



INMS Component 3: Developing regional assessments of nitrogen management

East Europe Regional Demonstration

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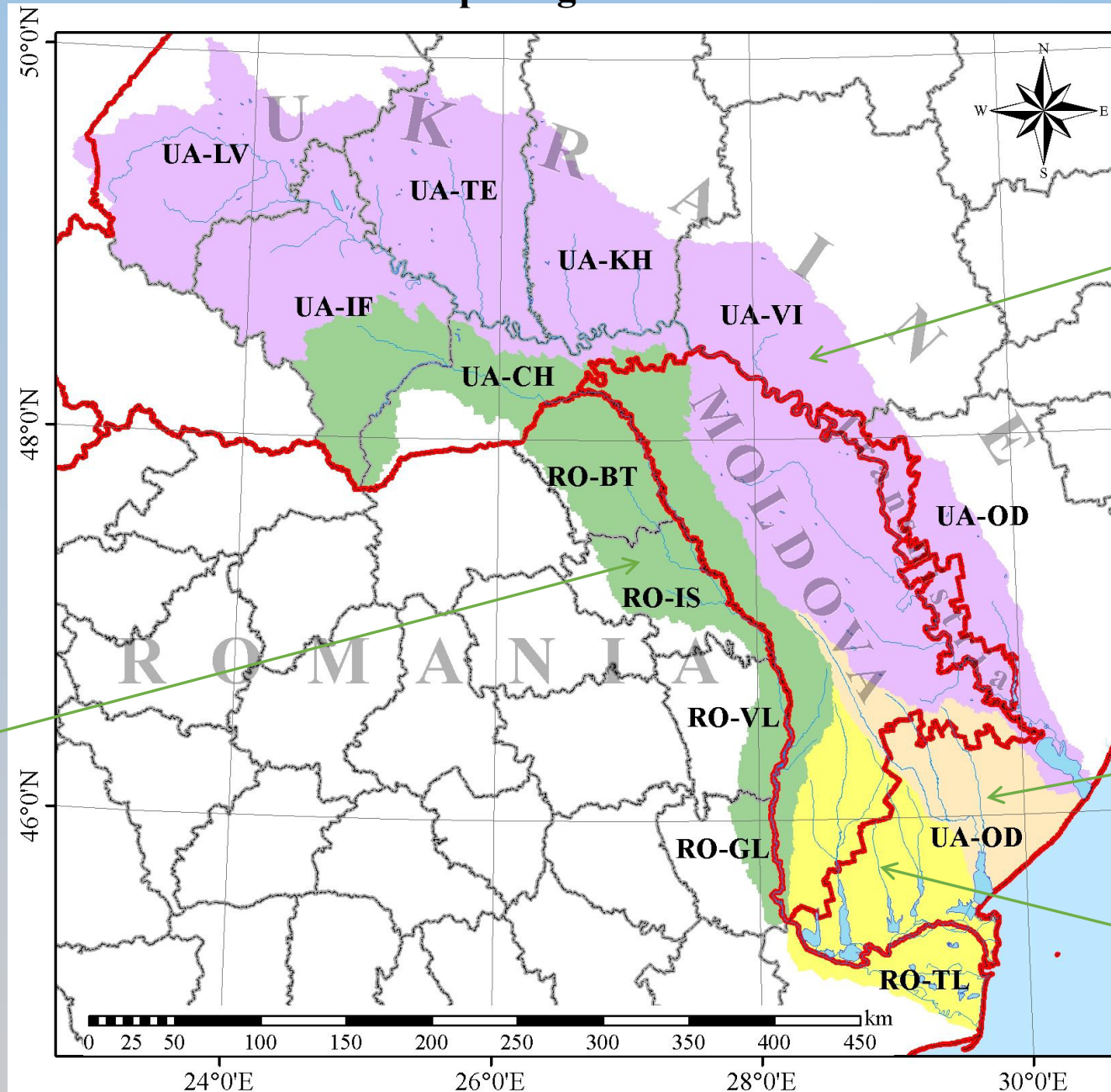
INMS-5 Meeting

Location of East Europe Regional Demonstration in the Black Sea basin



East Europe Regional Demonstration

Prut Catchment
Length: 967 km
Basin area: 27 540 km²



Dniester Catchment
Length: 1 362 km
Basin area: 72 326 km²

Interfluvial Area

Danube Delta

Tasks 3.1.4, 3.1.5

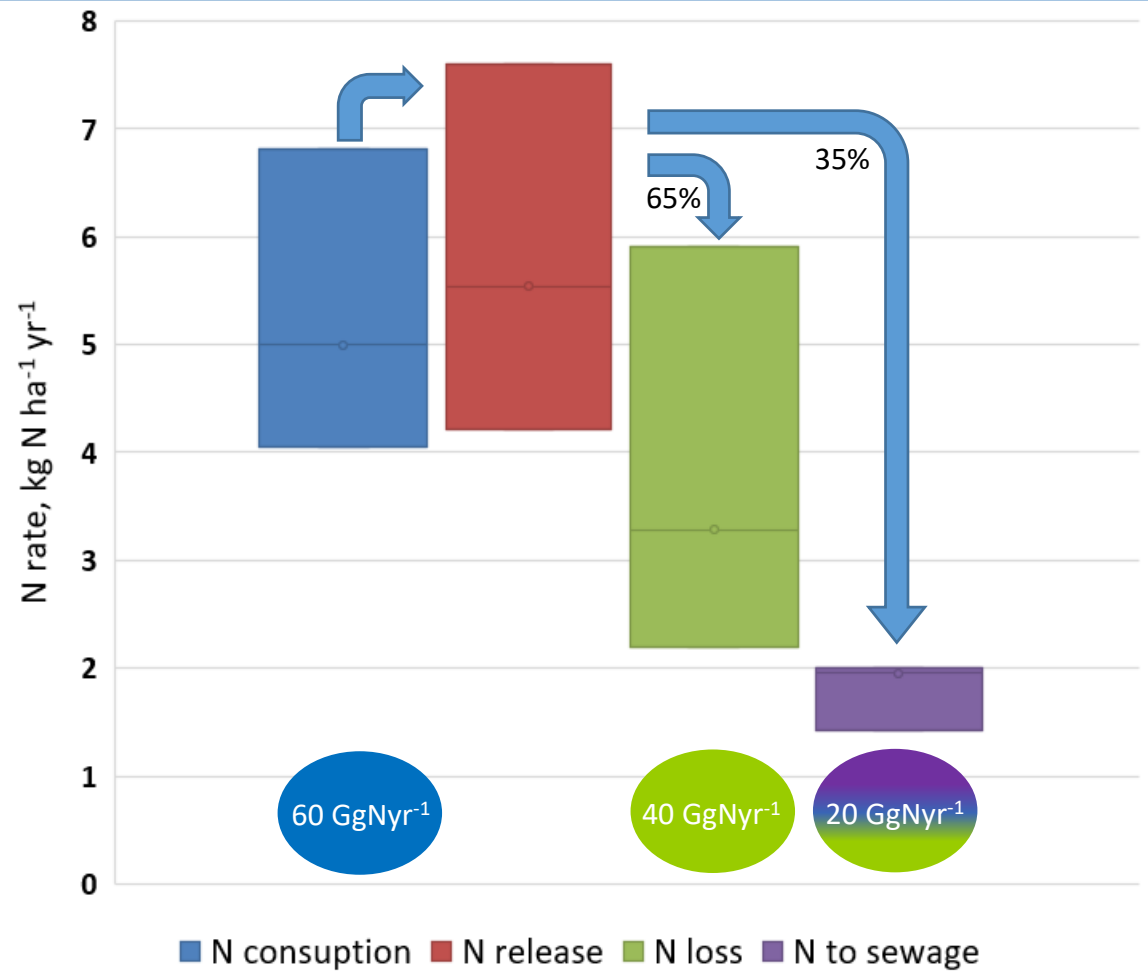
Threats	Drivers/ Reasons	Potential benefits
Water issues - Quality decrease (surf&ground) - Eutrophication - Hypoxia/ anoxia - Nutrient accumulation in/ re-mineralization from bottom sediments - N loads to coastal areas	- households not connected to sewage system - untreated/ insuf. treated wastewaters - Leaching and run-off from agriculture - N deposition to water areas (located near N agri- and industrial hotspots)	- Additional N source via recycling - Additional N and P source via recycling - Increase NUE (decreasing N losses) by using slow-release fertilizers, inhibitors, fertigation - Nr scrubbers with recycling
Biodiversity - Composition change - Decrease in population - Fish catches decrease	- Water pollution drivers (see above) - N deposition - Habitat changes - Illegal fishing - Low/ absence stocking with fish	- Might be diminished via recycling
Soil fertility - N mining - SOM depletion (fertility loss) - Wind erosion - Land use change/ deforestation/ wetland burning	- Deficit of organic fertilizers applied (UA and MD) - N fertilizers applied (UA, MD and for some crops in RO): not enough/ not right type/ not right application method -> lower NUE - Monocropping/ absence of right crop rotation/ absence of perennial grasses in crop rotation - Fallow fields/ absence of cover crops - Deep ploughing - Non proper irrigation facilities -> low WUE - Damage of shelterbelts - Illegal tree cutting (north part of UA) - Wetland wildfire and burning (illegal)	- Coupling with livestock -> manure recycling - Increase NUE (decreasing N losses) by using slow-release fertilizers, inhibitors, fertigation - Increase yield and sustain soil fertility -> economic and environmental effects - restoration of regional irrigation systems and promotion of deep multiple-use drip-irrigat.

Threat	Reason	Potential benefits
Air quality - PM2.5 - N deposition - Tropospheric O3	- NH3 emission (mainly agriculture) - NOx emission (energy, transport, industry, agriculture and forest & wetland fires/ burning) - Nr emission (the same as above)	- Agriculture: Increase NUE (decreasing N losses) by using slow-release fertilizers, inhibitors, fertigation - Human: change personal diet - Industry: Nr scrubbers with recycling - RES technology promotion
GHG balance - N2O and stratospheric O3 depletion	- N2O emission (mainly agriculture and surface waters)	- Agriculture: Increase NUE (decreasing N losses) by using slow-release fertilizers, inhibitors, fertigation - Industry: N2O scrubbers (?) with recycling - Decrease water N pollution diminishes water N2O emission

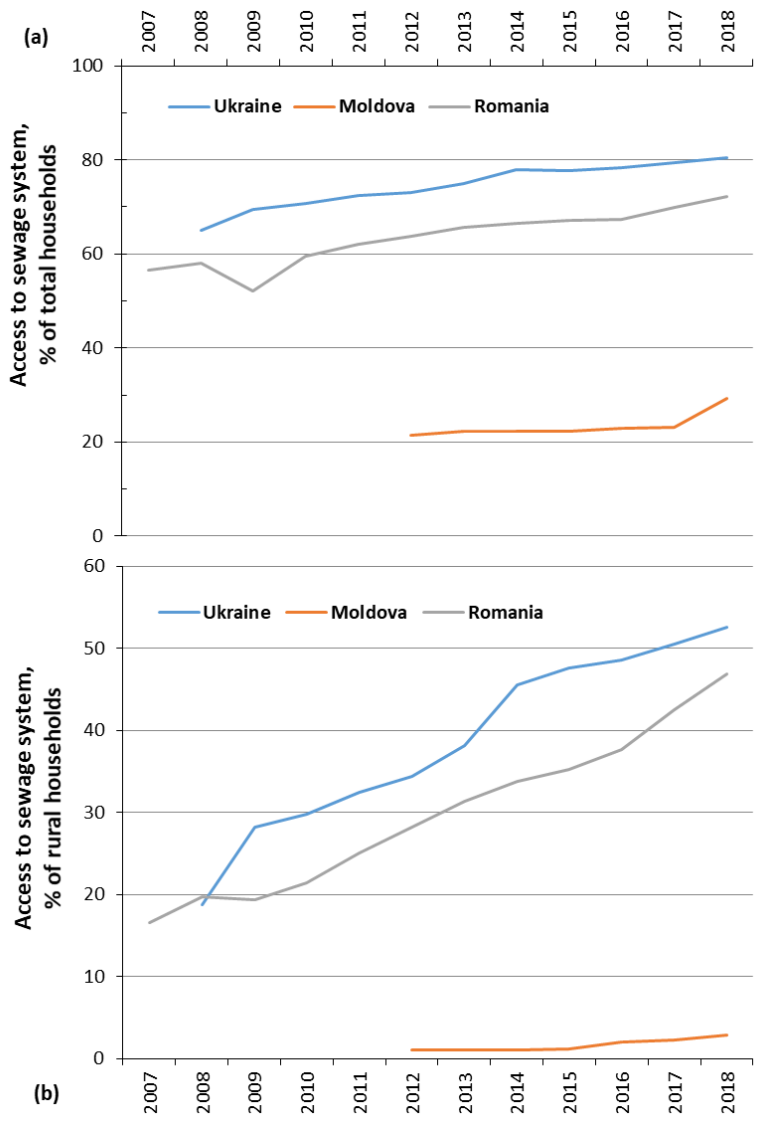
Human health and wellbeing via decreasing quality of ecosystem services

Linkage with C1 (e.g. A1.2 and A1.4) and C2 (A2.1) on ‘Threats and Benefits’ for communication/ sharing approaches/ preliminary results/ draft report is required for demos

Mean rates of N consumption and excretion by human and N loss to the environment per ha⁻¹ of demoregion in 2015



Share of total (a) and rural (b) households connected to sewage system



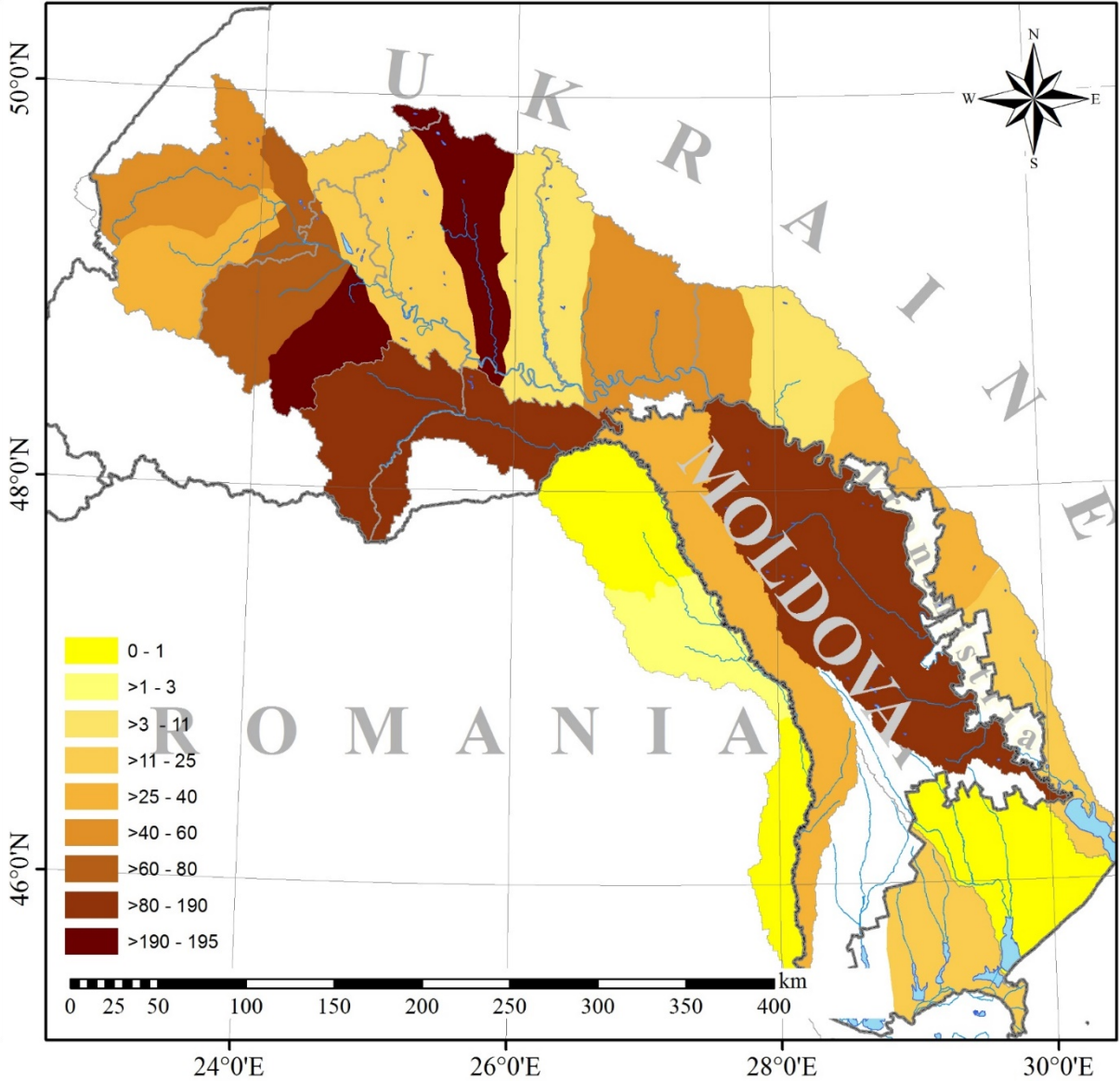
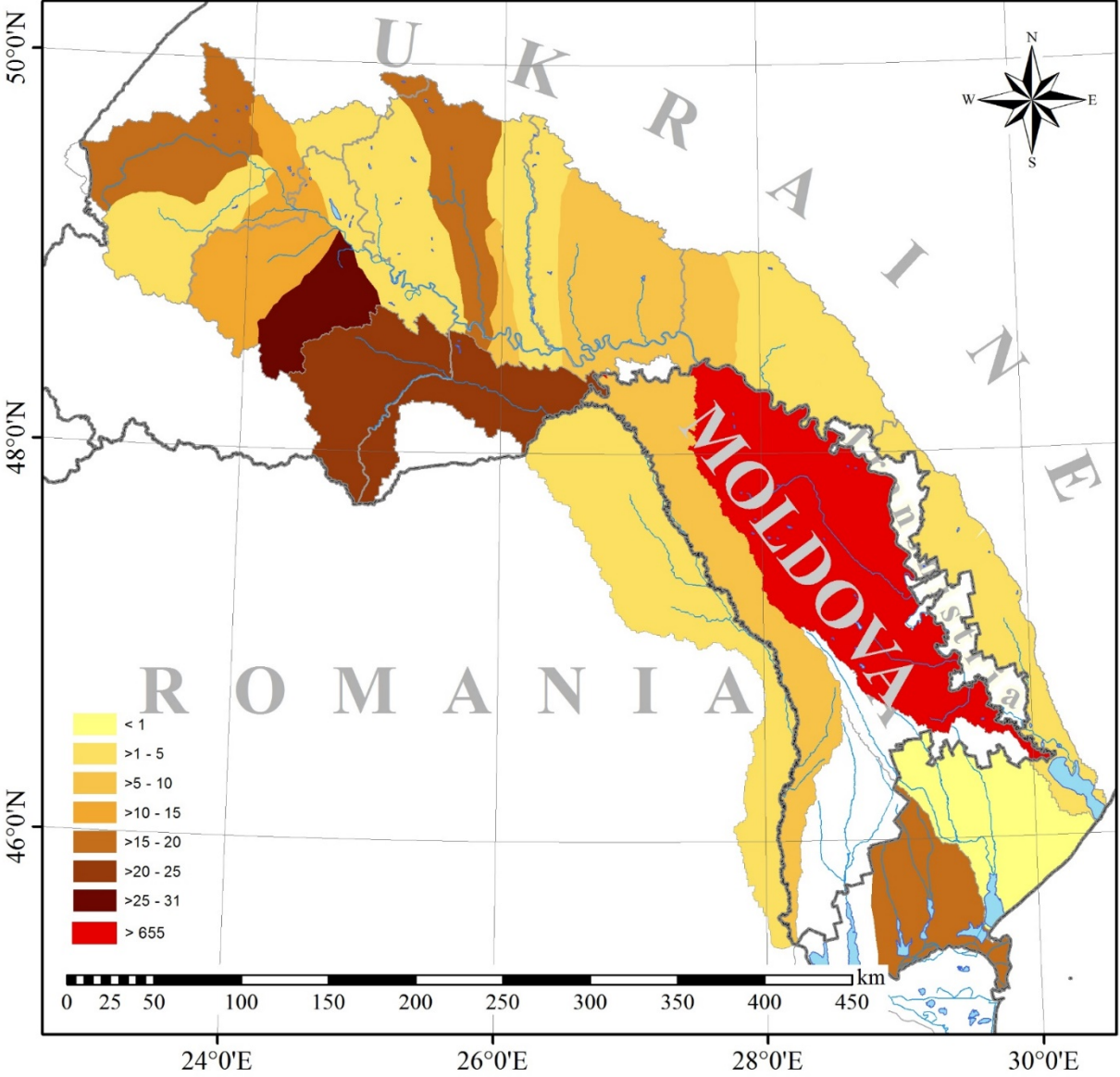
[Data source: FAO; INSSE; StatMoldovei; UkrStat; Sutton et al., 2000; Medinets et al., 2015; Ministry of Health of Ukraine]

Task 3.1.1-3.1.3

**Residual water discharges to river
watersheds in 2015 (mln m³)**

**DIN input with wastewaters
in 2015 (Mg N y⁻¹)**

Wastewaters

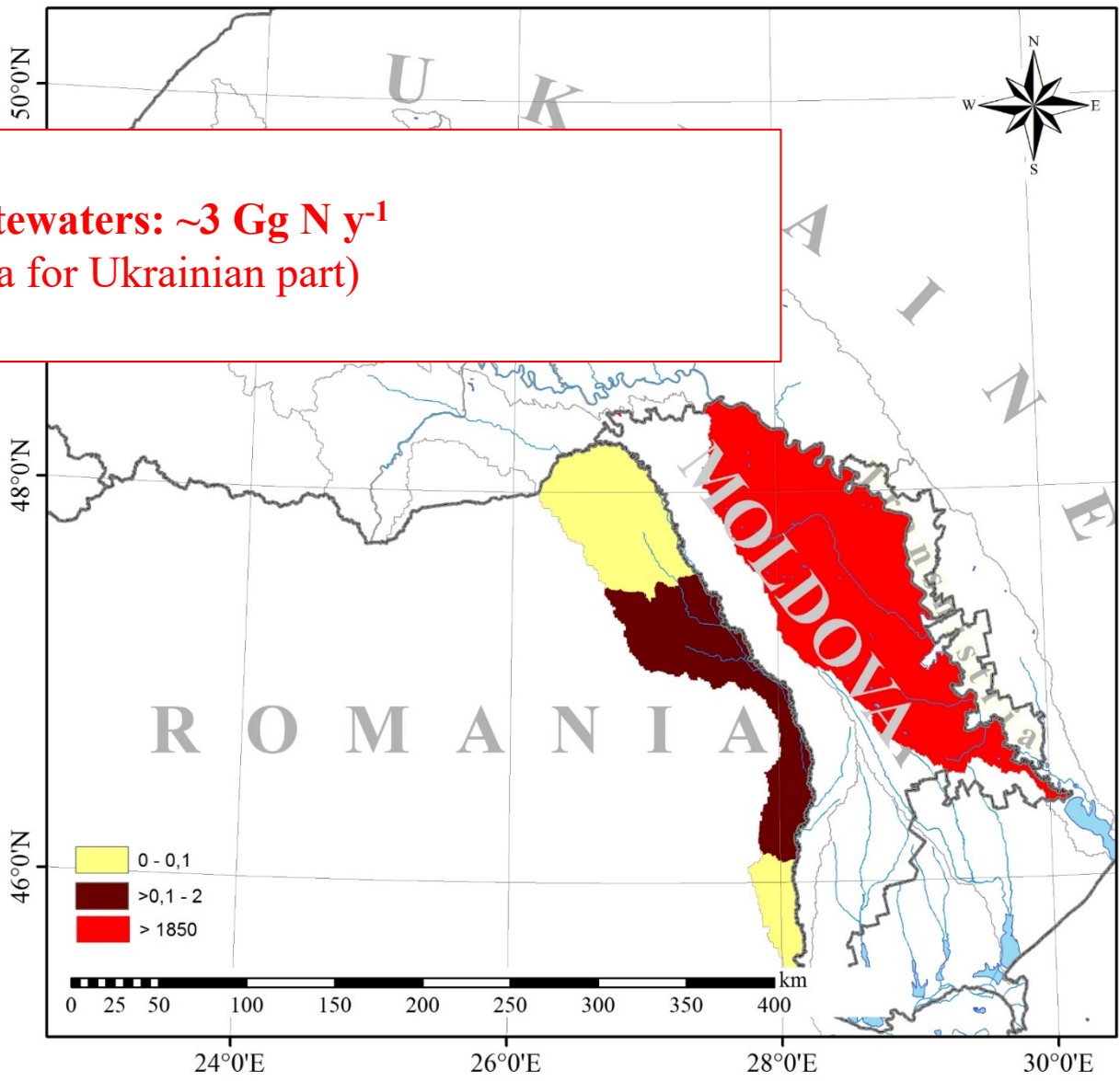
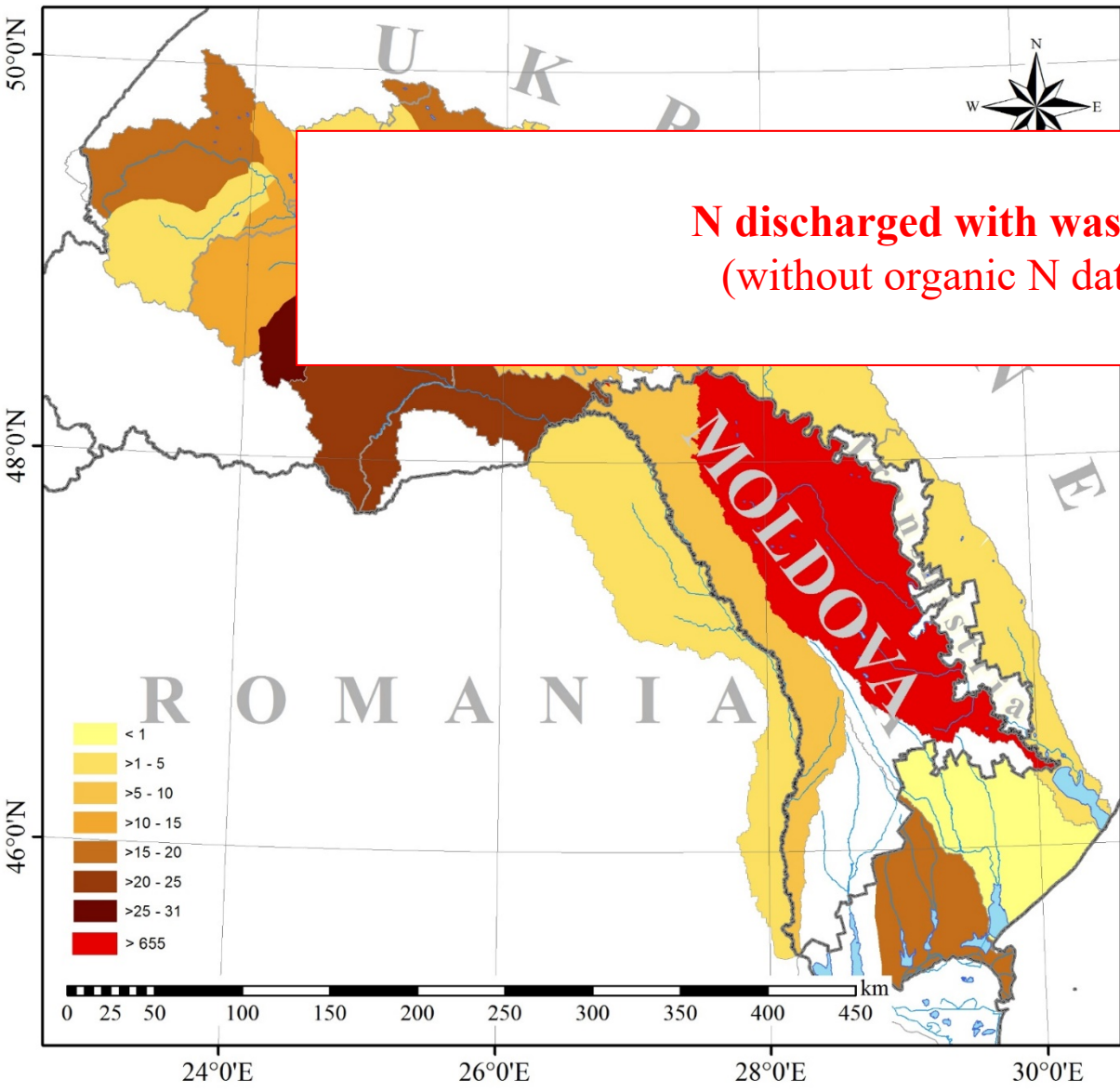


Task 3.1.1-3.1.3

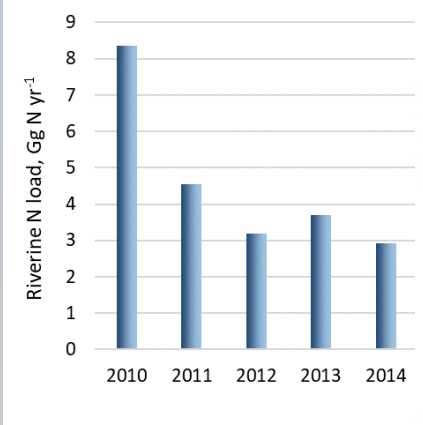
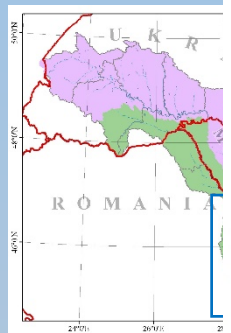
Residual water discharges to river
watersheds in 2015 (mln m³)

Total N input with wastewaters
in 2015 (Mg N y⁻¹)

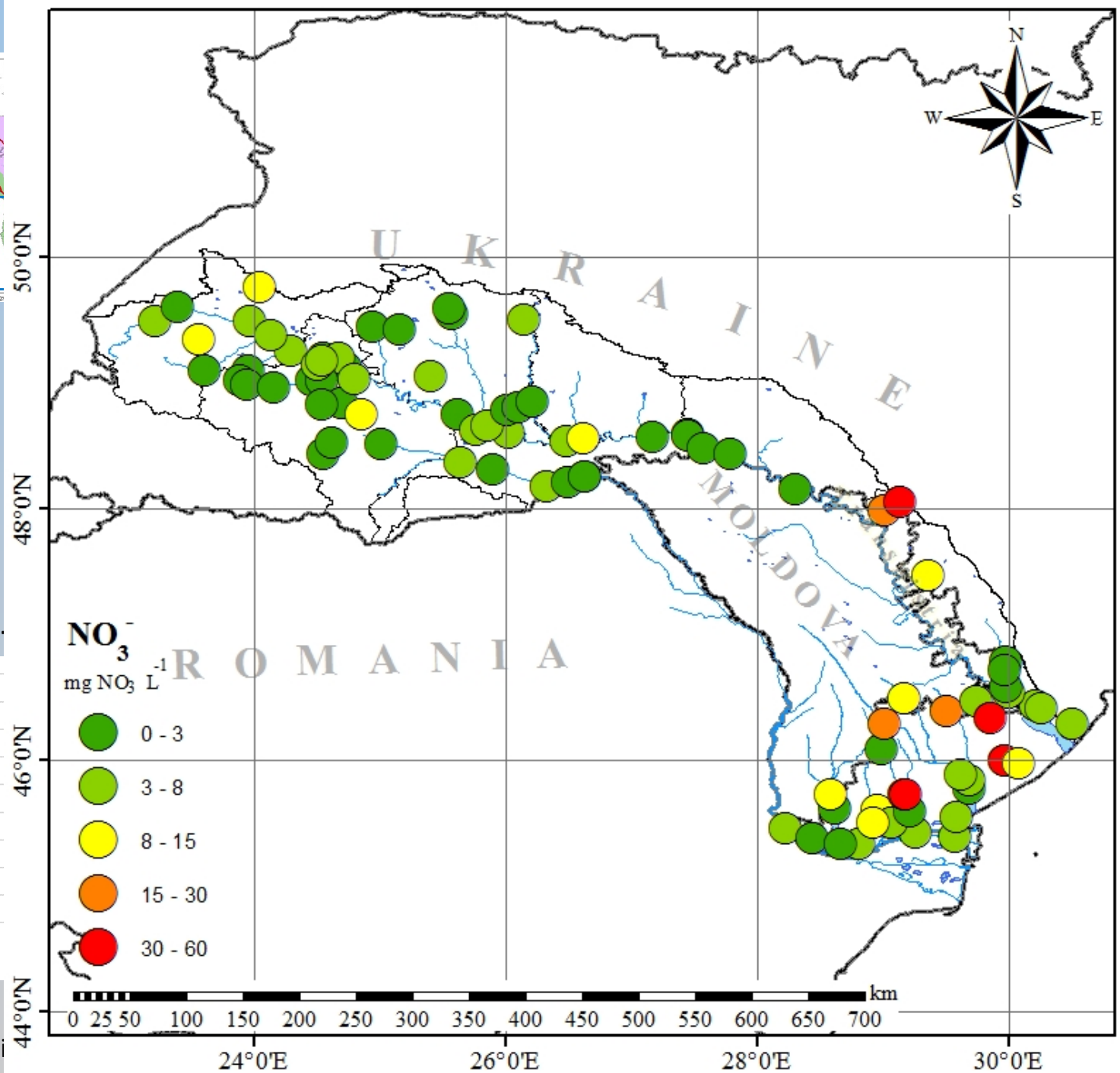
Wastewaters



Riverine N load

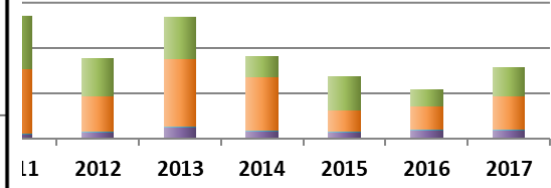


[Data source: Apele Moldovei]



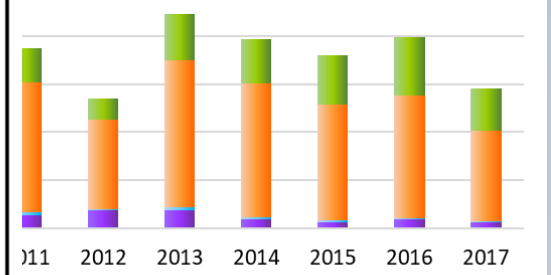
DNIESTER

Organic N NO3- NO2- NH4+



DANUBE

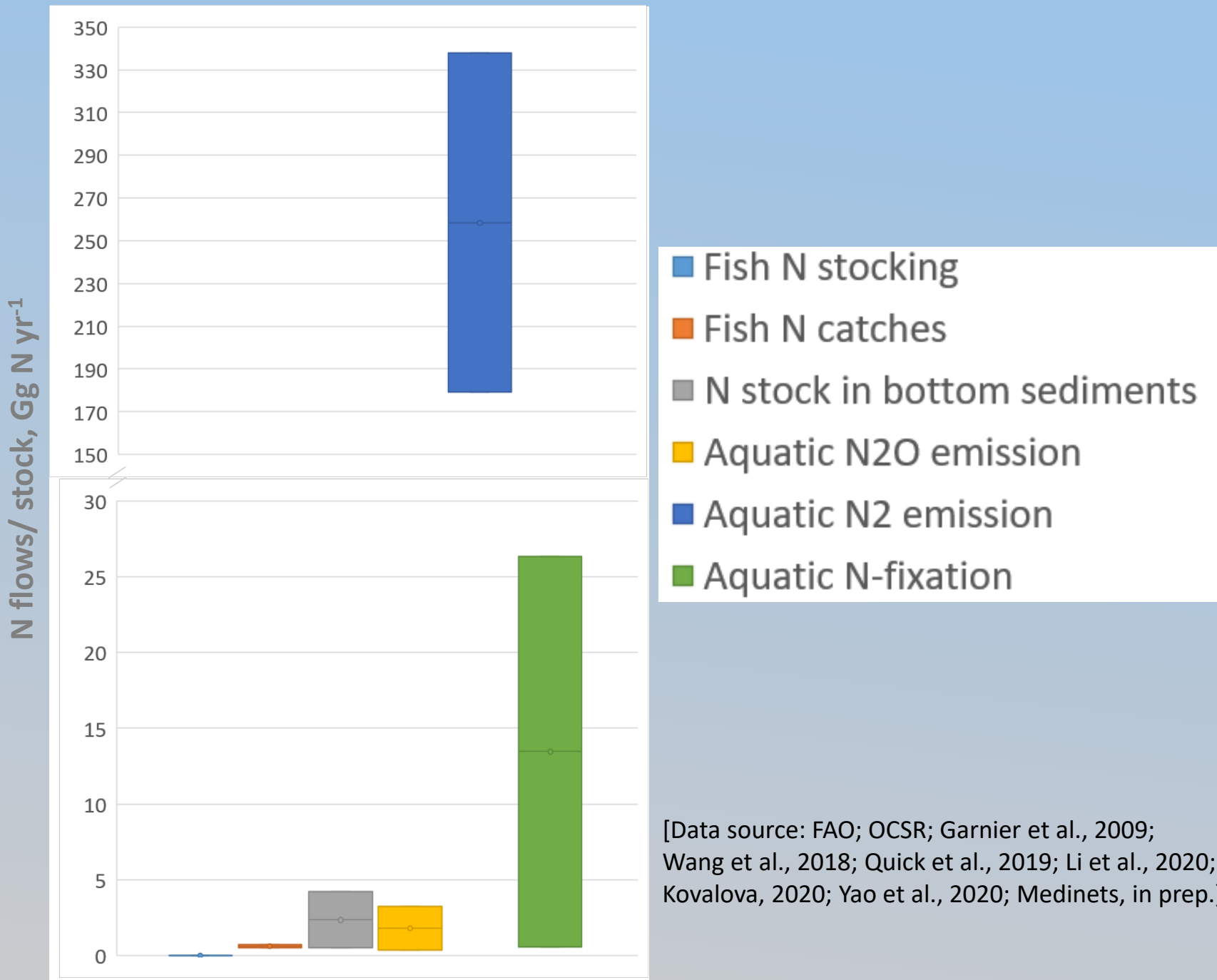
NH4+ NO2- NO3- Organic N

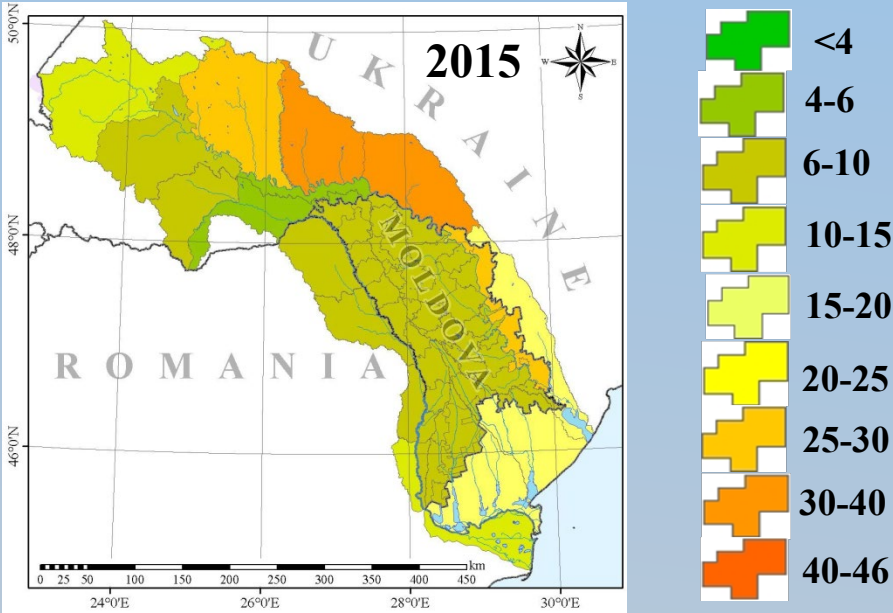


ep.]

Task 3.1.1-3.1.3

Aquatic N flows and stock



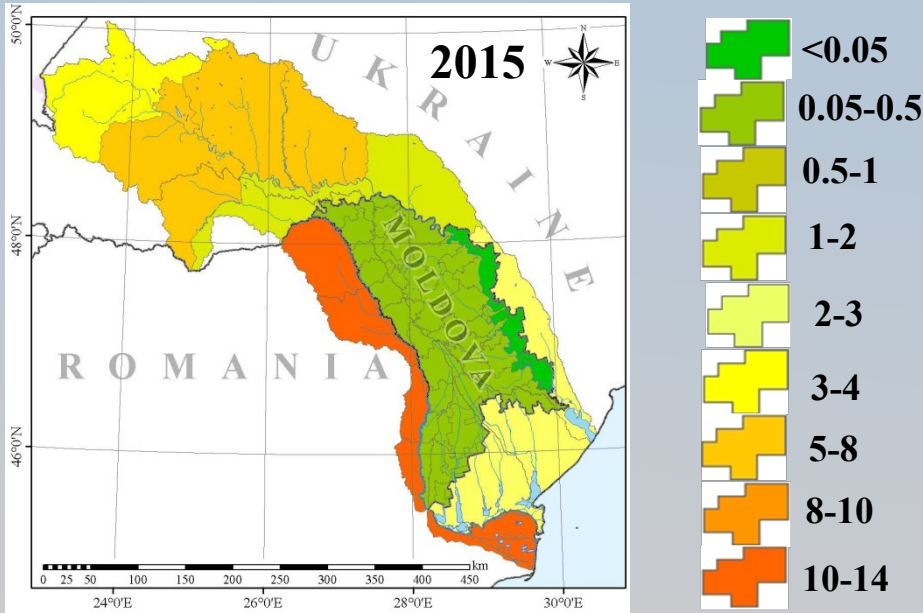


Country	Synthetic N fertlizer application in demo-region, kg N ha-1 y-1					
	per total area			per sowing area		
	2010	2015	2017	2010	2015	2017
MD	5,4	9,8	14,6	18,5	33,5	50,0
UA	13,8	19,0	26,9	39,3	41,8	57,4
RO	10,1	10,3	12,2			

N input with synthetic fertiliser: 190 Gg N y⁻¹
N input with organic fertilizer: 47 Gg N y⁻¹

Total N input with fertilisers in 2015: 237 Gg N y⁻¹

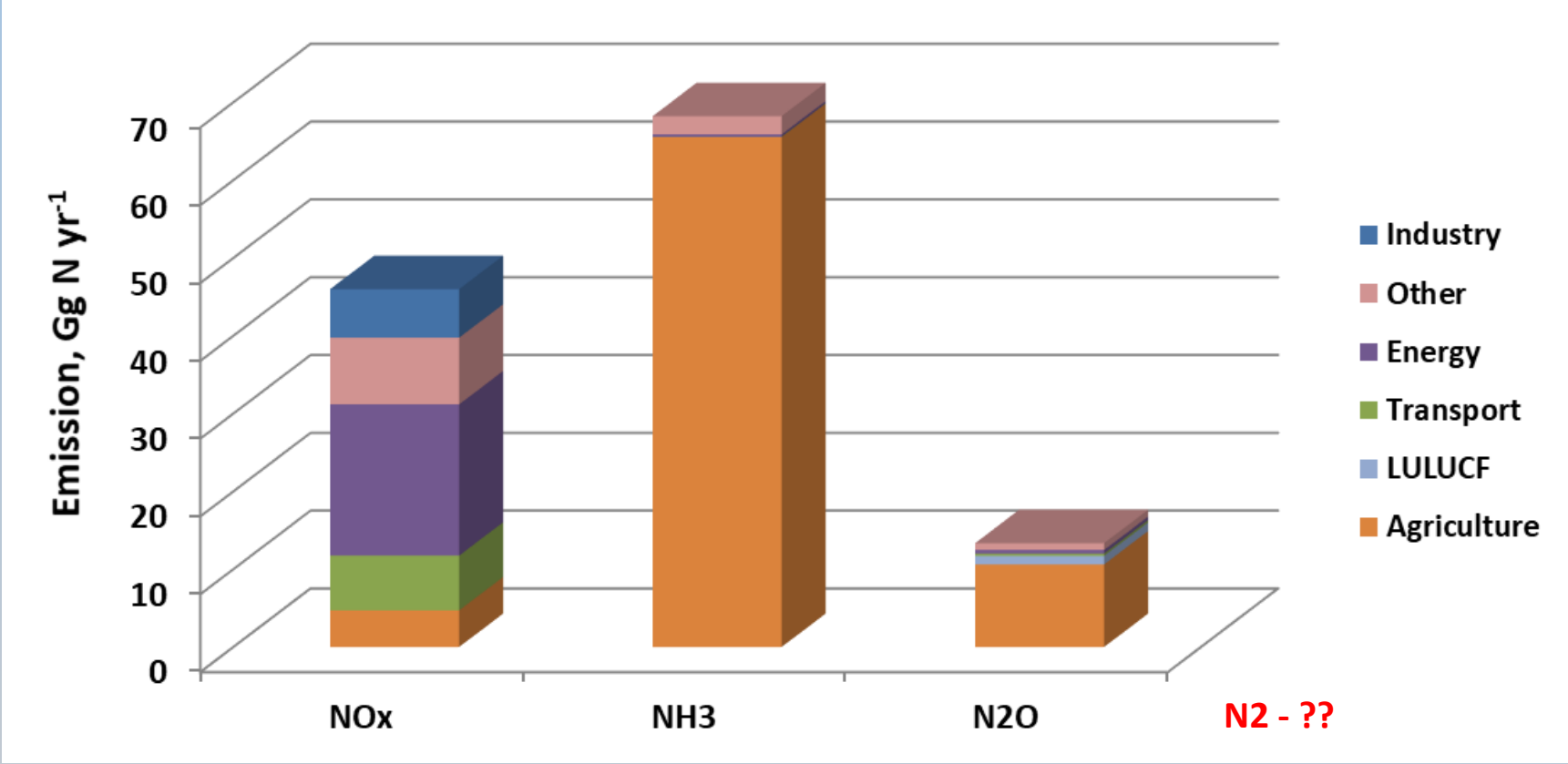
Organic fertilizer use per total area (kg N ha⁻¹)



Country	Organic fertlizer application in demo-region, kg N ha-1 y-1					
	per total area			per sowing area		
	2010	2015	2017	2010	2015	2017
MD	0,1	0,4		0,4	1,3	
UA	2,3	3,5	3,5	6,5	7,7	7,5
RO	13,5	13,5				

[Source: EuroStat; National statistics]

Emission of N_r from land-based sources
by sector within the EE demo region in 2015



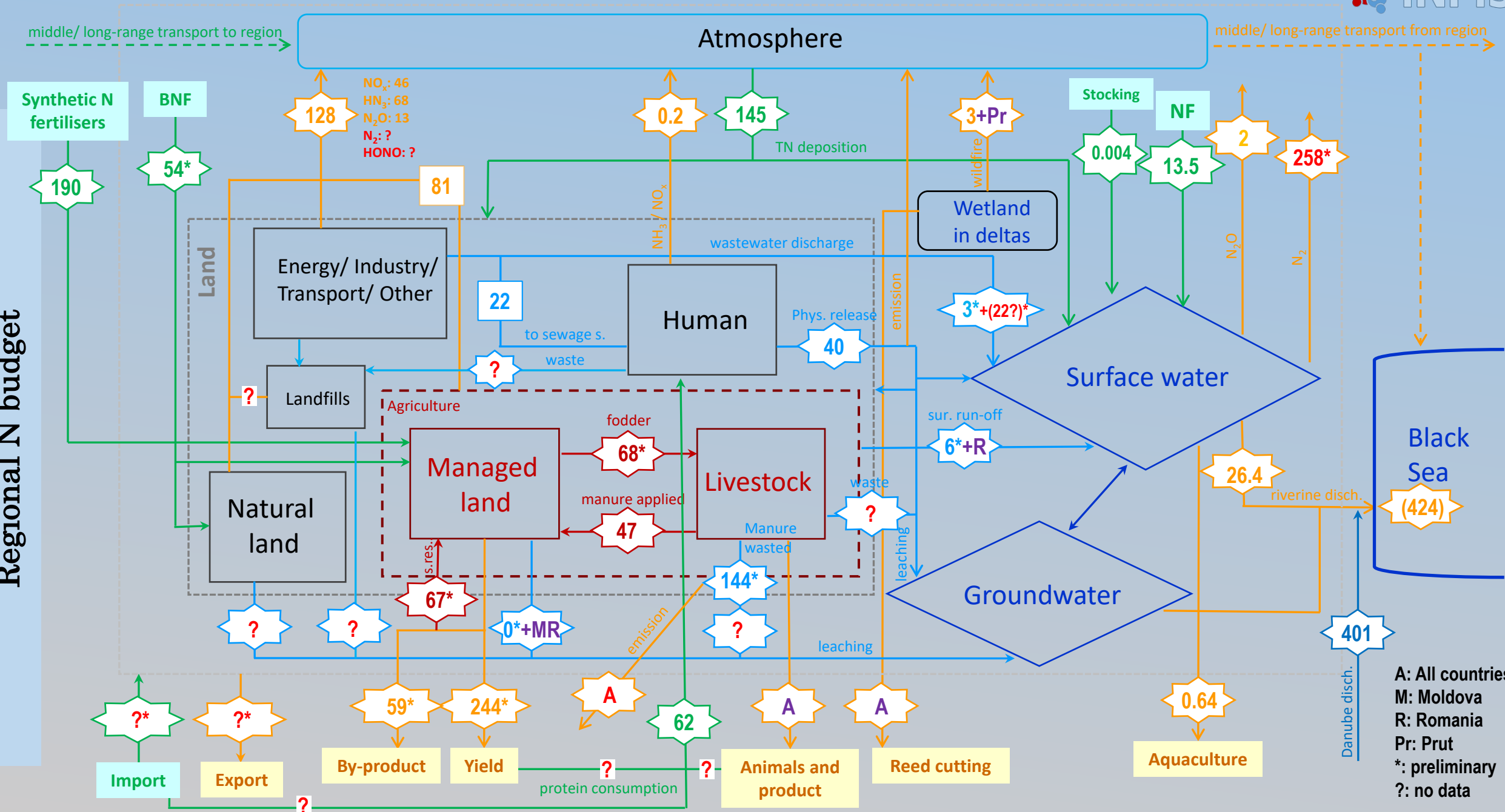
Total N losses to the atmosphere: 128 Gg N y⁻¹

Task 3.1.1-3.1.3

Conceptual scheme of N mass budget within the EE demo in 2015 (Gg N y⁻¹)



Regional N budget



Report on quantified N flows of major N source sectors in East Europe regional demonstration

Executive summary

1. Introduction

2. Methods

3. Agriculture

3.1. Crop husbandry

3.2. Animal husbandry

4. Energy

(5. Industry)

6. Transport

7. Natural/ semi-natural ecosystems (forest, steppe grassland, wetland)

8. Humans

9. Waste

10. Atmospheric deposition

11. Aquatic ecosystems

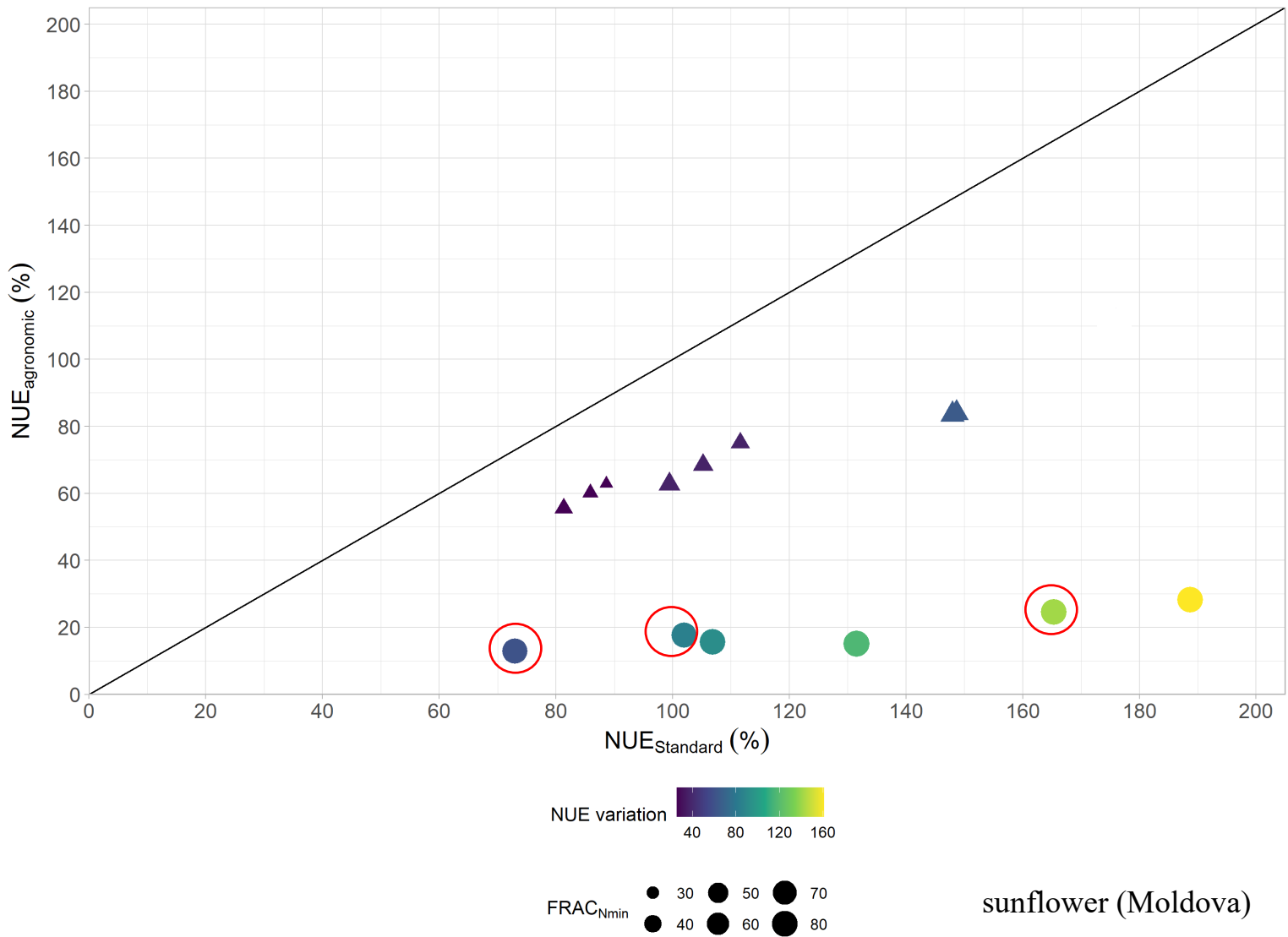
12. Interactions between N flows

13. Integrated N flows and conceptual pattern of N budget for the region

14. Conclusion, recommendations and further actions

Task 3.1.6 (feat. Task 1.1.3)

NUE_{standard} vs NUE_{agronomic} of
winter wheat (UA and MD) and sunflower rotations (MD)



$$NUE_{standard} = N_{out} / N_{inp} * 100$$

$$NUE_{agronomic} = (N_{out_fert} - N_{out_control}) / N_{inp} * 100$$

Cultivar (country)	N fert. applied, kg N ha ⁻¹
W. wheat (UA)	60-180
W. wheat (MD)	60-120
Sunflower (MD)	30-90

Source • Moldova (Boincean and Dent, 2020; Boincean, unpublished data) ▲ Ukraine (Burykina et al., in prep)

Task 3.1.6

	Agri- and budget indicators	Relevance to EE demo/ Tendency
	N uptake (crop yield)	+/ increase
	N input (fertilizer)	+/ increase
	N-mineralization/ SOM content	+/+ Increase/ depletion
	N surplus	+

	Environmental indicators and critical loads	Relevance to EE demo/ Tendency or parameter
	Land cover/ use change (deforestation)	+/ increase
	N deposition/ Nr emission (NH3, NOx)	+/ critical load
	Air quality (trop. O3, PM2.5)	+/ MAC
	Water quality (TN=?; NH4+=0.50 mg L ⁻¹ ; NO3-=50 mg L ⁻¹)	+/ EQS
	Wastewater discharges (TN=10-15 mg N L ⁻¹)	+/ MAC/ critical load
	Access to sewage system (% of households ??)	+
	Eutrophication (TRIX, NEAT, GES)	+/ multi-parametrical

Task 3.1.8 coupled with A1.6 ‘Barriers’

- chapters reviewing
- case studies providing
- questionnaires translations and dissemination

Romanian: https://docs.google.com/forms/d/e/1FAIpQLSfkP8EYh_w-ID0wQNJQ8yjQSGBSaaloB65WCRPi7-vG7Bddwg/viewform?vc=0&c=0&w=1

English-Russian: <https://docs.google.com/forms/d/e/1FAIpQLSexAAIklDB4nTxqSp2a4lwDuZM2aPbSKmQjrrzXuJkzuG0gZQ/viewform>

Ukrainian: offline

Task 3.1.9 coupled with A2.4 ‘Scenarios’

- information/ data providing
- questionnaire filling in

Task 3.1.7 coupled with A2.3 ‘Good N practices/ measures’

- collaboration should be set up
- reviewing mitigation options/ better N management/ trade-offs for the region is planned



GEF/ UNEP TOWARDS INMS East Europe Regional Demonstration Workshop followed by Field Visit

May 29-30, 2019
Odesa, Ukraine

Suggestions, decisions and actions approved by the 1st workshop on East Europe Regional Demonstration within UNEP/GEF Towards INMS project

The participants agreed:

- 1) There is an urgent need to go forward on national N management coordination in Moldova and Ukraine considering experience of Romania that crosses domains and industries;
- 2) Support implementation of the UNEA-4 N-resolution by all three countries;
- 3) To emphasize the high significance of reactive N coming to the East Europe (EE) region via water and atmospheric inputs. Also countries should work together by improving the interregional cooperation to address challenges;
- 4) To focus future efforts to address key gaps and knowledge (contribution of natural sources and impact on biodiversity, different N forms, seasonality, interregional impact such as long-range transport etc.);
- 5) To welcome the presentations and information presented during the workshop and to consider the possibility to unify the approaches for collection and assessment of N-relevant reporting within the EE demo region for future, *inter alia*, to recommend all countries within the EE demo to pay more attention to direct and indirect determination of organic N in environment (especially concentration in waters and content in atmosphere deposition). Ideally, organic N should be included into governmental (national) monitoring programs in Ukraine and Moldova. More globally it is highly recommended to estimate share of organic N deposited from the atmosphere;
- 6) To promote the establishment of International N Initiative (INI) Regional hub for the Black Sea area under umbrella of the Black Sea Commission (BSC) and the EU Horizon 2030 Program for more tight coordination between the Black Sea Basin countries on nutrient problems in order to improve science-policy dialogue and engagement of policy makers and stakeholders into the INMS process and to apply for joint proposals for funding in more efficient way.
As a first step, EE Demo network should be created within Towards INMS Project;
- 7) Also, we kindly request the Program Coordination Unit (PCU) of INMS Project to consider the possibility to publish regular INMS letters on the project progress and in-kind activities for both academia and stakeholders (public). This information might be mirrored in participating organization' websites and further promoted via social media;
- 8) To consider the utilization of all presented data in a proper way to produce synthesis analysis;

- 9) To highlight Delta region-specific problem of biological contamination because of fish-eating birds (cormorants and pelicans). This is of high relevance for National Parks (many of the Ramsar Convention and Natura2000 sites) located in deltaic regions in all three countries;
- 10) Recognized substantial uncertainty in NO_x emission from soil, which is currently poorly assessed, as well as need of better quantification of that source considering ongoing reductions in NO_x emissions from other ones;
- 11) Welcomed opportunities for further involvement of OSCE in terms of dialogue between policy-makers, academia and public;
- 12) Noted importance of involvement of NGOs and their contribution, need for further actions towards wider public awareness.



[INMS EEDemo, 2019]

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