

Land Use/Cover Change Different Spatial Level Study: Cognitive and Practical Value

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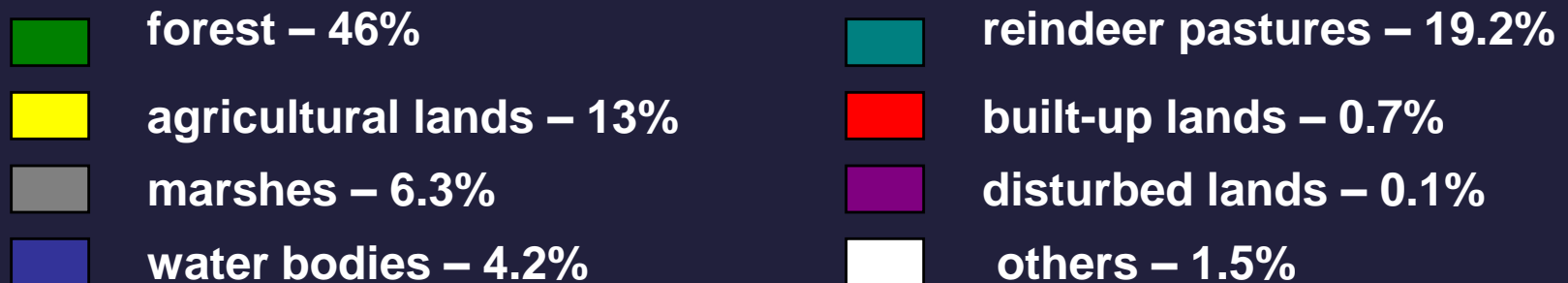
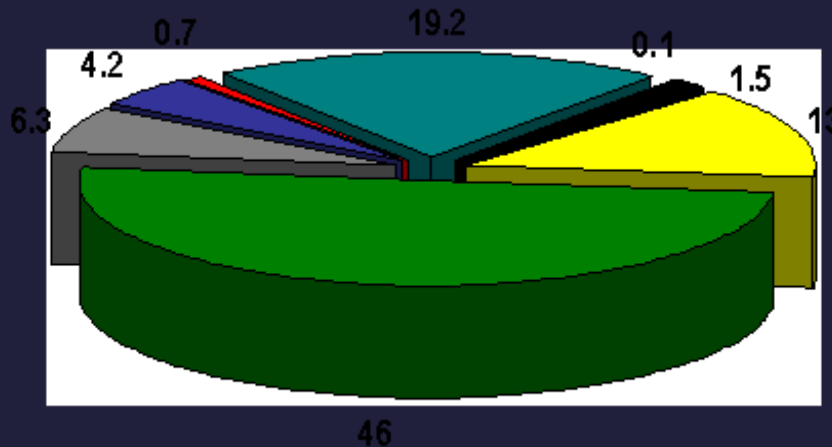
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The structure of lands in Russia (total area 1720,8 mln ha) has significant geographical diversity : from tundra at the north to semi-desert areas at the south



Current Land Cover structure in Russia

Russia has a very rich natural agricultural capacity and a large internal market. Agricultural lands occupy 13%, including 40% of arable lands



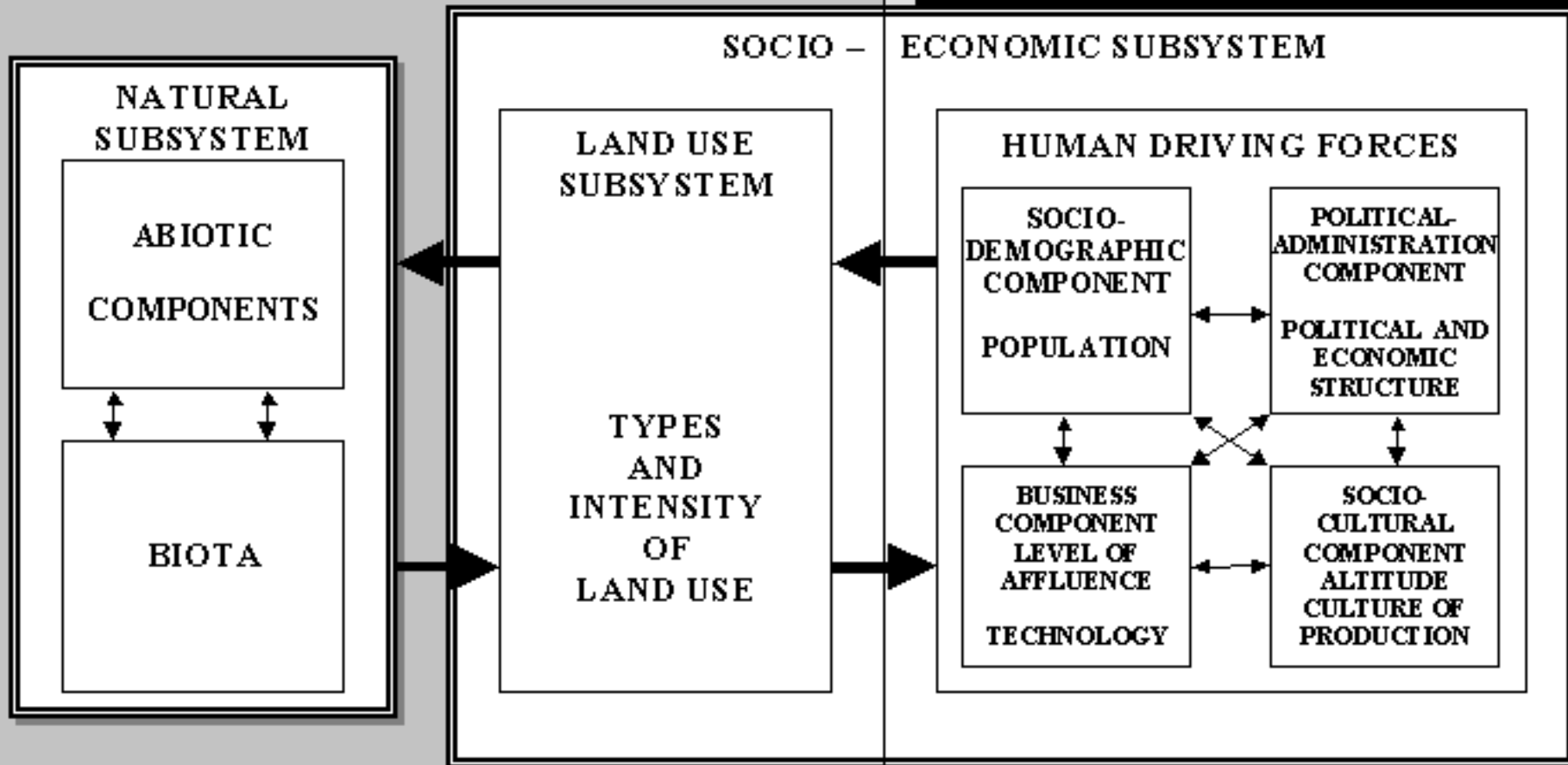
Land use by natural zones

	Mln ha	%	Forested Areas	Agricultural Lands
Middle Taiga	222,8	13,0	76,4	-
Southern Taiga	245,4	14,3	57,6	17,3
Forest- steppe	127,7	7,5	27,5	57,2
Steppe	79,9	4,7	-	73,3
Dry Steppe	22,2	1,3	-	85,5

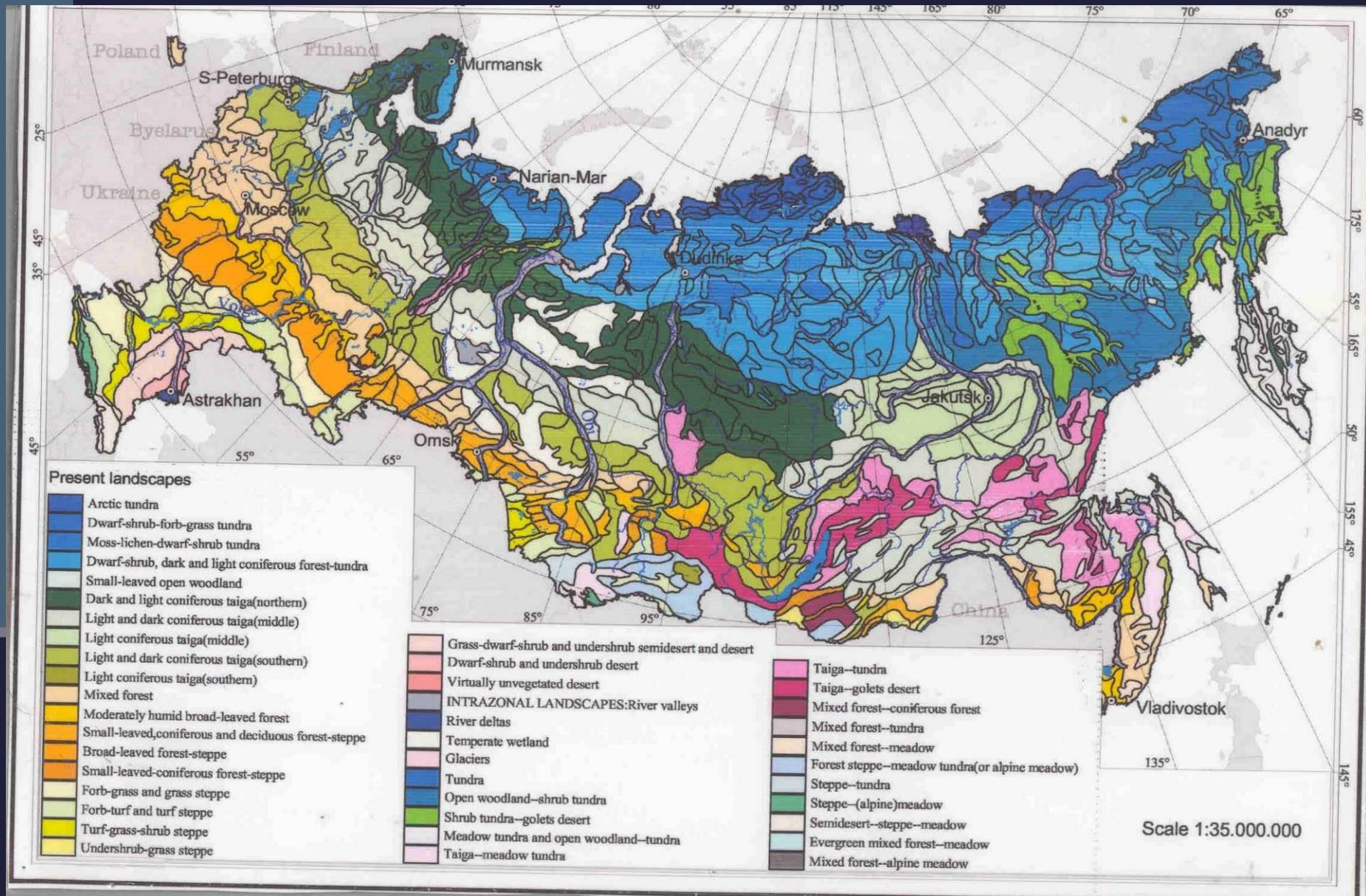
Present-Day (Contemporary) Landscapes (PDL) model

The notion *PDL* is very close synonym to the notion of 'land cover' accepted by IGBP-HDP Global Land Project and described as human-environmental system

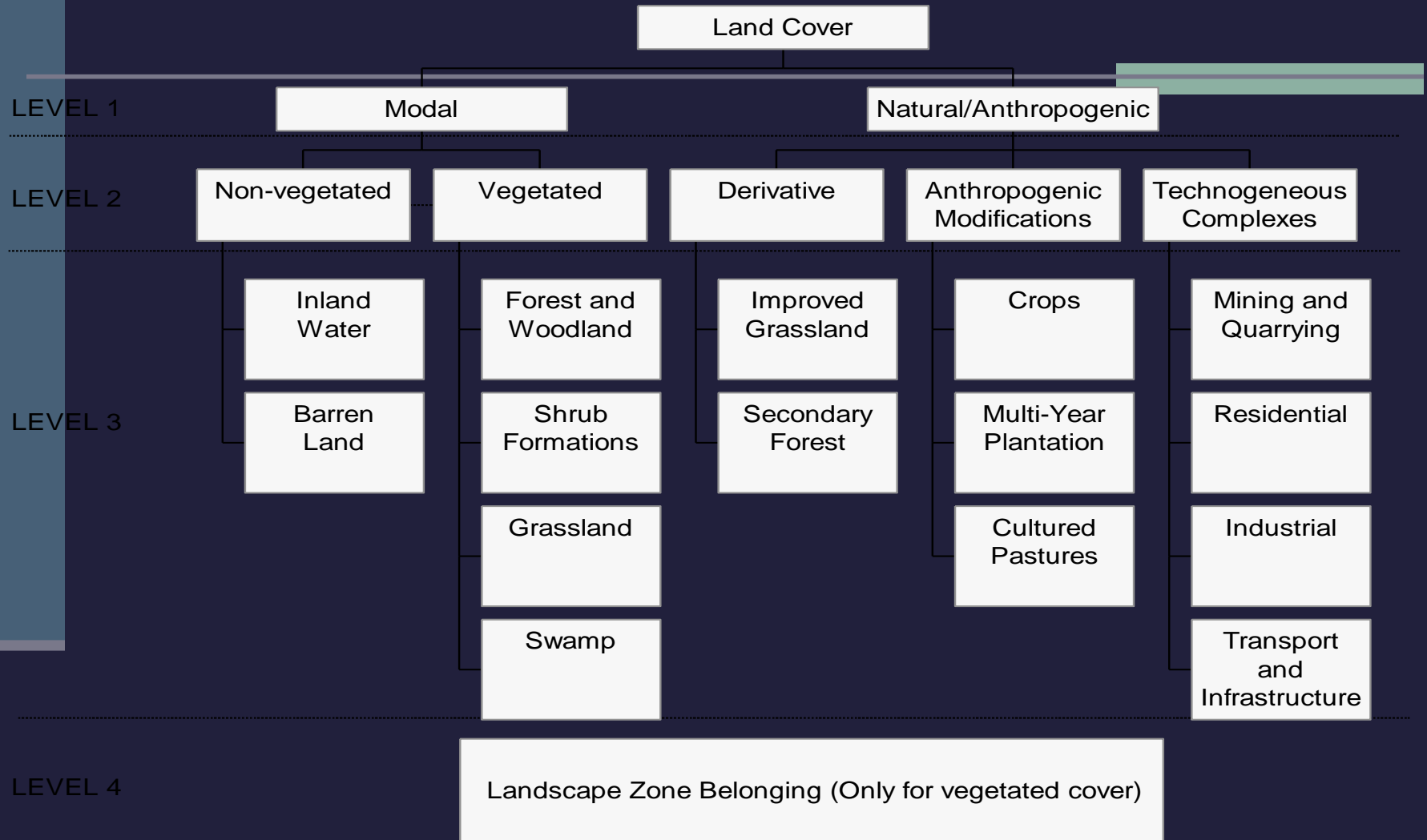
PRESENT-DAY LANDSCAPES



Natural basement (subsystem) of Landscapes defines the present Land Cover features



Land Cover degree of transformation for different level of investigation



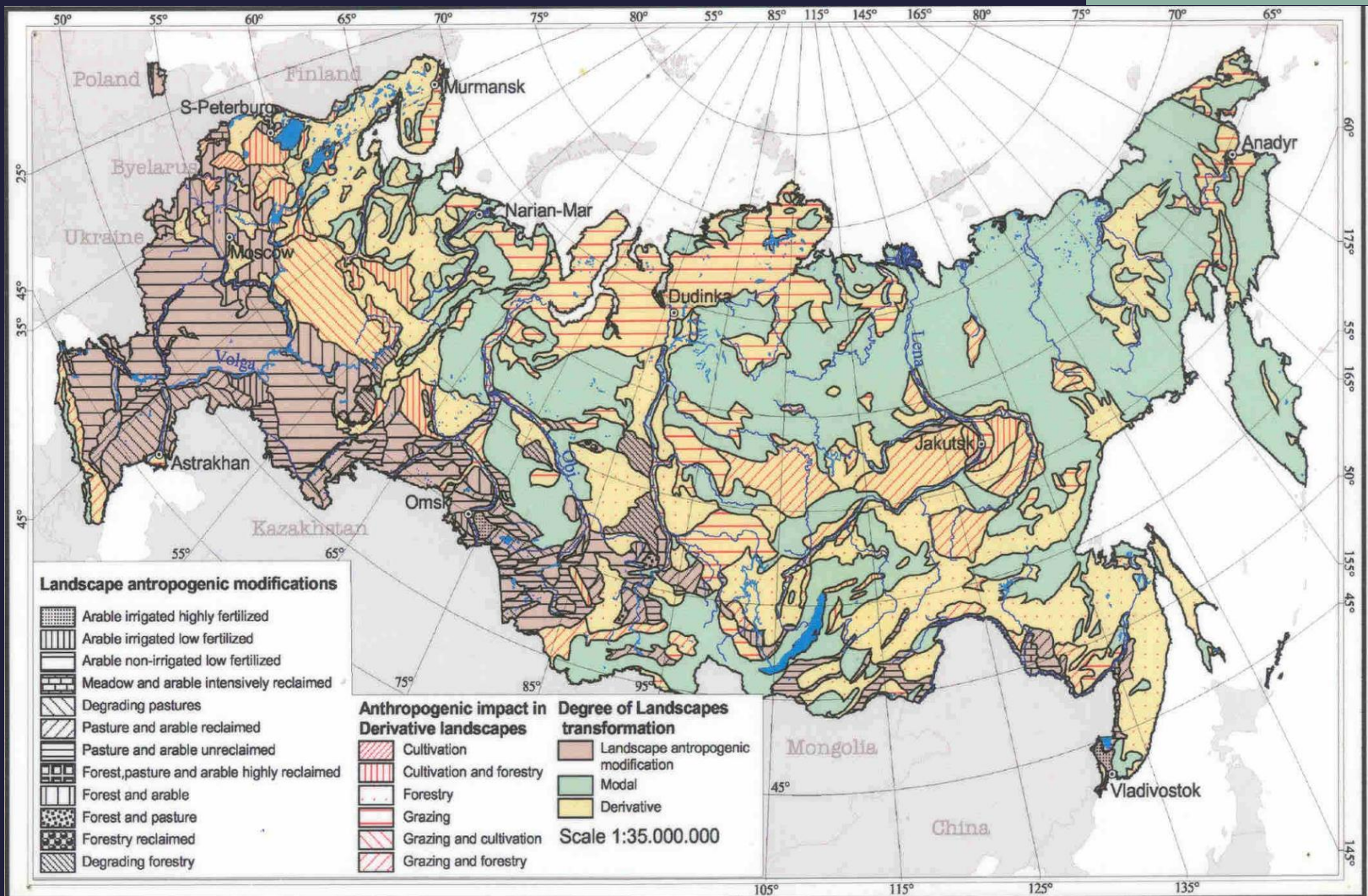
Present-day landscapes

(shown by colour and cross-hatching)

Modal landscapes correspond to main zonal type of landscape

Derivative landscapes with changed original vegetation type (secondary biotic successions, but there is no changes of the whole ecosystem structure)

Antropogenic modification with continuous influence of human activity



Geographical scaling is the important issue for LUCC evaluation

Scaling of LUCC investigations define:

- the degree of information details,
- resolution of remote sensing data,
- methodology of classification & mapping

LUCC study in Russia are done at different scales:

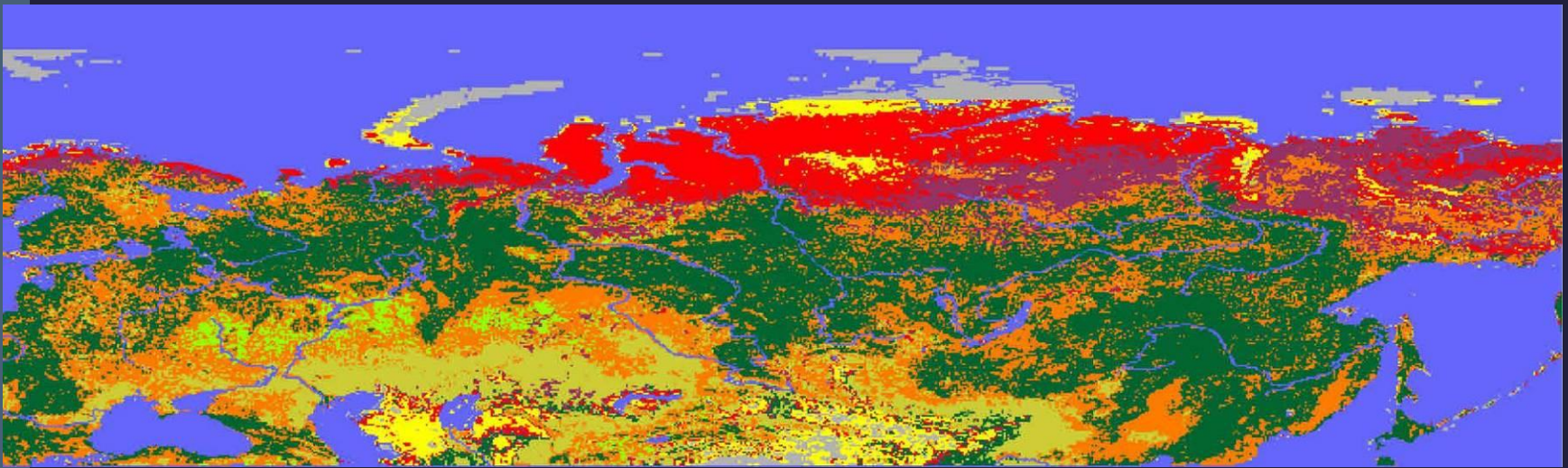
macroregional - for the whole Russia,

regional – EPR, Siberia

local large-scale – case studies

Land Cover Classification (Macroregional Level)

Present-day landscapes were stratified for the whole territory of Russia and contiguous border territories on the base of 10-km resolution AVHRR images and NDVI data (info on vegetation biomass and seasonal dynamics- not only about floristic features). It allowed to find some discrepancy with traditional maps (ex.- for steppe zone areas of intensive irrigation in N.Caucasus were differentiated from more dry steppe regions in Volga & West Siberia)



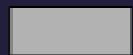
desert



shrubland



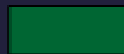
water



error data



forested shrubland



forest



forested grassland



grassland

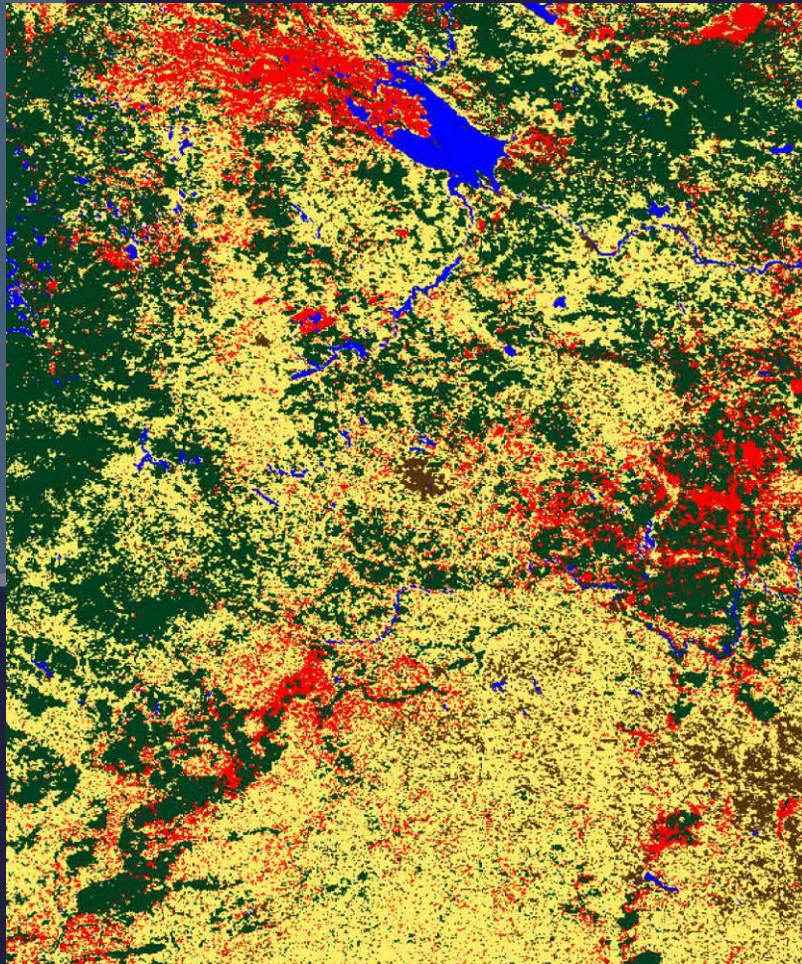


not agreed

Land Cover Classification (Regional level)

2 territories were studied (Central European Russia and Middle Volga region) on the base of 1-km seasonal vegetation activity (NDVI) data from AVHRR.

NDVI value for different seasons (phenological stages) were used instead of different zones of spectrum for the single moment of time that allowed to distinguish seasonal landscapes dynamics, moistening and draining conditions



LEGEND



Wet poorly drained mostly coniferous forests and agricultural lands



Dry well drained secondary deciduous forests



Dry well drained agricultural lands



Low-vegetated urban and rural lands



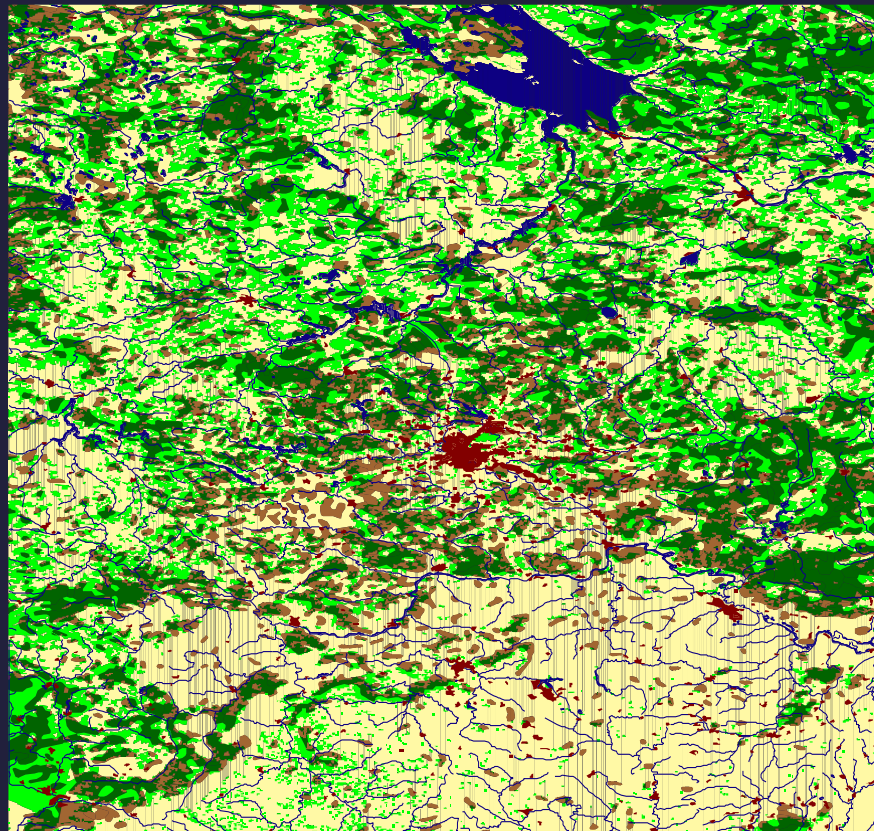
Water bodies

Pattern of LUCC: urban development over agricultural lands; deforestation; recovery of forests; waterlogging of arable lands

For Central Russia 20 years Forest Dynamics has been studied

Two processes: deforestation (brown) under urban construction (“dacha belt” around Moscow) and forest regeneration (bright green) in marginal arable land in stagnation conditions- newly renovated forest cover

Changes in Forest Cover During 20-years period



- Populated places
- Rivers
- Lakes
- New forest
- Deforestation
- Agreed forest
- Agreed open land

Pavel Cherkashin
Moscow State University
1999

50 0 50 100 150 Kilometers

Regional level – Middle Volga region

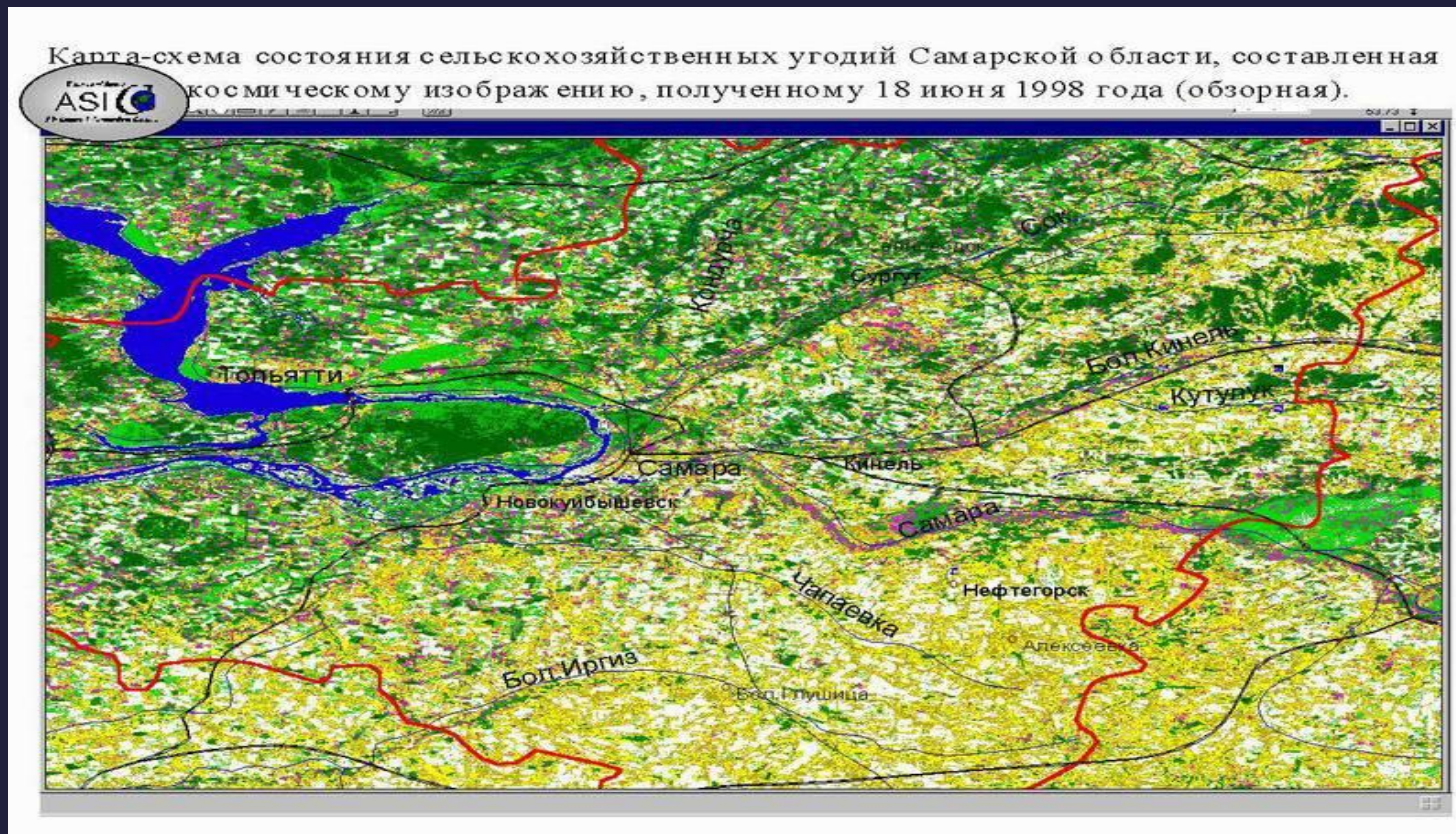
The map showing the land cover types and dynamics of agricultural lands was compiled using space images received from the «Resurs-0» satellite module. Variability of climatic conditions – recurrent droughts caused severe failure of crops and mass stravation (1891, 1921, 1940-46).

The map shows influence of draughts on state agricultural lands in Samara oblast :

green- crop cover of soil is more than 60% (satisfactory)

orange - crop cover of soil is 30-60% (moderately suffered) yellow - crop cover is 10-30% (strongly suffered)

white- crop cover is less than 10% (catastrophically suffered)



Cognitive and practical value of LUCC study

- The cognitive value of study is connected with possibility to use the diverse LUCC data that are systematically organized ("folded") within the different level of present-day landscapes. This organization of data was effectively exploited in developing spatial databases and GIS.
- The practical value of the study comprehends the domains of education, policy and decision-making. The sustainable land use policy should help to reconcile human activity needs with the requirements of the environment and to avoid the unfavorable consequences of land

Conclusion

Different scale study helps:

- **to provide understandable presentation of geographical distribution of areas with different LUC trends and degree of land cover transformation;**
- **to identify territories with similar land cover status in order to replicate more advanced environmental management experience and**
- **to reveal the territorial extent of areas with the most heavily transformed lands that may need prompt rehabilitation actions.**

The sustainable ecologically sound land use systems should help to reconcile human activity needs with the requirements of the environment and to avoid the unfavorable consequences of land and biodiversity degradation.