Basic selection: selection of relevant land cover classes in the different environmental zones in Europe;
2. country expert rules: refinement of the draft land cover map on the basis of additional expert rules and country specific information;
3. addition of the biodiversity data layers with European coverage (PBA, IBA, N2k, CDDA);
4. addition of national biodiversity data sets;
5. addition of national HNV datasets (Switzerland)



HNV - CURRENT JRC/EEA APPROACH METHODOLOGICAL ASPECTS

1. CORINE Land Cover is the only dataset available for the whole extent of EEA-39 with the same reliability and quality
2. CLC provides also a time series for 2000, 2006, 2012 and 2018
3. Minimum mapping unit of 25 is quite coarse, even when “CLC accounting layers” consider also changes at smaller scale (5 ha)
4. Geographical accuracy for delineation of HNV farmland therefore is limited
5. Auxiliary data like altitude etc. are used in some countries to differentiate CLC classes within environmental zones, but in fact the approach focuses on a binary outcome:
   CLC class = HNV yes/no
6. Selection of CLC classes in the first two steps of the approach may be discussed

HNV - CURRENT JRC/EEA APPROACH ISSUES TO BE TACKLED

1. Selection of CLC classes per environmental zone
   - ➔ Country cases to compare JRC/EEA approach with national HNV farmland datasets
2. Geographical enhancement
   - ➔ Use of High Resolution Layers to exclude not agriculturally used ares
     - Imperviousness
     - Water and Wetness
     - Forest / Tree Cover Density
     - Grassland
3. Use of intensity parameters
   - ➔ Identification of intensively used areas that are unlikely to contain HNV farmland
     - Total nitrogen input in kg/ha (CAPRI)
     - Livestock density per ha (CAPRI)
     - Irrigation

COUNTRY CASE STUDIES

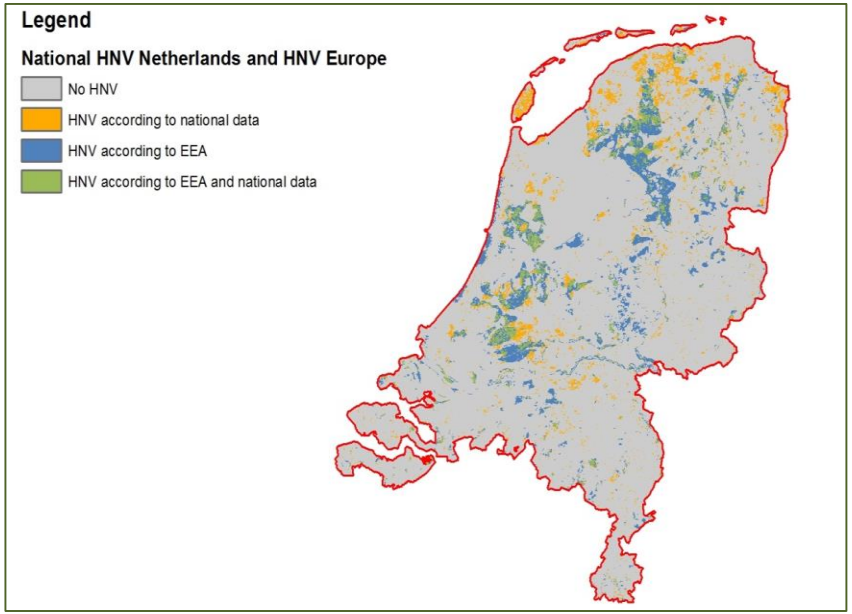
1. Selection of 9 country case studies with available spatial and/or statistical data on national HNV farmland.
2. Comparison of the methodological basis for defining and identifying HNV farmland in the national HNV approaches with the JRC/EEA HNV farmland methodological approach using the 3 HNV types set out in the JRC report (Parachini et al. 2008).
3. The GIS analysis comprises
   - the comparison of the time-period (actuality) of reference data
   - the comparative analysis of GIS spatial explicit data
   - the identification of sources of omission and commission of European wide HNV farmland in comparison to national HNV farmland or biotope mapping data, grouped according to environmental regions and CLC-classes.

The following countries provided national HNV farmland data and biodiversity data respectively (statistical tables and GIS data in original resolution):

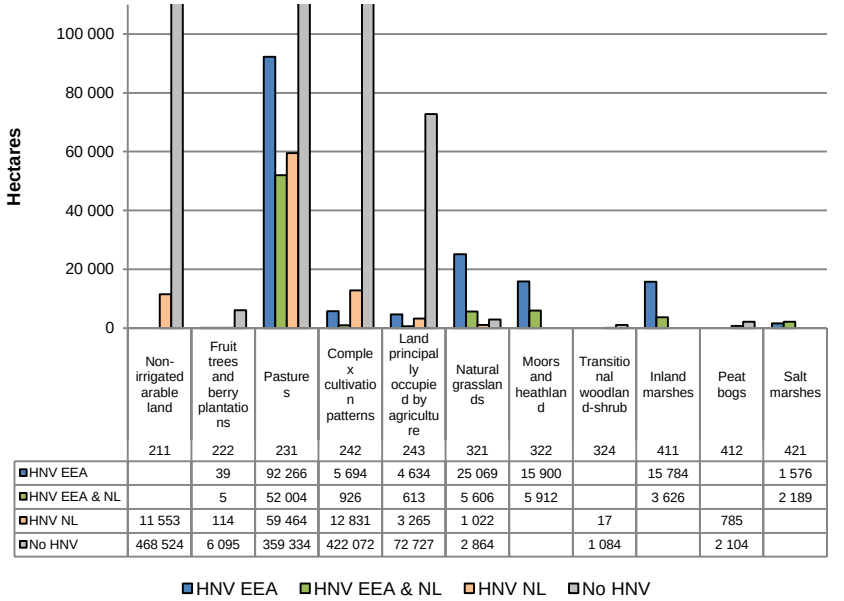
COUNTRY CASE STUDIES

Country	Data Format	HNV type	Resolution	Cover	Environmental Zones	Comparability	
						spatial	thematic
Austria	national HNV farmland data	1, (2)	1 * 1 km	Austria	Alpine South, Continental, Pannonian	y	y
Portugal	Research case study data	1,2,3	Polygons, rasterized to 100 * 100m	Minho-Lima region, Melgaço municipality	Lusitanian	y	y
Netherlands	national HNV farmland data	1,2,3	Polygons, rasterized to 100 * 100m	Netherlands	Atlantic North, Atlantic Central, Continental	y	y
Estonia	national HNV farmland data	1,2,3 (EHNV, MHNV, RLHNV)	1 * 1 km	Estonia	Boreal, Nemoral	y	partially
Italy	national HNV farmland data	1,2,3	10 *10 km	Italy	Alpine South, Mediterranean mountains, Mediterranean North & South	n	y
Romania	national HNV grassland dataset	1	LAU2	Carpathian Region	Alpine South, Continental	n	partially
Czech Republic	national grassland biotope layer	1	100 * 100m	Czech Republic	Alpine South, Continental, Pannonian	y	partially
Germany	national HNV farmland dataset	1,2,3 (EHNV, HNV, MHNV)	1,278 sample sites of 1 km² each	Germany	Alpine South, Continental, Pannonian, Atlantic Central, Atlantic North	n	y
Croatia	national HNV farmland dataset	1,3	CLC polygons, rasterized to 100 * 100 m	Croatia	Mediterranean North, Alpine South, Continental, Pannonian, Mediterranean mountains	y	Y

IMPROVEMENT OF MAPPING RULES FOR THE NETHERLANDS

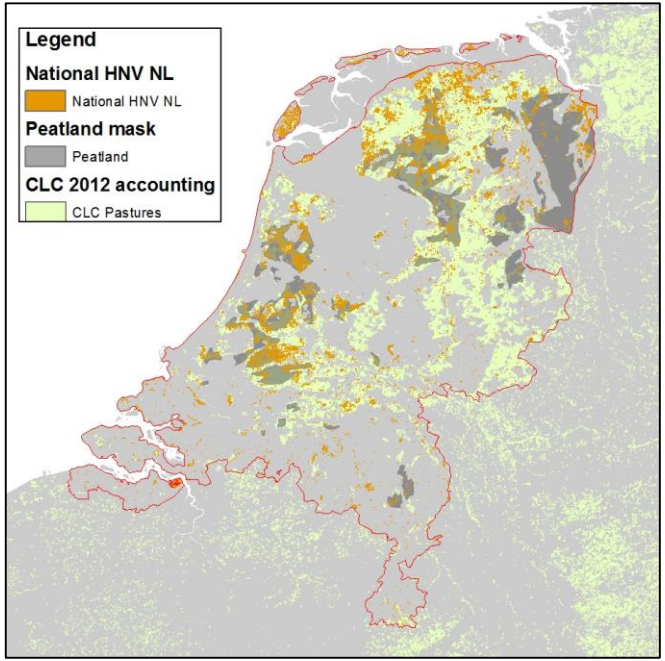


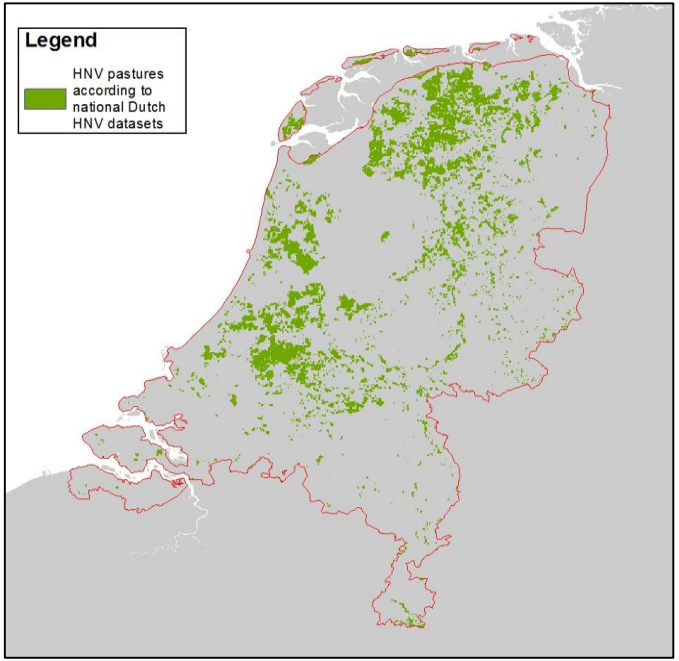
Environmental zone: Atlantic Central (Netherlands)



	Non-irrigated arable land	Fruit trees and berry plantations	Pastures	Complex cultivation patterns	Land principally occupied by agriculture	Natural grasslands	Moors and heathland	Transitional woodland-shrub	Inland marshes	Peat bogs	Salt marshes
	211	222	231	242	243	321	322	324	411	412	421
HNV EEA		39	92 266	5 694	4 634	25 069	15 900		15 784		1 576
HNV EEA & NL		5	52 004	926	613	5 606	5 912		3 626		2 189
HNV NL	11 553	114	59 464	12 831	3 265	1 022		17		785	
No HNV	468 524	6 095	359 334	422 072	72 727	2 864		1 084		2 104	

IMPROVEMENT OF MAPPING RULES FOR THE NETHERLANDS



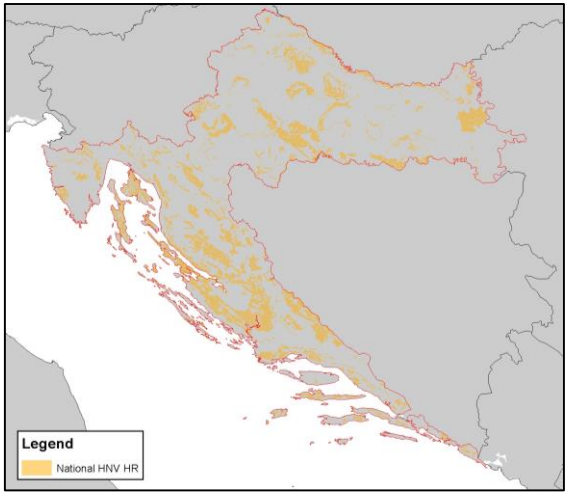


➔ the peatland mask is not suitable for the delineation of CLC-231

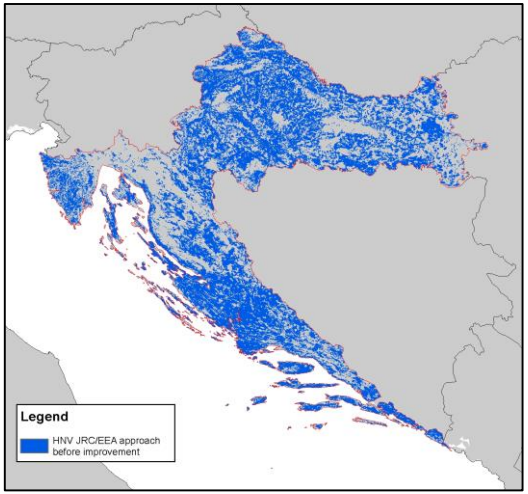
IMPROVING OF MAPPING RULES FOR CROATIA

Code	CLC class	Original JRC/EEA approach	Improved JRC/EEA approach
211	Non-irrigated arable land	Taken into analysis in special areas	mapped only in special areas
212	Permanently irrigated land	Taken into analysis in special areas	mapped only in special areas
221	Vineyards	All mapped areas are indicative as HNV Farmland	mapped only in special areas
222	Fruit trees and berry plantations	All mapped areas are indicative as HNV Farmland	mapped only in special areas
223	Olive groves	All mapped areas are considered as HNV farmland	mapped only in special areas
231	Pastures	All mapped areas are considered as HNV farmland	all areas are mapped
242	Complex cultivation patterns	All mapped areas are considered as HNV farmland	mapped only in special areas
243	Land principally occupied by agriculture	All mapped areas are considered as HNV farmland	mapped only in special areas
321	Natural grasslands	All mapped areas are considered as HNV farmland	all areas are mapped
322	Moors and heathland	All mapped areas are indicative as HNV Farmland	mapped only in special areas
323	Sclerophyllous vegetation	All mapped areas are indicative as HNV Farmland	not mapped
324	Transitional woodland/shrub	All mapped areas are indicative as HNV Farmland	not mapped
421	Salt marshes	not mapped	mapped only in special areas
411	Inland marshes	only adjacent to extensive carp fishponds	only adjacent to extensive carp fishponds
512	Water bodies	only extensive carp fishponds selected	only extensive carp fishponds selected

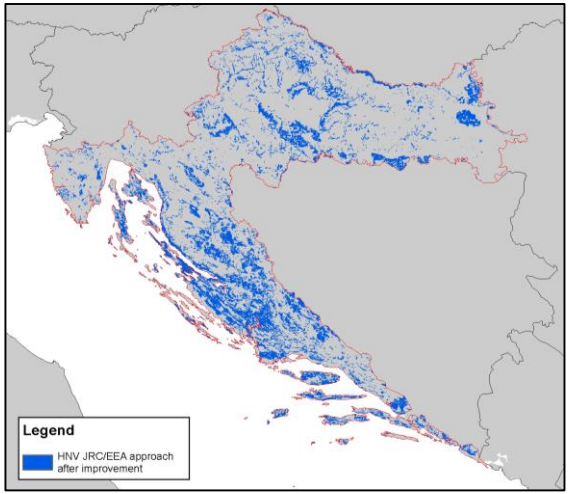
IMPROVMENT OF MAPPING RULES FOR CROATIA



HNV farmland according to updated national Croatian HNV farmland dataset



HNV farmland estimation according to originalJRC/EEA approach



HNV farmland estimation according to improved JRC/EEA approach

Use of National Biodiversity Data

- Use of National Biodiversity Data (UK, CZ, EE, LT, SE) is problematic as they are irregularly updated
- It may improve HNV farmland estimation for these countries, but it does not contribute to a quality enhancement at European scale. Gathering and preparation of these datasets is time consuming
- Comparability at European scale is lower for these countries
- National datasets usually have much higher spatial resolution and therefore overlay with CLC is problematic as very different CLC classes can be identified (for example “airports”)
- This affects the estimation of HNV farmland changes.

IMPACT OF SUSPENDING THE USE OF NATIONAL BIODIVERSITY DATASETS

Country	Area of HNV2012 accounting [ha]	Area of HNV without consideration of national biodiversity datasets [ha]	Change of HNV if national biodiversity datasets are not considered [%]	Area of national biodiversity dataset total [ha]	Area of national biodiversity dataset outside HNV [ha]	Share of national biodiversity dataset outside HNV [%]
CZ	1,287,827	1,074,468	-16,57	484,873	213,359	44.0
EE	484,765	445,916	-8,01	77,977	38,849	49.8
UK	5,455,847	5,035,429	-7,71	1,176,206	420,418	35.7
LT	649,293	600,579	-7,50	77,155	48,714	63.1
SE	1,164,480	1,015,955	-12,75	284,622	148,525	52.2

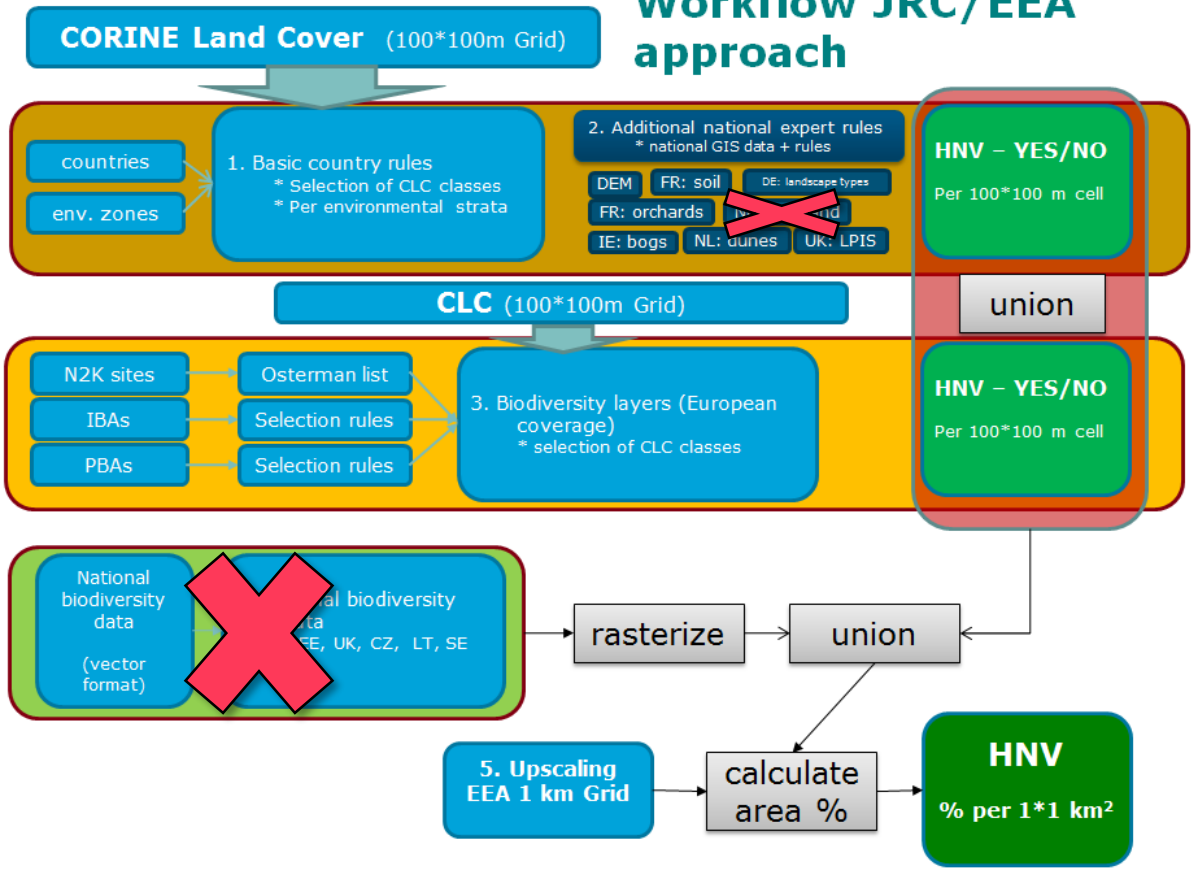
CONCLUSIONS OF COUNTRY CASE STUDIES

- No patterns could be identified to exclude or include certain CLC classes at European scale
- Approaches and mappings of national HNV farmland datasets are too different to be fully comparable with the JRC/EEA approach
- Findings to improve the current JRC/EEA approach can only be drawn for the countries specifically looked at
  - Netherlands: suspend dataset representing „peatland mask“ for mapping of CLC-231 (Pastures)
  - Croatia: exclude classes according to updated national Croatian HNV farmland mapping
  - Estonia: consideration of re-selection of CLC classes in special areas or better selection of special areas
  - Czech Republic: correction of false mapping rules (Olive groves)
- CLC-classes selected by the JRC/EEA approach in general adress the same areas as HNV as national HNV farmland mappings – but the European HNV dataset arrives at much higher estimates than the national assessments
- Geometric enhancement by exlusion of non agriculturally used area and thematic improvement by identification of intensively used areas within the CLC classes is considered to be more effective

PROPOSED FOLLOW UP ON GENERAL REVIEW AND COUNTRY CASE STUDIES

- EU approach and national work and focus are often very different => learn what we can and explain differences in approach and results as needed
- As stated at the beginning simplification of current approach is necessary as further elements are being added (HRL layers + farming intensity component)
- Thus EEA & ETC/ULS propose to:
  - Reduce use of national biodiversity data as much as possible (as country input is patchy and updates irregular and resource-intensive)
  - Focus the selection of ‘special areas’ on those that build on biodiversity observations => use of Natura 2000 areas as part of HNV selection would be stopped, which would also facilitate the use of results in policy evaluation

Workflow JRC/EEA approach



SUGGESTION FOR IMPROVEMENT/WAY FORWARD

A) Geometric enhancement

Application of High Resolution Layers

- Exclusion of non-agricultural areas

  ➔ HRL forest, HRL imperviousness

- refinement of higher estimated CLC Classes e.g. 231, 321, 243

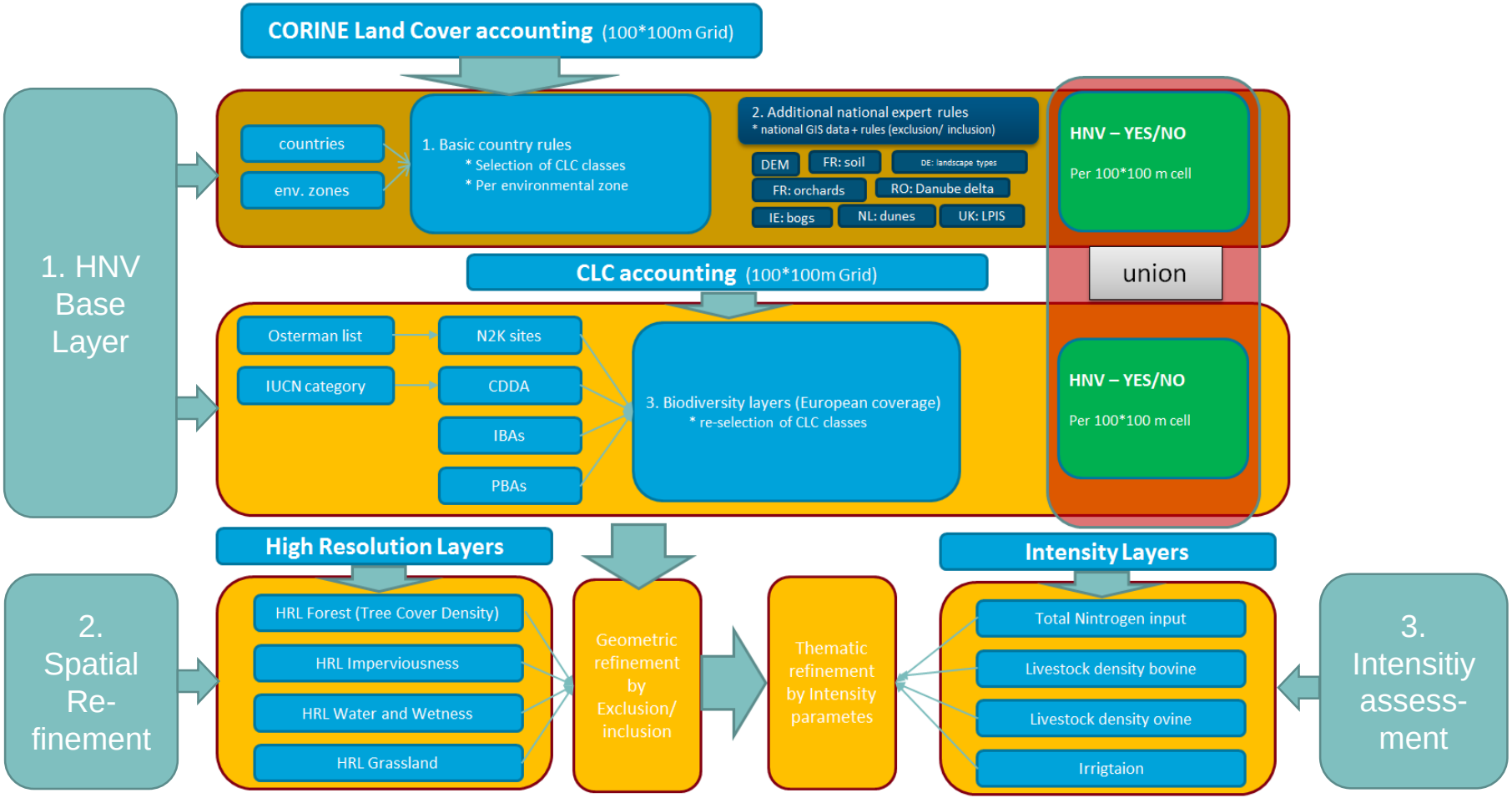
  ➔ HRL grassland

- Time series?

B) Thematic enhancement

Application of intensity mask:

- Exclusion of intensively used areas
- Improvement of classes with sources of omission in extensively used areas (e.g. CLC-211)


CORINE Land Cover accounting (100*100m Grid)
1. HNV Base Layer
countries
env. zones
1. Basic country rules
* Selection of CLC classes
* Per environmental zone
2. Additional national expert rules
* national GIS data + rules (exclusion/ inclusion)
DEM
FR: soil
DE: landscape types
FR: orchards
RO: Danube delta
IE: bogs
NL: dunes
UK: LPIS
HNV – YES/NO
Per 100*100 m cell
union
CLC accounting (100*100m Grid)
Osterman list
IUCN category
N2K sites
CDDA
IBAs
PBAs
3. Biodiversity layers (European coverage)
* re-selection of CLC classes
HNV – YES/NO
Per 100*100 m cell
High Resolution Layers
2. Spatial Re-finement
HRL Forest (Tree Cover Density)
HRL Imperviousness
HRL Water and Wetness
HRL Grassland
Geometric refinement by Exclusion/ inclusion
Thematic refinement by Intensity parametes
Intensity Layers
Total Nintrogen input
Livestock density bovine
Livestock density ovine
Irrigtaion
3. Intensitiy assess-ment

IMPLEMENTATION OF HIGH RESOLUTION LAYERS

Spatial enhancement of the HNV farmland estimation through exclusion of non-agriculturally used areas:

1. HRL Imperviousness:

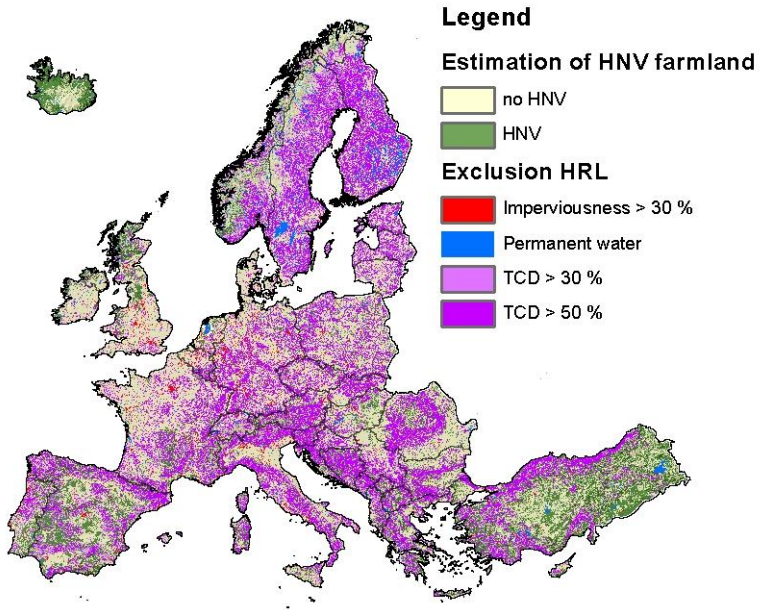
   ➔ Threshold: > 30 %

2. HRL Water and Wetness:

   ➔ Threshold: permanent water

3. Tree Cover Density:

   ➔ 30 % or 50 % depending on CLC-Class



HRL IMPEVIOUSNESS

Exclusion by HRL Tree Cover Density is different for CLC classes:

1. Some CLC classes that are expected to contain a certain amount of trees will not be affected by the exclusion (e.g. permanent crops, Agro-forestry areas…)
2. Exclusion will be applied by threshold of > 30 % tree cover (arable land, areas to be expected to have no trees)
3. Exclusion will be applied by threshold of > 50 % tree cover (e.g. mixex classes)

CLC	Class	Exclusion rule
211	Non-irrigated arable land	exclusion when TCD > 30 %
212	Irrigated arable land	exclusion when TCD > 30 %
213	Rice fields	exclusion when TCD > 30 %
221	Vineyards	no exclusion at all
222	Fruit trees	no exclusion at all
223	Olive	no exclusion at all
231	Pastures	exclusion when TCD > 30 %
241	Annual crops & permanent crops	exclusion when TCD > 70 %
242	Complex Cultivation pattern	exclusion when TCD > 70 %
243	land principally occupied	exclusion when TCD > 70 %
244	Agro-forestry	no exclusion at all
311	Broadleaved Forest	no exclusion at all
321	Natural grassland	exclusion when TCD > 30 %
322	Moors and heathland	exclusion when TCD > 30 %
323	Sclerophyllous vegetation	no exclusion at all
324	Transitional woodlan shrub	exclusion when TCD > 70 %
333	Sparsely vegetated	exclusion when TCD > 30 %
411	Inland marshes	exclusion when TCD > 30 %
412	Peat bogs	exclusion when TCD > 30 %
421	Salt marsches	no exclusion at all
512	Water	no exclusion at all

RESULTS I

ICC	BaseLayer	HNV area in hectares after application of HRL			Reducion of HNV in percent by application of		
		IMP	IMP + WW	IMP + WW + TCD	IMP	IMP + WW	IMP + WW + TCD
AL	1.005.200	1.004.632	1.003.429	881.406	-0,06	-0,18	-12,32
AT	1.971.875	1.961.817	1.959.245	1.720.070	-0,51	-0,64	-12,77
BE	433.456	431.260	430.872	389.731	-0,51	-0,60	-10,09
BA	1.886.575	1.883.433	1.882.577	1.476.324	-0,17	-0,21	-21,75
BG	2.679.220	2.677.195	2.673.776	2.256.600	-0,08	-0,20	-15,77
HR	1.092.171	1.090.251	1.087.464	983.668	-0,18	-0,43	-9,93
CY	340.362	339.971	339.549	337.331	-0,11	-0,24	-0,89
CZ	1.103.381	1.099.243	1.097.354	981.481	-0,38	-0,55	-11,05
DK	189.239	188.961	187.995	179.204	-0,15	-0,66	-5,30
EE	445.826	445.189	443.861	375.568	-0,14	-0,44	-15,76
FI	1.156.804	1.151.556	1.140.406	999.295	-0,45	-1,42	-13,62
FR	8.118.916	8.086.313	8.075.785	7.035.545	-0,40	-0,53	-13,34
DE	2.720.056	2.692.615	2.682.442	2.346.949	-1,01	-1,38	-13,72
GI	0	0	0	0			
EL	4.953.920	4.949.412	4.947.536	4.714.621	-0,09	-0,13	-4,83
GG	550	526	526	476	-4,36	-4,36	-13,45
HU	2.091.164	2.089.391	2.086.496	1.921.834	-0,08	-0,22	-8,10
IS	6.145.944	6.145.521	6.127.888	6.124.756	-0,01	-0,29	-0,34
IE	1.112.797	1.111.395	1.107.475	1.096.178	-0,13	-0,48	-1,49
IM	16.680	16.679	16.670	16.670	-0,01	-0,06	-0,06
IT	5.473.909	5.454.265	5.445.273	4.481.426	-0,36	-0,52	-18,13
JE	1.013	1.000	991	898	-1,28	-2,17	-11,35
XK	437.462	436.967	436.901	404.654	-0,11	-0,13	-7,50

RESULTS II

ICC	BaseLayer	HNV area in hectares after application of HRL			Reducion of HNV in percent by application of		
		IMP	IMP + WW	IMP + WW + TCD	IMP	IMP + WW	IMP + WW + TCD
LV	404.809	404.694	403.292	349.902	-0,03	-0,37	-13,56
LI	152	152	152	140	0,00	0,00	-7,89
LT	546.377	546.120	543.066	469.374	-0,05	-0,61	-14,09
LU	25.003	24.925	24.909	22.558	-0,31	-0,38	-9,78
MK	1.044.815	1.043.519	1.042.940	920.233	-0,12	-0,18	-11,92
MT	2.989	2.977	2.977	2.957	-0,40	-0,40	-1,07
ME	407.078	406.756	406.590	300.183	-0,08	-0,12	-26,26
NL	544.740	540.869	536.523	513.056	-0,71	-1,51	-5,82
NO	6.220.901	6.214.481	6.167.602	5.559.007	-0,10	-0,86	-10,64
PL	3.976.115	3.962.486	3.952.942	3.623.520	-0,34	-0,58	-8,87
PT	3.242.158	3.228.788	3.226.747	3.037.451	-0,41	-0,48	-6,31
RO	5.133.113	5.130.351	5.125.932	4.421.974	-0,05	-0,14	-13,85
RS	782.263	782.060	781.033	670.780	-0,03	-0,16	-14,25
SK	493.231	492.538	491.588	382.256	-0,14	-0,33	-22,50
SI	534.122	528.729	528.503	427.530	-1,01	-1,05	-19,96
ES	20.071.497	20.024.926	20.021.120	18.782.100	-0,23	-0,25	-6,42
SE	1.055.745	1.053.193	1.040.851	912.972	-0,24	-1,41	-13,52
CH	0	0	0	0			
TR	37.190.673	37.133.501	37.121.343	34.258.897	-0,15	-0,19	-7,88
UK	5.300.574	5.292.439	5.282.524	5.200.196	-0,15	-0,34	-1,89
ESMO	0	0	0	0			
UKES	0	0	0	0			
ZZ	8.221	7.163	7.080	6.740	-12,87	-13,88	-18,01
TOTAL	86.984.576	86.820.667	86.707.714	79.861.826	-0,19	-0,32	-8,19

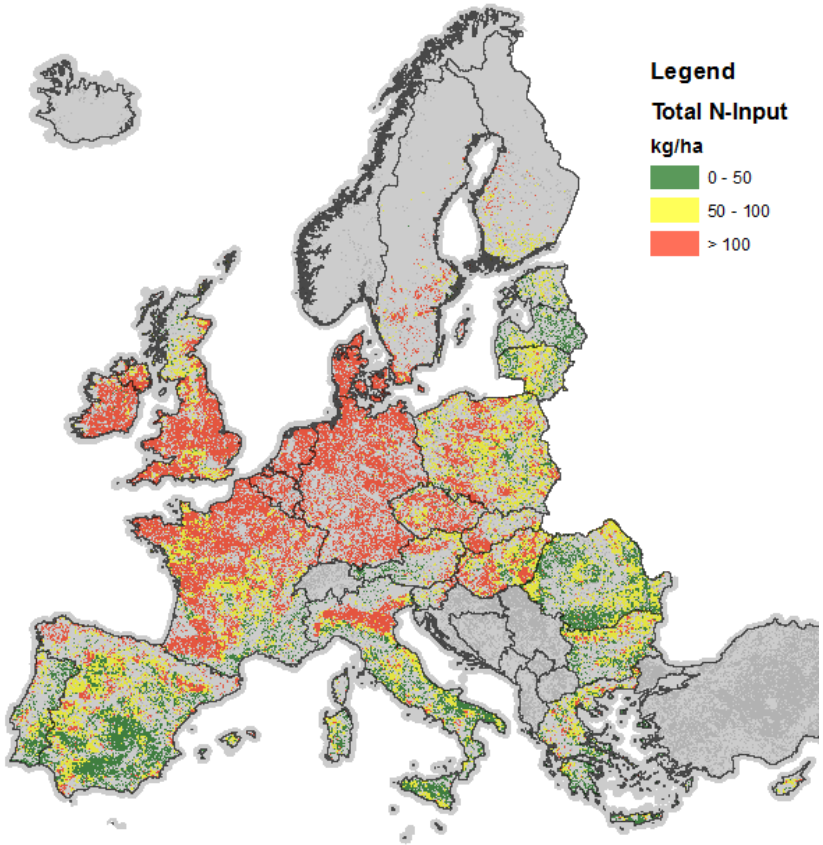
IMPLEMENTATION OF INTENSITY LAYERS

- So far, HNV mapping according to the JRC/EEA approach is a selection of CLC classes per country and environmental zone.
- In a few countries for some CLC classes there exist further mapping rules (for example to map certain classes only above/below a certain altitude or a special region). But in fact the result is more or less binary – a selected CLC-Class = HNV yes or no.
- By application of the intensity parameters it is possible for the first time to differentiate the selected CLC classes into levels of intensity or even further exclude areas if intensity is considered too high and not compatible to HNV.
- For this, the available intensity parameters have to be classified and codified to set initial thresholds that could be utilised.
- Available intensity parameters from the CAPRI model (JRC) are:
  - Total nitrogen input in kg/ha
  - Livestock density (bovine: dairy & non-dairy cattle, ovine: sheep & goats)

TOTAL NITROGEN INPUT

- Calculated by the CAPRI-model
- Total N-input is built by mineral fertilizer and manure
- The following classification is suggested:

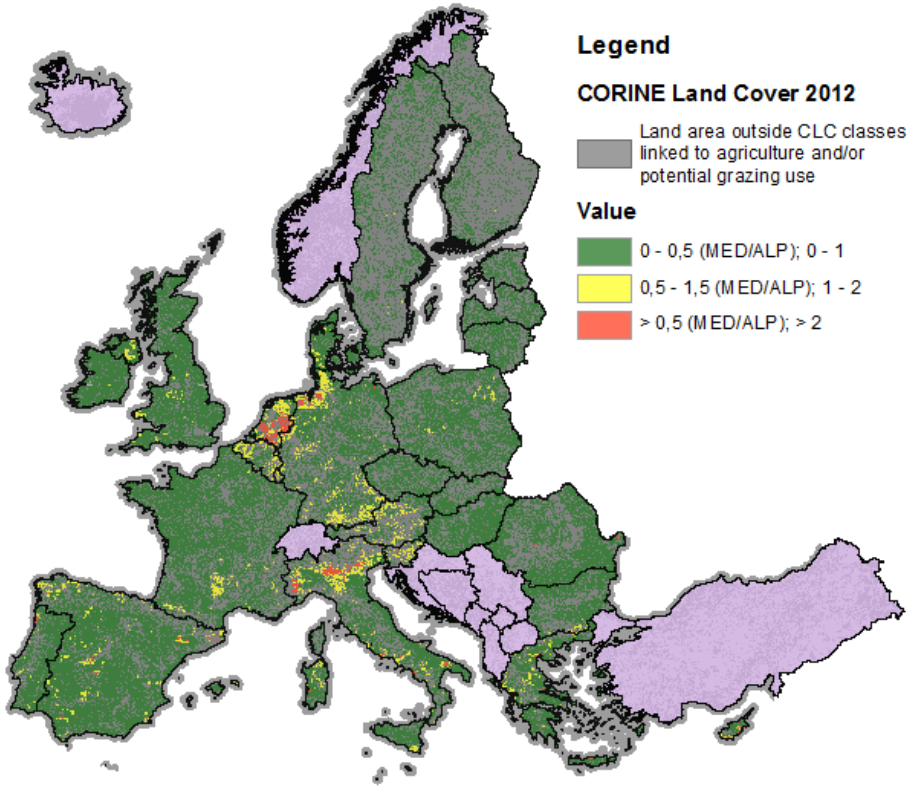
Total N-Input	Level of intensity	Intensity Code
0 – 50 kg	Low intensity	1
50 - 100	Medium intensity	2
> 100 kg/ha	High intensity	3



DATA SET ON (POTENTIAL) GRAZING LIVESTOCK

- Calculated by the CAPRI-model
- Total livestock ist built by ovine and bovine animals
- The following classification is suggested:

LSU / ha Mediterranean	LSU / ha Rest of Europe	Level of intensity	Intensity Code
0 – 0.5	0 – 1	Low intensity	1
0.5 – 1.5	1 – 2	Medium intensity	2
> 1.5	> 2	High intensity	3



CONSTRUCTION OF LIVESTOCK DATASET

- Built on farm structure survey data transformed by JRC-CAPRI-Team into spatial dataset aligned with CAPRI-model spatial unit (FSU)
- Observations on nature of this dataset:
  a) Explicit focus on livestock types that are potentially grazing
  b) In particular for bovine livestock the actual share of grazing livestock is not known.
  c) Estimate calculated on basis of coefficients provided by countries under LULUCF reporting – this needs to be improved
- Two spatial datasets created:
  - Non-grazing livestock distributed over CAPRI UAAR
  - Grazing livestock distributed over CAPRI UAAR and extra grazing land estimated via CLC expert rules
  - These two datasets are combined in the map presented via rasterization

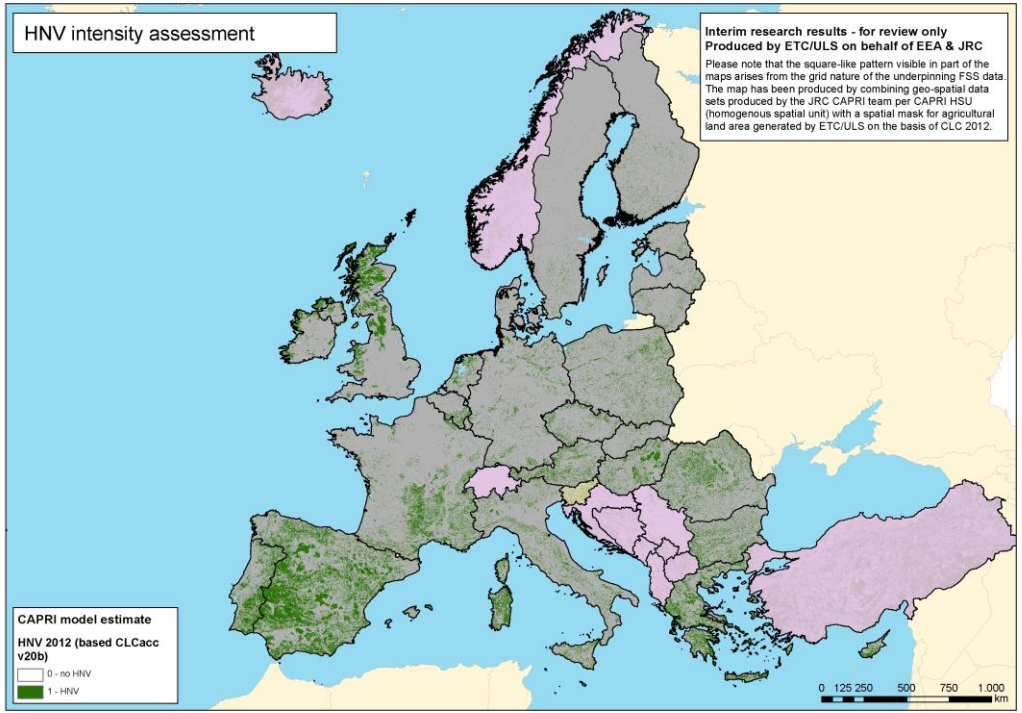
PRACTICAL IMPLEMENTATION OF INTENSITY DATA

- The data for N-Input and Livestock density are calculated for spatial units utilised in CAPRI – the farm structure soil units (FSU) – but the estimated share of grazing animals is distributed on expanded grazing area (based on additional CLC classes)
- The FSU do not spatially differentiate CLC classes. Further, the data for N-Input and Livestock will overlay in most cases.
- Therefore it's necessary to determine which CLC-classes can be differentiated by which intensity parameter. For example, it would not make much sense to apply livestock density to CLC-Class 221 (Vineyards) or Total N-Input to CLC-Class 323 (Sclerophyllous vegetation).
- But there are classes where both N-Input and Livestock may be applied (231 – Pastures). In such cases the final assessment will be given to the parameter with the highest intensity, lowest density or the mean value of intensity

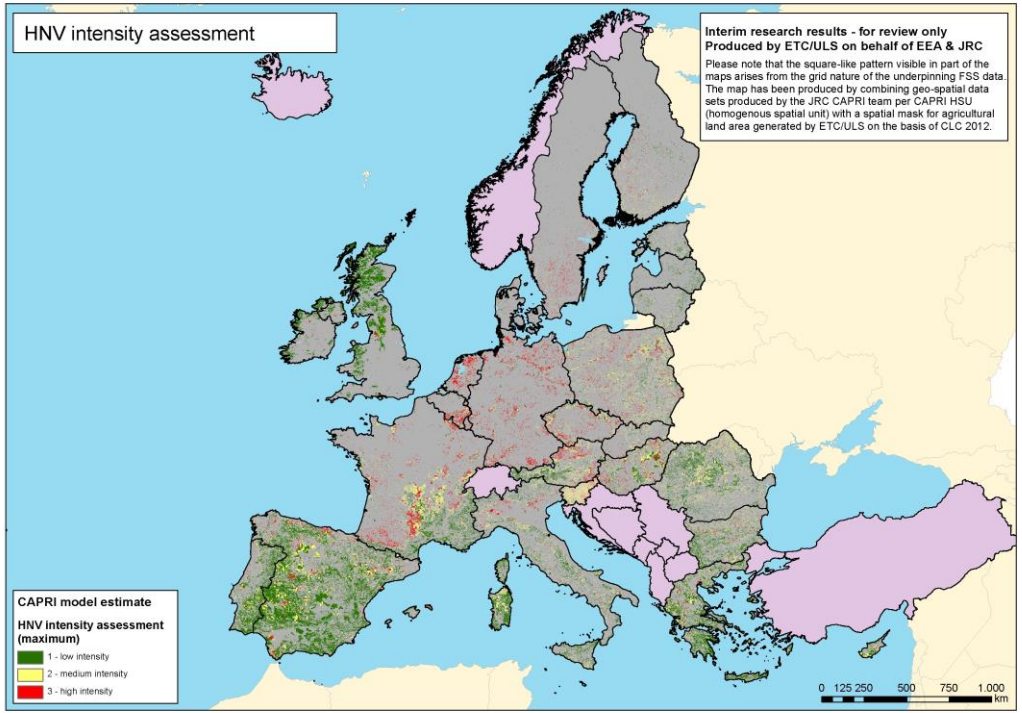
ASSIGNATION OF INTENSITY PARAMETERS TO CLC CLASSES

CLC-Class	N-Input	Dairy cattle	Non-dairy cattle	Ruminants = sheep & goats
211 – Non-irrigated arable land	x			
212 – Permanently irrigated land*	x			
213 – Rice fields	x			
221 – Vineyards	x			
222 – Fruit trees and berry plantations	x			
223 – Olive groves	x			x
231 – Pastures	x	x	x	x
241 – Annual crops associated with permanent crops	x			
242 – Complex cultivation patterns	x	x	x	x
243 – Land principally occupied by agriculture	x	x	x	x
244 – Agro-forestry areas		x	x	x
311 – Broadleaved forest**				
321 – Natural grassland		x	x	x
322 – Moors and heathland		x	x	x
323 – Sclerophyllous vegetation		x	x	x
324 – Transitional woodland-scrub				x
333 – Sparsely vegetated areas		x	x	x
411 – Inland marshes		x	x	x
412 – Peat bogs				x
421 – Salt marshes		x	x	x

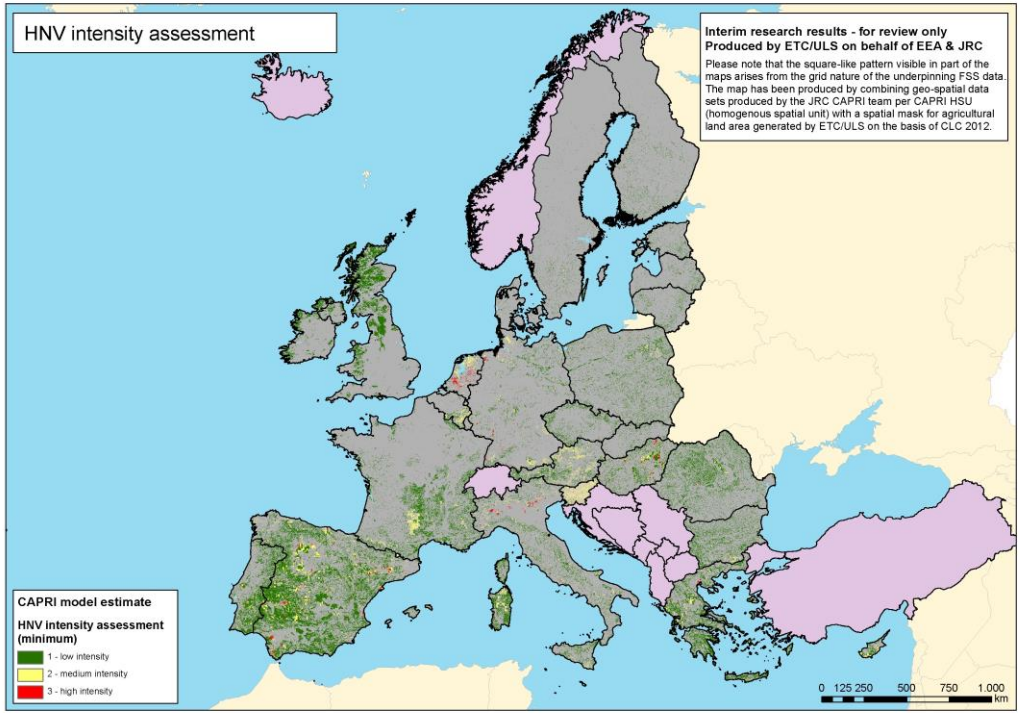
RESULTS - HNV


HNV intensity assessment
Interim research results - for review only
Produced by ETC/ULS on behalf of EEA & JRC
Please note that the square-like pattern visible in part of the maps arises from the grid nature of the underpinning FSS data. The map has been produced by combining geo-spatial data sets produced by the JRC CAPRI team per CAPRI HSU (homogenous spatial unit) with a spatial mask for agricultural land area generated by ETC/ULS on the basis of CLC 2012.
CAPRI model estimate
HNV 2012 (based CLCacc v20b)
0 - no HNV
1 - HNV
0 125 250 500 750 1.000
km

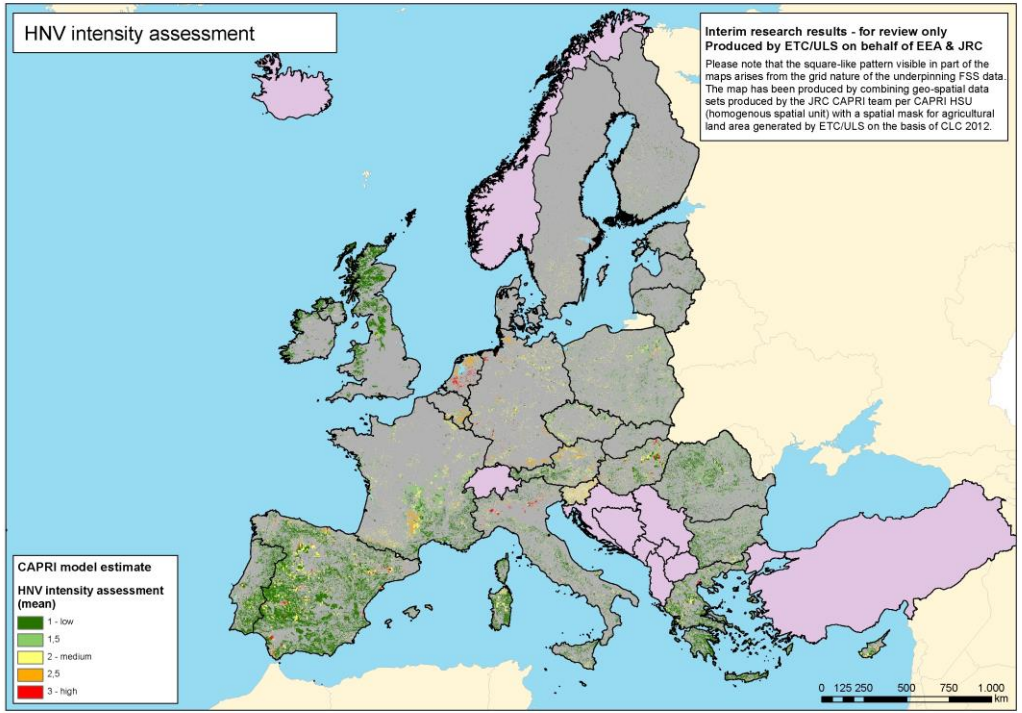
RESULTS BY MAXIMUM INTENSITY OPERATION



RESULTS BY MINIMUM INTENSITY OPERATION



RESULTS BY MEAN INTENSITY OPERATION



RESULTS

ICC	Total area [ha]	Intensity max [%]			Intensity min [%]			Intensity mean [%]				
		low	medium	high	low	medium	high	low	low-medium	medium	medium-high	high
AT	1.720.050	38	39	23	66	34	0	38	19	30	14	0
BE	389.639	12	18	70	45	54	1	12	15	21	51	1
BG	2.255.474	65	29	7	95	4	0	65	25	10	0	0
HR	10.507	100	0	0	100	0	0	100	0	0	0	0
CY	334.215	60	33	6	69	28	4	60	7	27	2	4
CZ	981.481	19	39	42	99	0	0	19	38	42	0	0
DK	164.246	69	3	28	96	4	0	69	0	30	1	0
EE	365.016	70	29	1	100	0	0	70	29	1	0	0
FI	990.168	33	47	20	100	0	0	33	47	20	0	0
FR	7.004.435	43	30	27	92	8	0	43	27	24	5	0
DE	2.327.502	15	7	78	75	20	5	15	5	58	18	5
EL	4.630.127	81	15	4	92	6	1	81	9	8	0	1
HU	1.921.289	42	34	23	79	13	8	42	22	28	0	8
IE	1.073.106	91	3	7	100	0	0	91	3	7	0	0
IT	4.459.605	66	26	8	83	14	3	66	14	14	2	3
LV	349.338	93	7	0	100	0	0	93	7	0	0	0
LI	140	100	0	0	100	0	0	100	0	0	0	0
LT	467.497	60	38	2	100	0	0	60	38	2	0	0
LU	22.558	9	3	88	33	63	4	9	3	21	63	4
MT	2.507	25	26	49	34	56	10	25	0	36	30	10
NL	509.823	10	7	83	17	50	33	10	1	14	43	33
PL	3.617.985	21	56	24	98	2	0	21	55	24	1	0
PT	3.032.608	84	14	2	93	6	1	84	8	7	0	1
RO	4.418.844	61	36	3	98	2	0	61	35	4	0	0
SK	382.251	24	54	22	98	1	1	24	54	21	0	1
SI	427.457	20	46	33	41	57	2	20	14	38	25	2
ES	18.765.705	78	17	5	86	12	2	78	6	13	1	2
SE	897.823	20	28	52	98	2	0	20	28	51	2	0
UK	5.133.961	96	2	2	100	0	0	96	2	2	0	0
ZZ	2.218	80	13	7	100	0	0	80	13	7	0	0
TOTAL	**66.657.575**	**63**	**23**	**14**	**89**	**9**	**2**	**63**	**17**	**16**	**3**	**2**

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