

East Europe Regional Demonstration Progress Report

**Sergiy Medinets¹, Lidiya Moklyachuk², Oksana Butrym²,
Yevgen Gazyetov¹, Tatyana Pavlik¹, Katerina Utkina³, Volodymyr Medinets¹, Tommy Dalgaard⁴**



¹Regional Centre for Integrated Environmental Monitoring
ODESA NATIONAL I. I. MECHNIKOV UNIVERSITY
Odesa, Ukraine



²Ecotoxicology Department
INSTITUTE OF AGROECOLOGY and ENVIRONMENTAL MANAGEMENT of NAAS
Kyiv, Ukraine



³NGO NEW ENERGY
Kharkiv, Ukraine



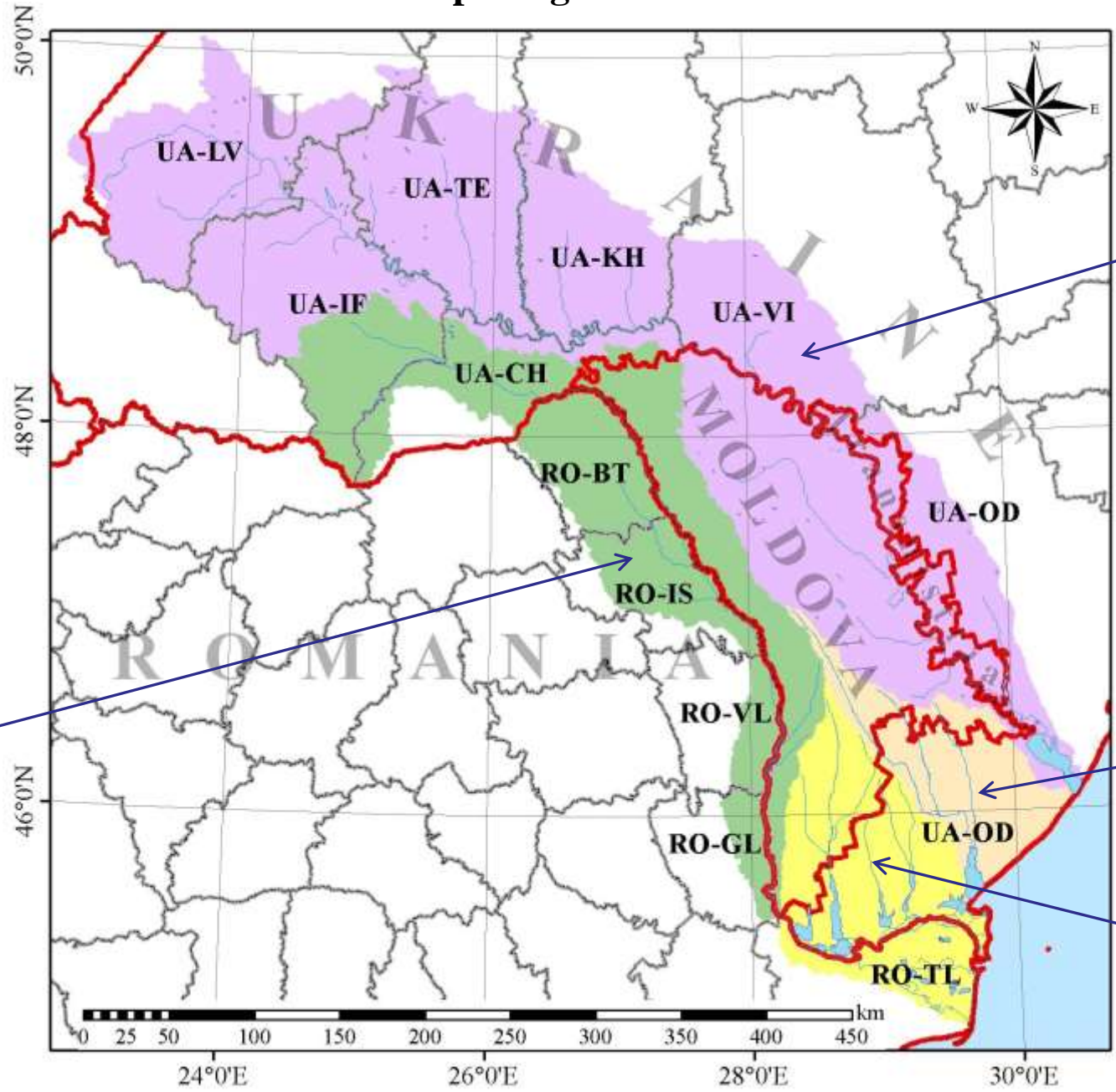
⁴Department of Agroecology - Agricultural Systems and Sustainability
AARHUS UNIVERSITY
Aarhus, Denmark

Location of East Europe Regional Demonstration in the Black Sea basin



East Europe Regional Demonstration

Introduction



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

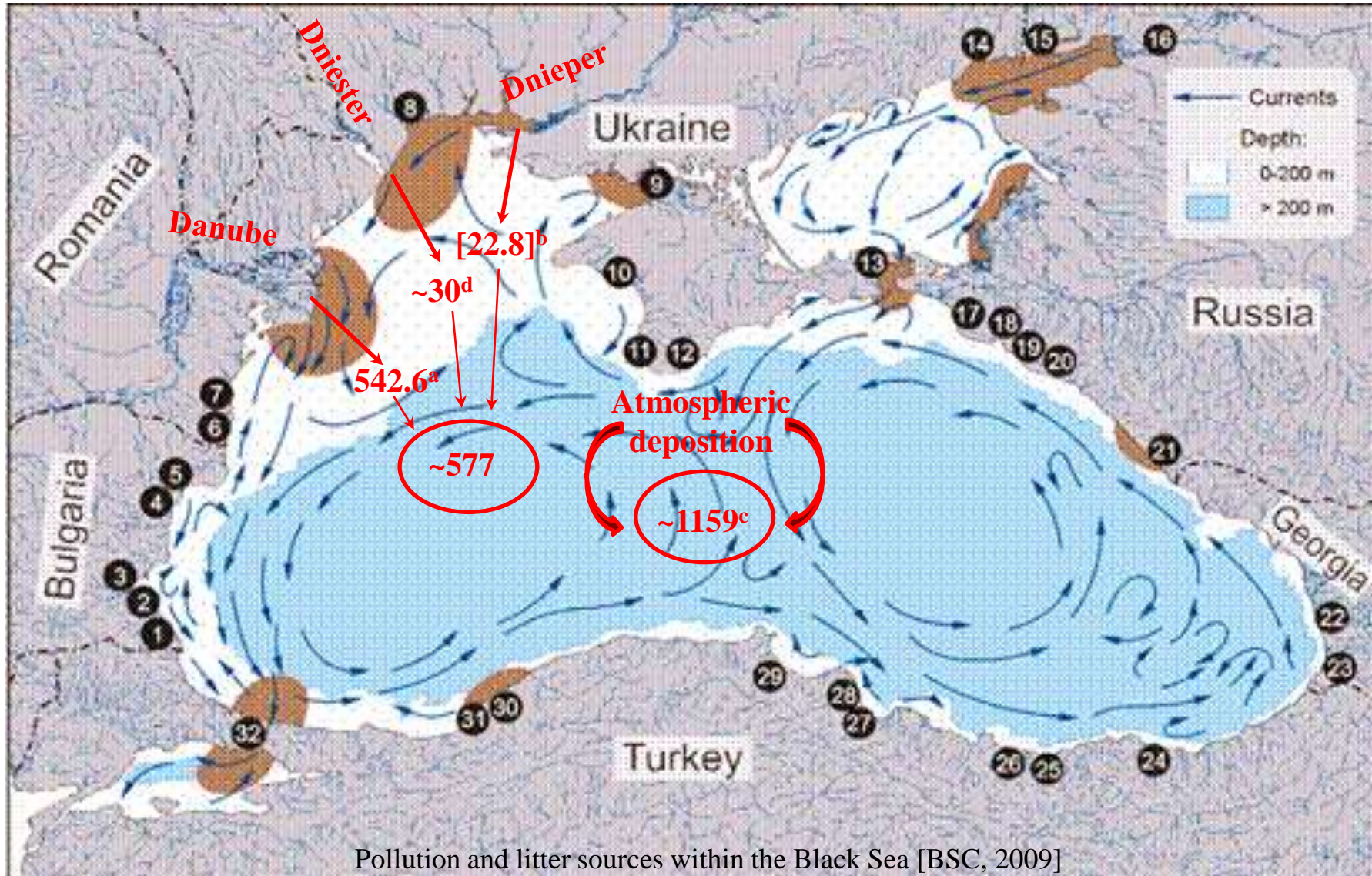
Prut Catchment
 Length: 967 km
 Basin area: 27 540 km²

Interfluvial Area

Danube Delta

Riverine and atmospheric total N input (Gg N y^{-1}) to the Black Sea

[^aTDA, 2007 and Oguz *et al.*, 2008; ^bBSEP, 1999 and UNDP, 2003; ^cMedinets, 2014; ^dMedinets *et al.*, 2015]



Pollution and litter sources within the Black Sea [BSC, 2009]

To reduce the negative impact of N_r on ecosystems and improve understanding of the global N cycle

All N flows will be considered to quantify sources, paths and sinks

Benefits and threats related to N will be identified

Recommendations will be developed

to reduce nutrient losses/ improve N management for range of stakeholders including governmental organizations, private sector, academia, civil society organizations and UN agencies

to update current national legislation (in Ukraine and Moldova) in line with the EU Directives;
to amend transnational agreements related to nutrient management and environment protection



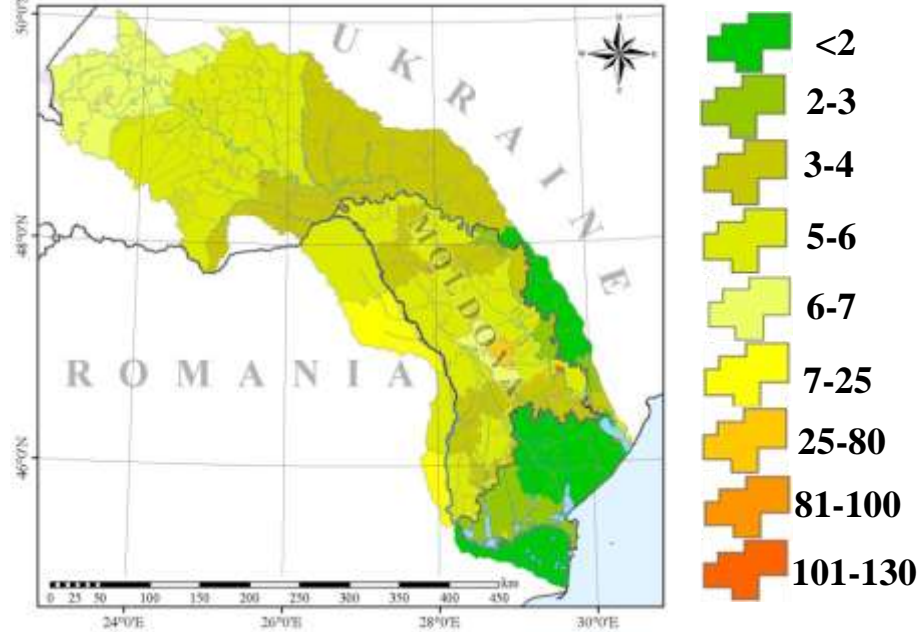
Sources: National Statistics / EuroStats/ Environmental agencies
Project reports/ peer-review papers
CEIP/ CLRTAP EMEP
EDGAR
National GHG Cadasters/ UNFCCC
FAO/ GRDC
BSC/ ICPDR

Scale: District (NUTS 3; where available)
Macroregion (NUTS 2; where available)
State

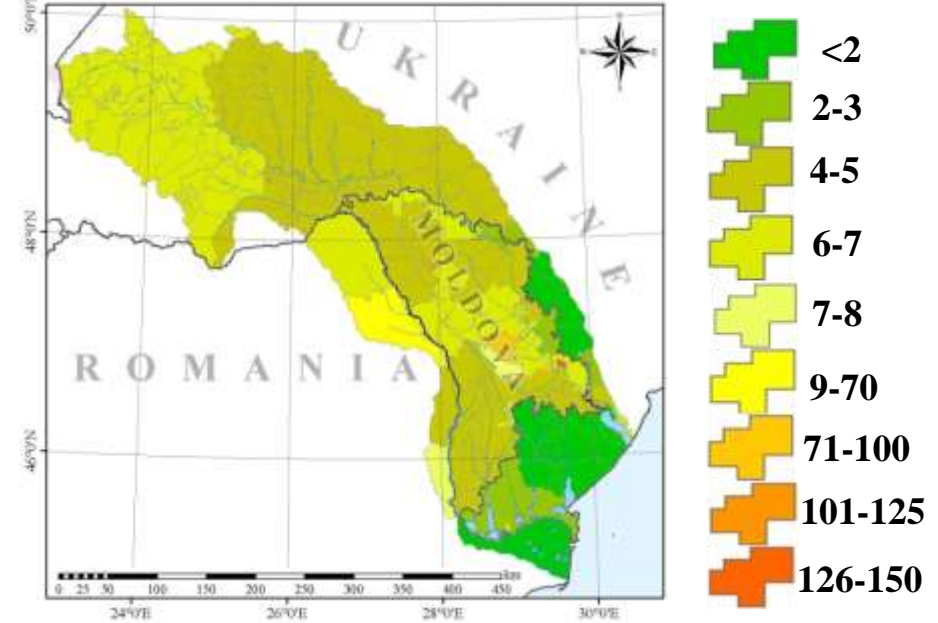
Period: 2013-2017 (studied years) with 2015 (as target year)
2010 (check-point year; where available)
2005 (base year; where available)

Human population

**Consumption of N (via proteins)
by human population in 2015 (kg N ha⁻¹)**



**Direct physiological N release
from human population in 2015 (kg N ha⁻¹)**



Mean N consumption:

5.2 kg N cap⁻¹ yr⁻¹ (88 g protein cap⁻¹ d⁻¹) [this study]

Recommended N consumption: 2.9-3.5 kg N cap⁻¹ yr⁻¹ (50-60 g protein cap⁻¹ d⁻¹) [WHO, 2007]

Estimated mean N release:

5.6 kg N cap⁻¹ yr⁻¹ (range: 4.3 – 6.8 kg N cap⁻¹ yr⁻¹) [this study]

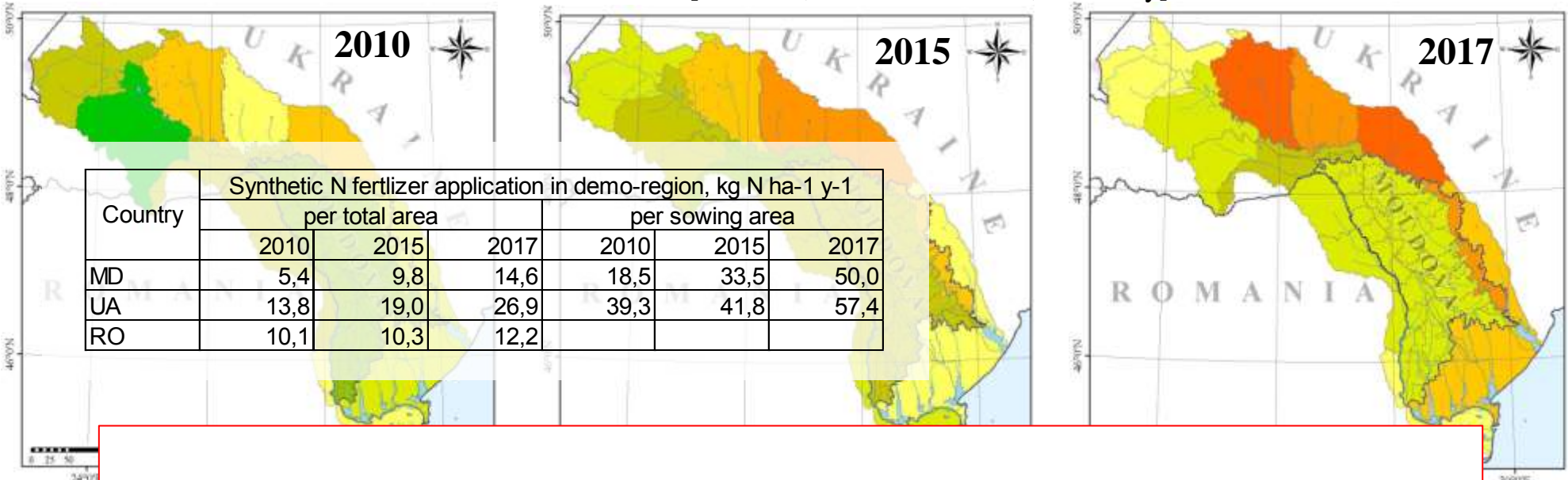
Mean N excretion:

4.7 kg N cap⁻¹ yr⁻¹ [Rose et al., 2015]

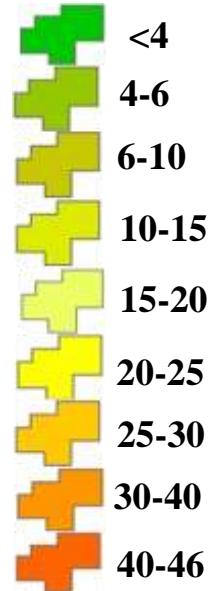
N input from human population (lacking sewage treatment system): 33 Gg N y⁻¹

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

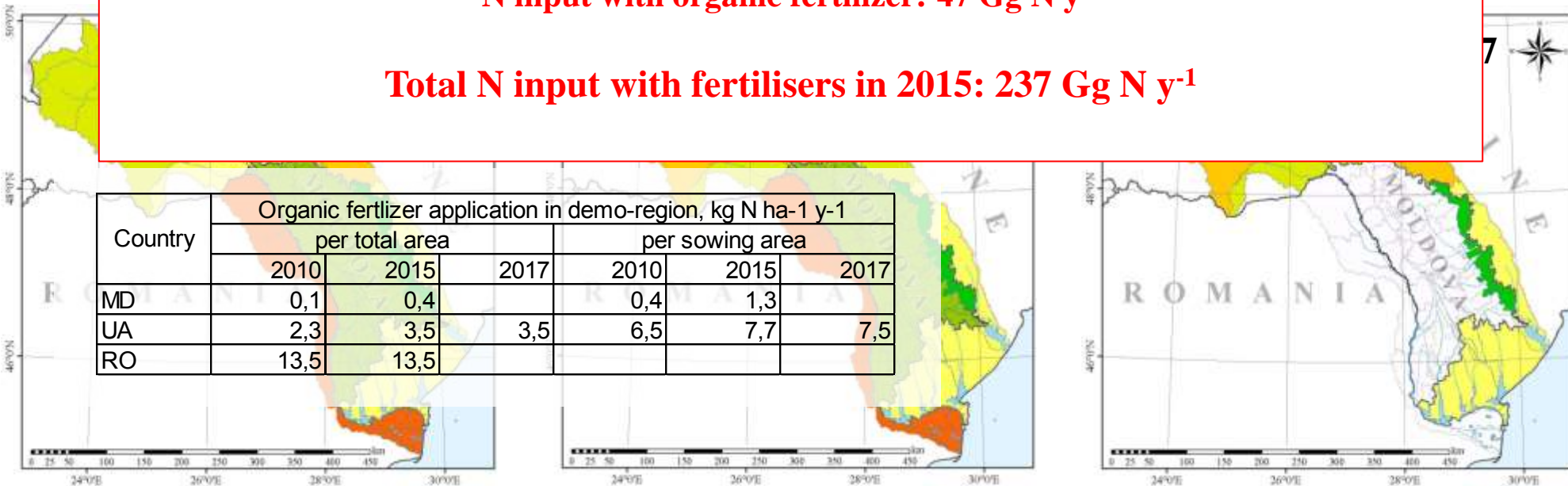
[EuroStat; National statistics; this study]



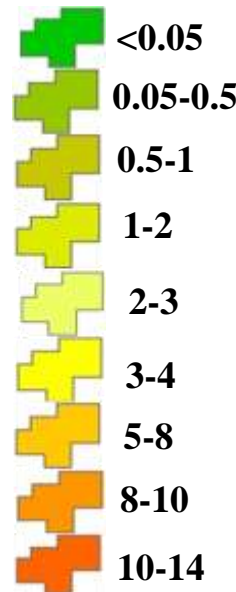
Country	Synthetic N fertilizer application in demo-region, kg N ha ⁻¹ y ⁻¹					
	per total area			per sowing area		
	2010	2015	2017	2010	2015	2017
MD	5,4	9,8	14,6	18,5	33,5	50,0
UA	13,8	19,0	26,9	39,3	41,8	57,4
RO	10,1	10,3	12,2			



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



Country	Organic fertilizer 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				



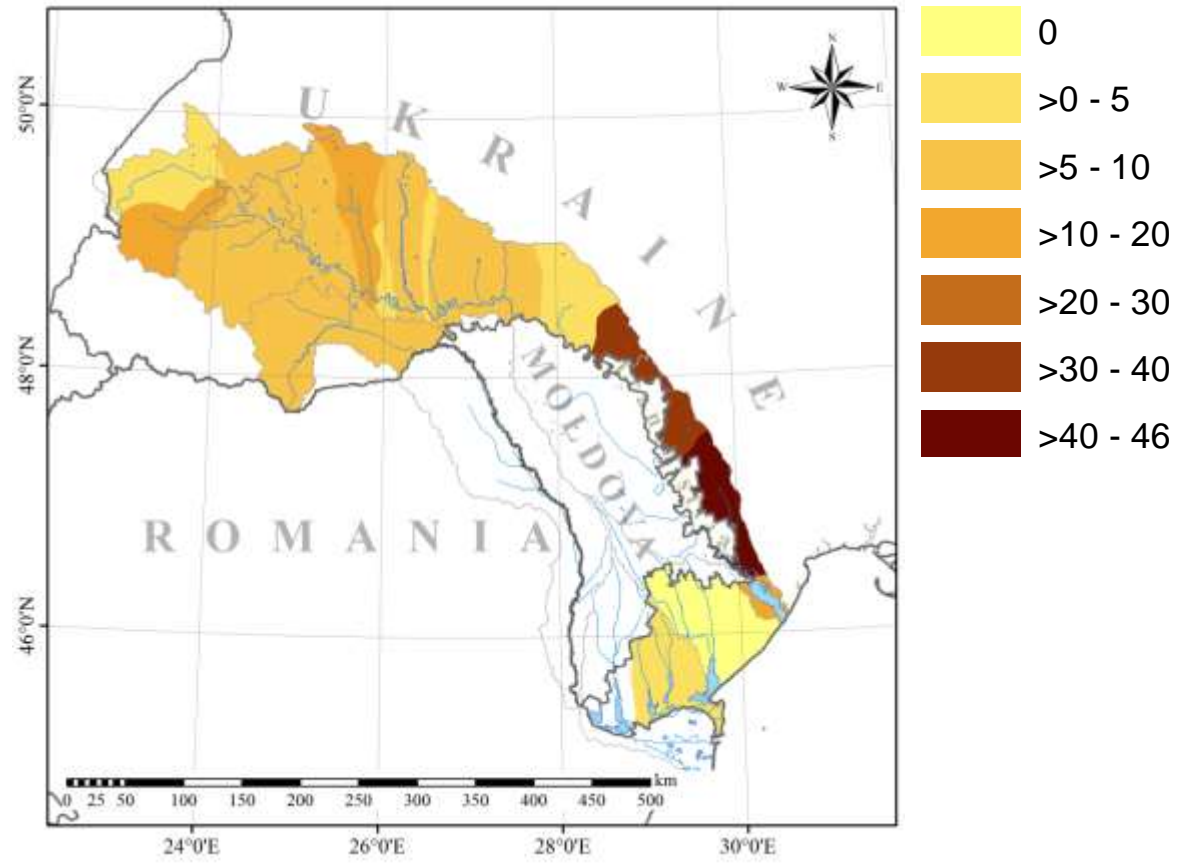
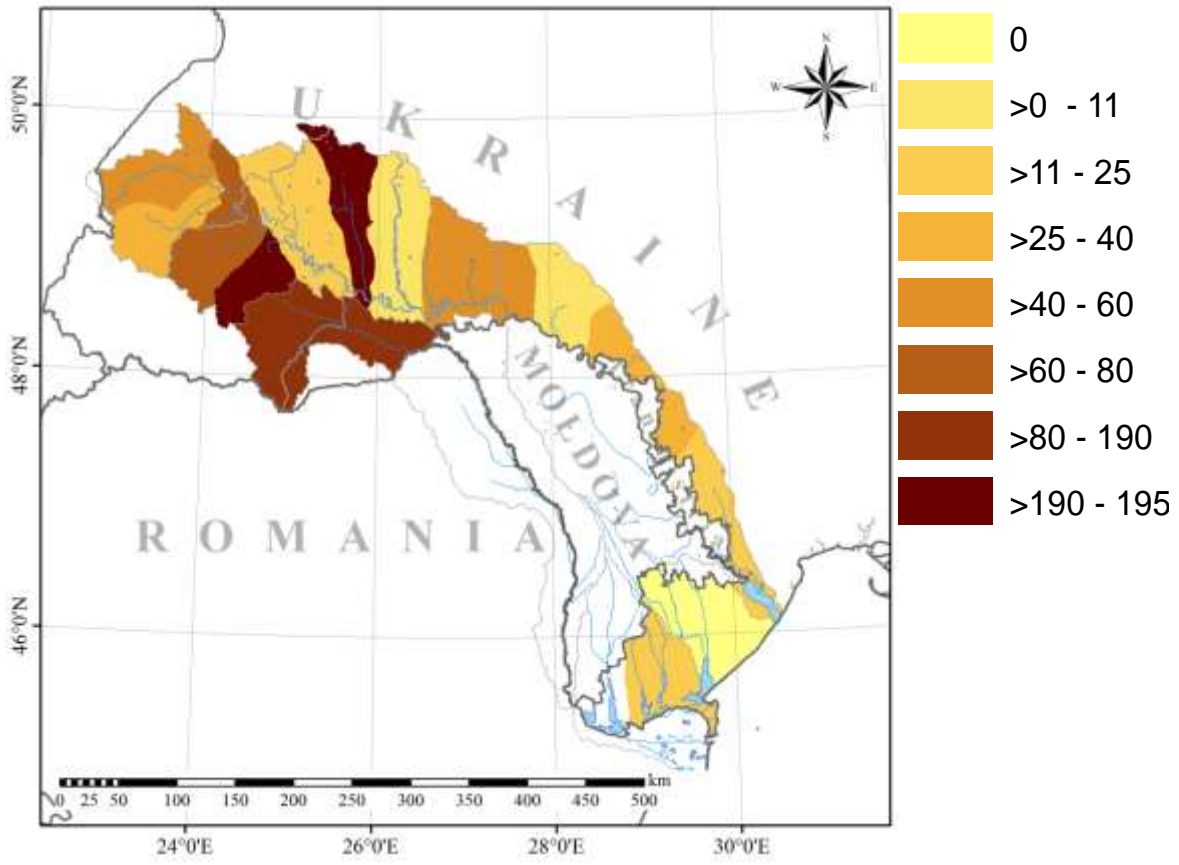
Flows quantification

Wastewater

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

DIN concentration in wastewaters in 2015 (mg N L⁻¹)

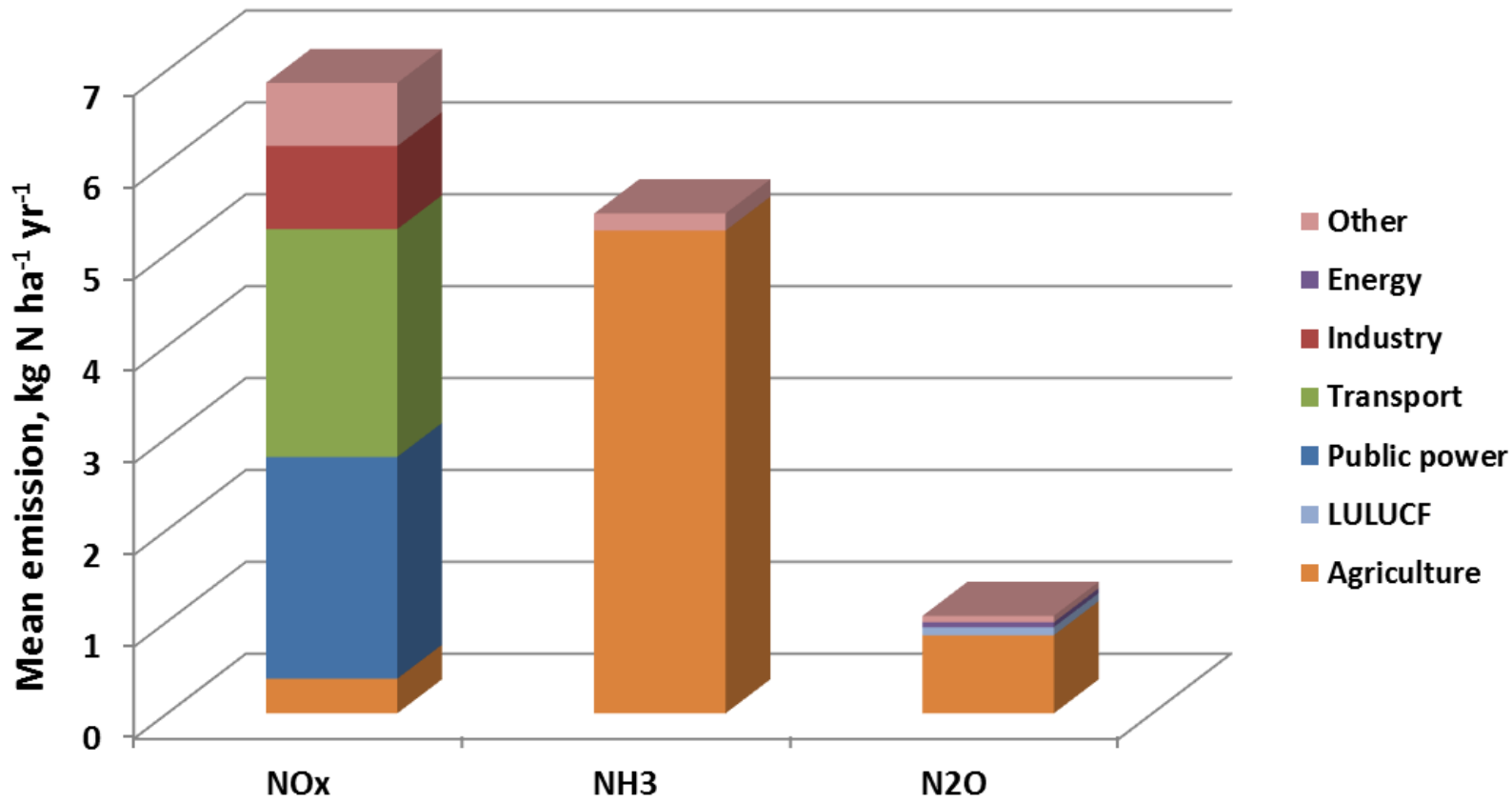
Flows quantification



Total DIN discharged with wastewaters: 0.7 Gg N y⁻¹
(Ukrainian part of the demo)

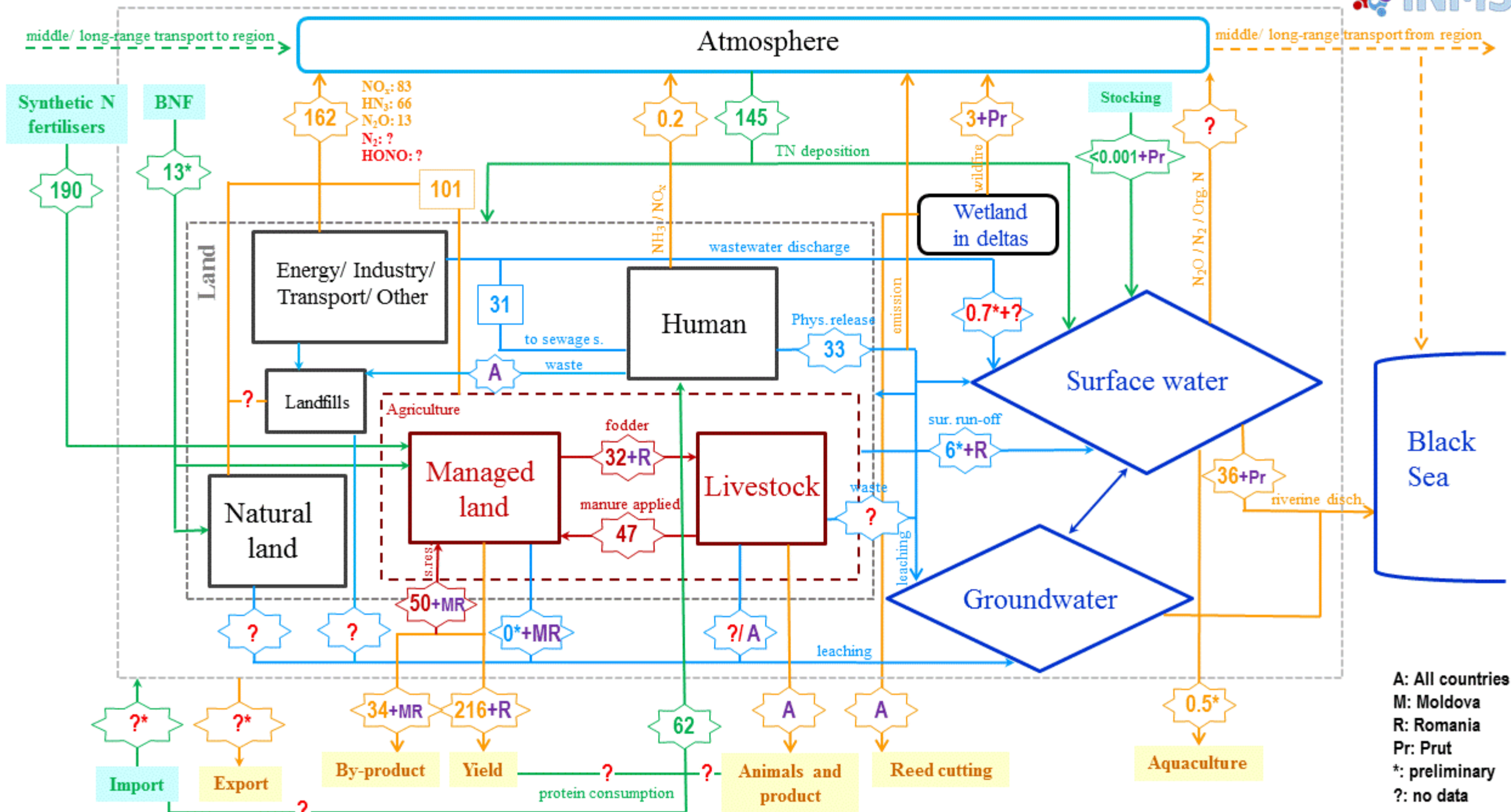
Flows quantification

Mean weighted N-gas emission by source sector from the EE demo region in 2015



Total N losses to the atmosphere: 162 Gg N y⁻¹

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



Key N flows identified for the EE region

- Synthetic N fertilizer application
- Atmospheric total N deposition (local and as results of middle/ long-range transport)
- N removal with agricultural products
- NH₃ emission from agriculture
- NO_x emission from transport and public power (and agriculture in rural areas)
- N removal via surface/ underground waters to the Black sea
- Untreated/ insufficiently treated wastewater from industrial, municipal and household sources (esp. direct physiological N release from human population)

Key N gaps/ uncertainties in the EE region

- Insufficient statistics data at district scale (NUTS 3)/ lack of case studies
- Direct N load by human population in rural areas with no sanitation [uncertain]
- NH₃ emission from agriculture in Ukraine (incl. manure cycle) [uncertain]
- NO_x emission from agricultural and other soils [uncertain]
- HONO emission from agricultural and other soils [no data]
- N₂ emission (via denitrification and anammox) [no data]
- NO₃⁻ leaching [uncertain/ no specific data]
- Surface N run-off [uncertain/ no specific data]
- Wastewaters [not sufficient data] and Landfills [no data/ impact is unclear]
- Wetland impact (incl. wildfires/ burnings) [limited data]
- Wildfires [no/ limited data]



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:

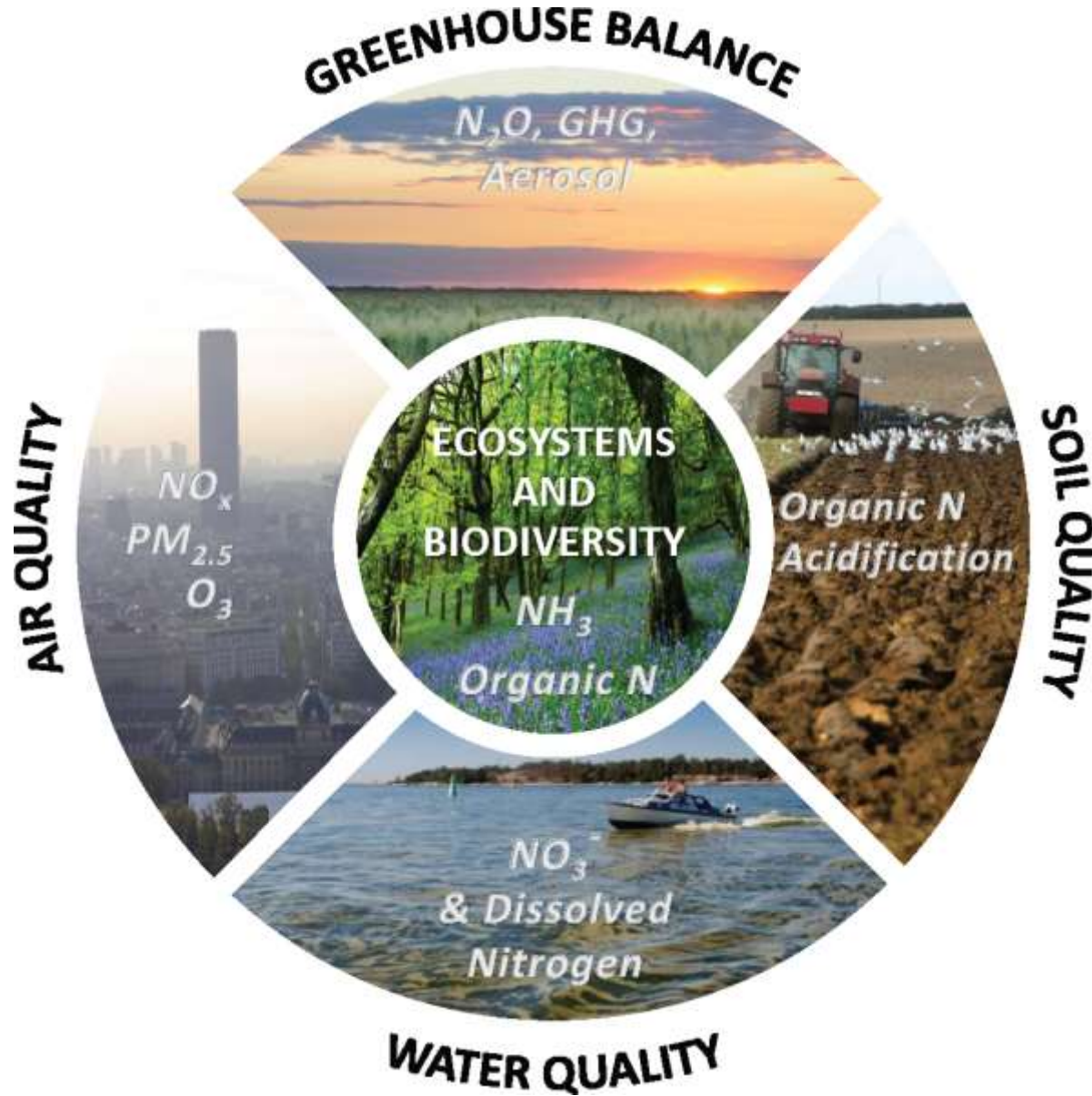
- 1) There is an urgent need to go forward on national N management coordination in Moldova and Ukraine considering experience of Romania that crosses domains and industries;
- 2) Support implementation of the UNEA-4 N-resolution by all three countries;
- 3) To emphasize the high significance of reactive 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]

Impacts



Water quality

Air quality

Greenhouse gas balance

Ecosystem and biodiversity

Soil quality

Contacts:

East Europe Regional Demonstration office

hosted by Odesa National I. I. Mechnikov University (ONU)

Odesa, Ukraine

e-mail: EEEDemo.INMS@onu.edu.ua

tel: +380487230120

Dr. Sergiy Medinets

ONU

Odesa, Ukraine

e-mail: s.medinets@gmail.com

Prof. Lidiya Moklyachuk

IAEM

Kyiv, Ukraine

e-mail: moklyachuk@ukr.net

