

Contact zones of the Amur River basin: Landscape structure, Land cover and Anthropogenic influence

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Contact (tension) zones

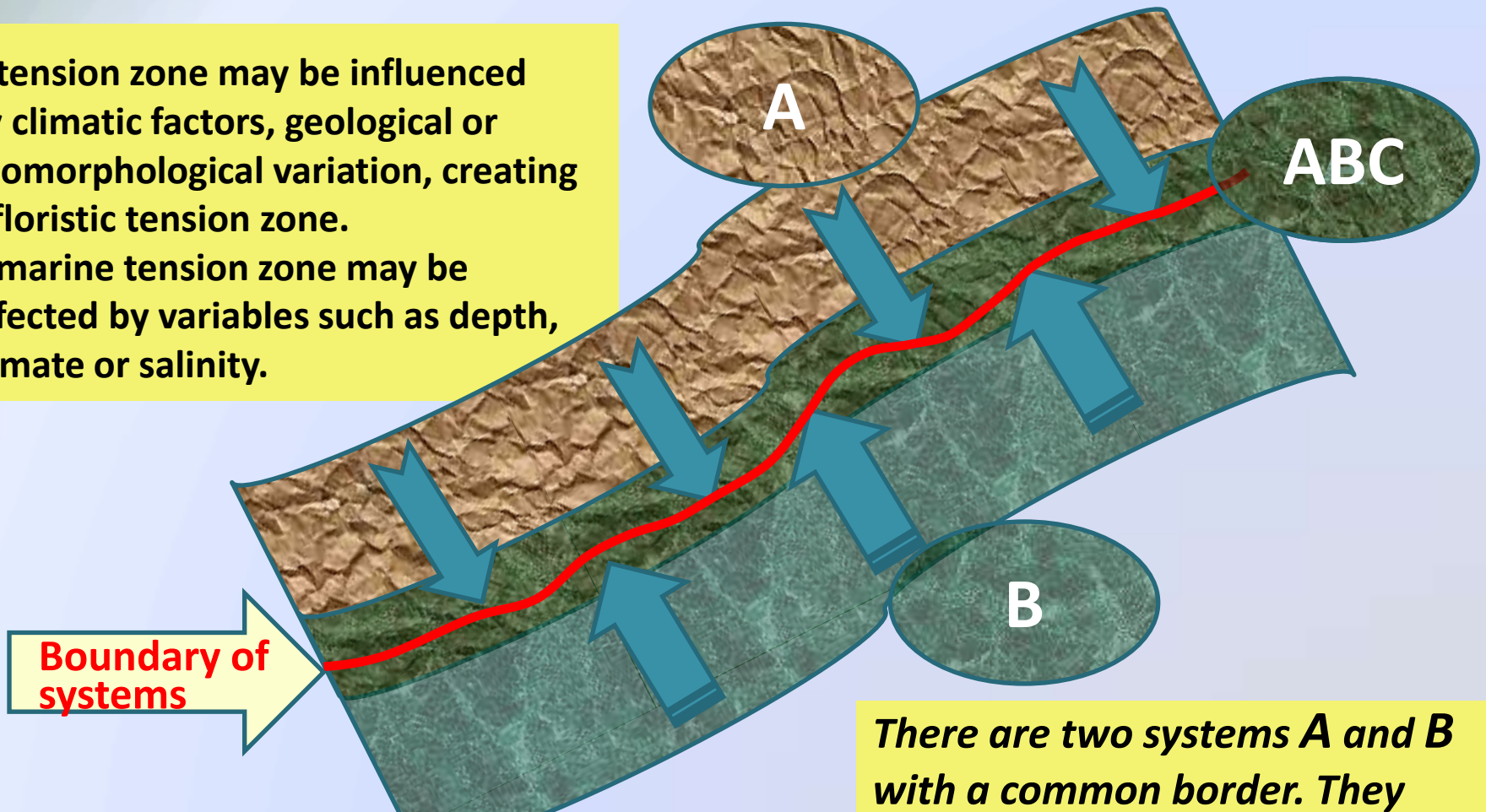
The contact (tension) zones are transitional, boundary spaces between different natural systems, between natural and anthropogenic systems. The contact structures are characterized by the increased intensity in exchange of matter and energy. At that, a fast development of destructive processes, negative effects and local environmental conflicts and crises are characteristics of them.

An emergence of new natural-anthropogenic and anthropogenic boundary systems – contact geozones (tension geozones) of different spatial scales – with the specific features, structures and stabilities is the object of wide speculation. Their occurrence is huge and roles are quite substantial.

Principle of formation tension zone

A tension zone may be influenced by climatic factors, geological or geomorphological variation, creating a floristic tension zone.

A marine tension zone may be affected by variables such as depth, climate or salinity.



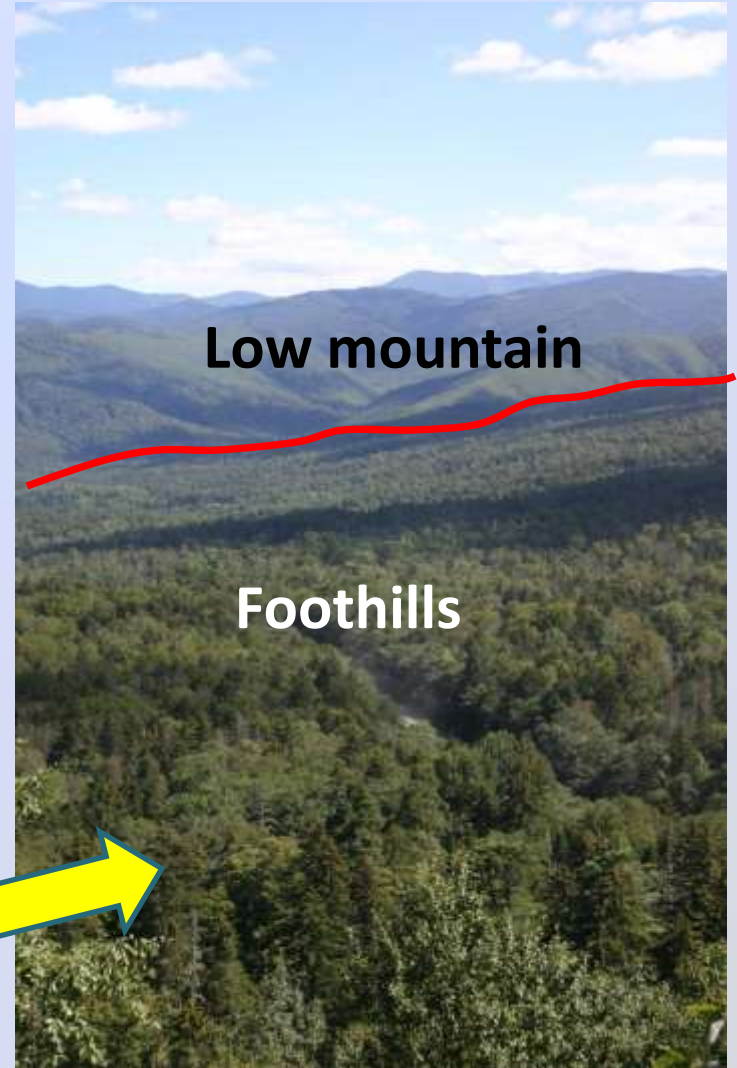
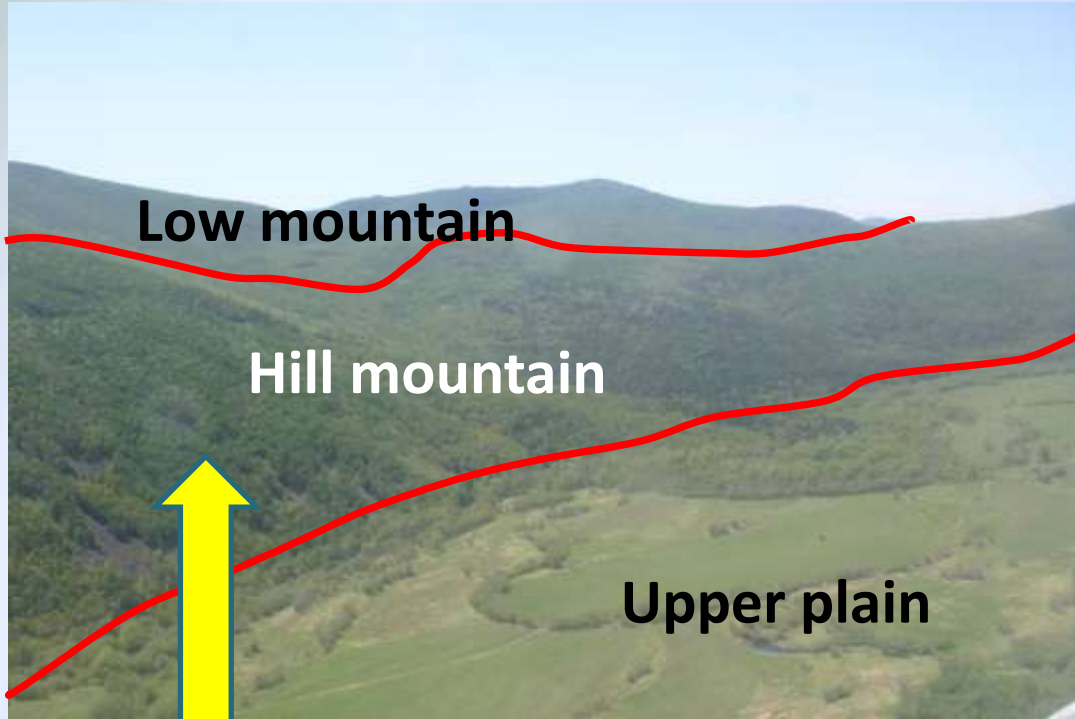
Boundary of systems

The same terms:

Contact zone, Hybrid zone, Buffer zone, Ecotone zone, Tension zone, Transitional zone

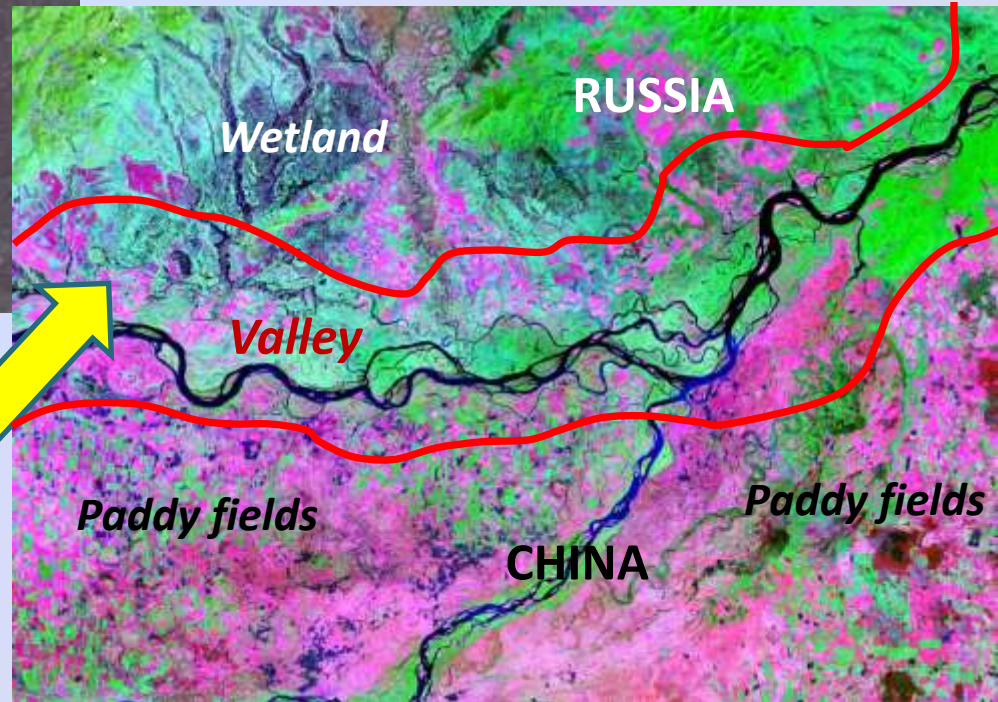
There are two systems A and B with a common border. They always form a subsystem of interaction ABC with specific properties.

Examples of contact zones



Geomorphologic contact zone

Examples of contact zones



International transboundary
contact zone

Examples of contact zones

Coastal contact zone



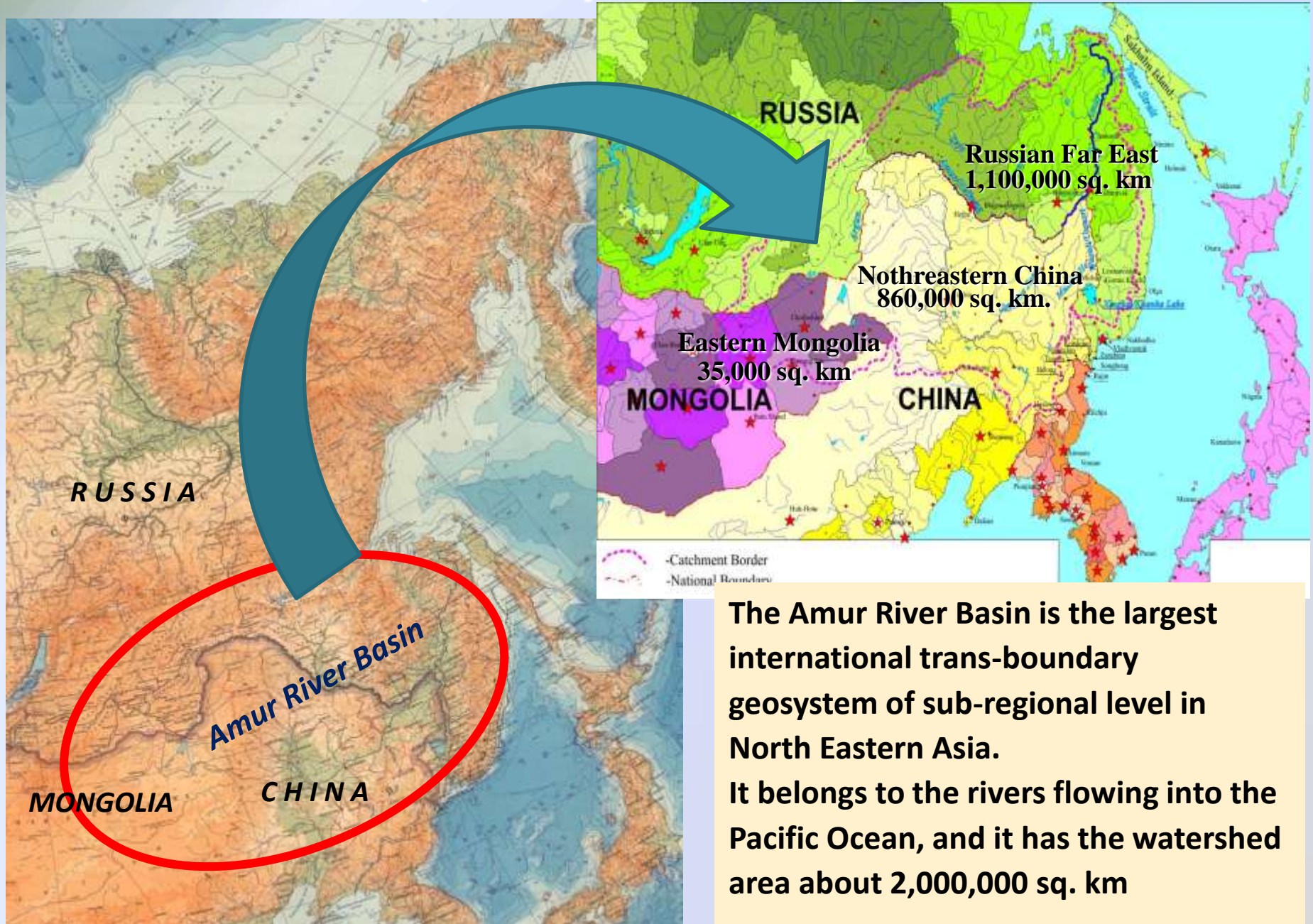
Object of Investigation

The main aim of our researching is to define the distribution contact zones in Amur River basin, theirs role and functions in the land use and natural management

Historically tension zones were entirely natural in origin, however human activity has altered the tension zones in a variety of areas all over the world.

Our study is concerned with the contact territories – transitional zones from plains to mountain areas, from anthropogenic to nature systems in the Amur River basin.

Spatial object of Investigation



The Amur River Basin is the largest international trans-boundary geosystem of sub-regional level in North Eastern Asia. It belongs to the rivers flowing into the Pacific Ocean, and it has the watershed area about 2,000,000 sq. km

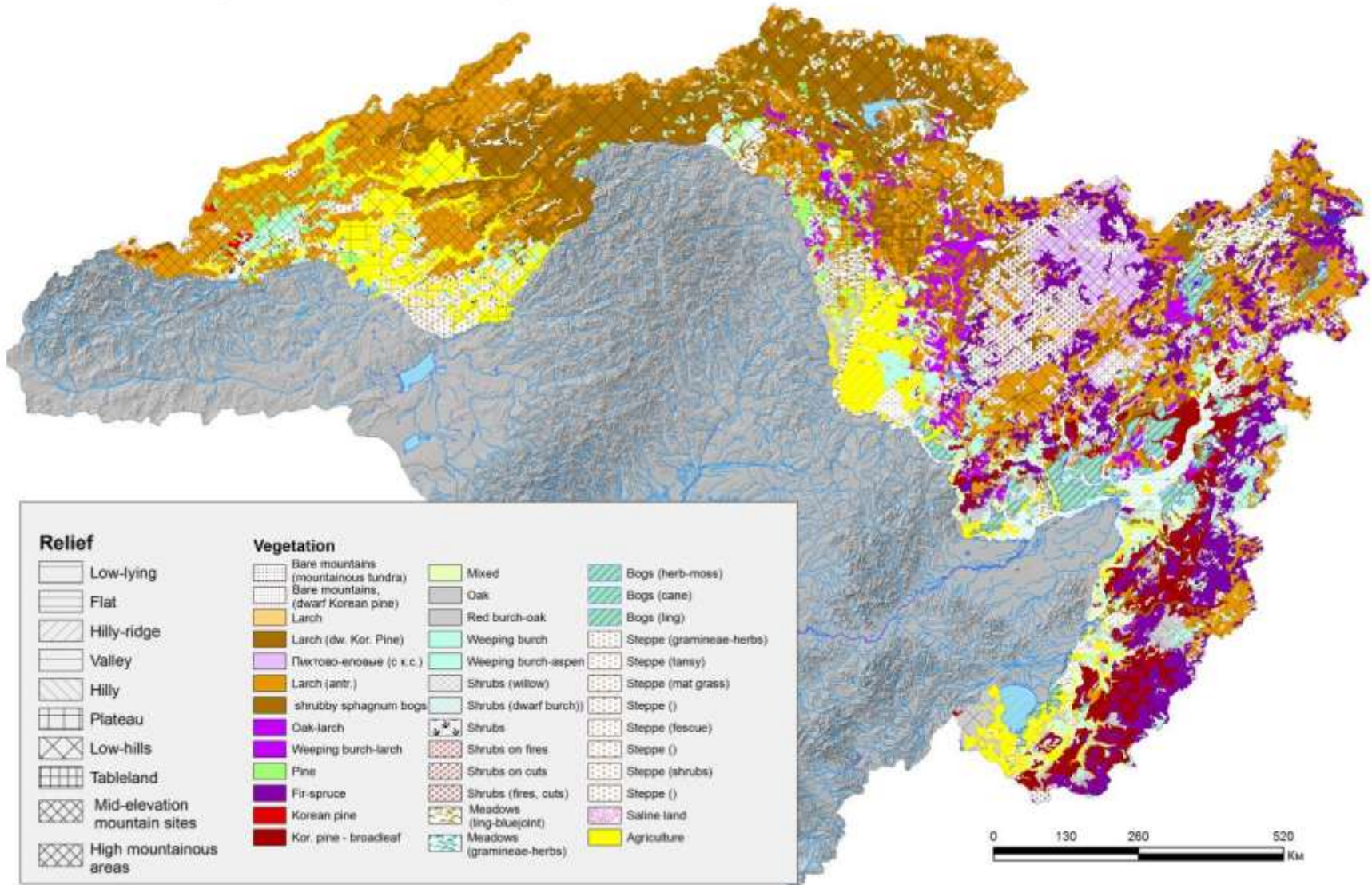
Information base maps

**Three electronic maps were the main information base
for our estimation of contact zones**

- The landscape mapping** of the Amur River basin territory has served as the information base for analyzing the landscape structure, identifying the contact (tension) zones themselves and making their functional zoning.
- The land use/land cover map** of the Amur River basin is the base information for estimation of modern status of anthropogenic environmental modification.
- The functional zoning** assumed a preparation of the special electronic map with identification of major groups of landscapes exercising different functions.

Information base maps

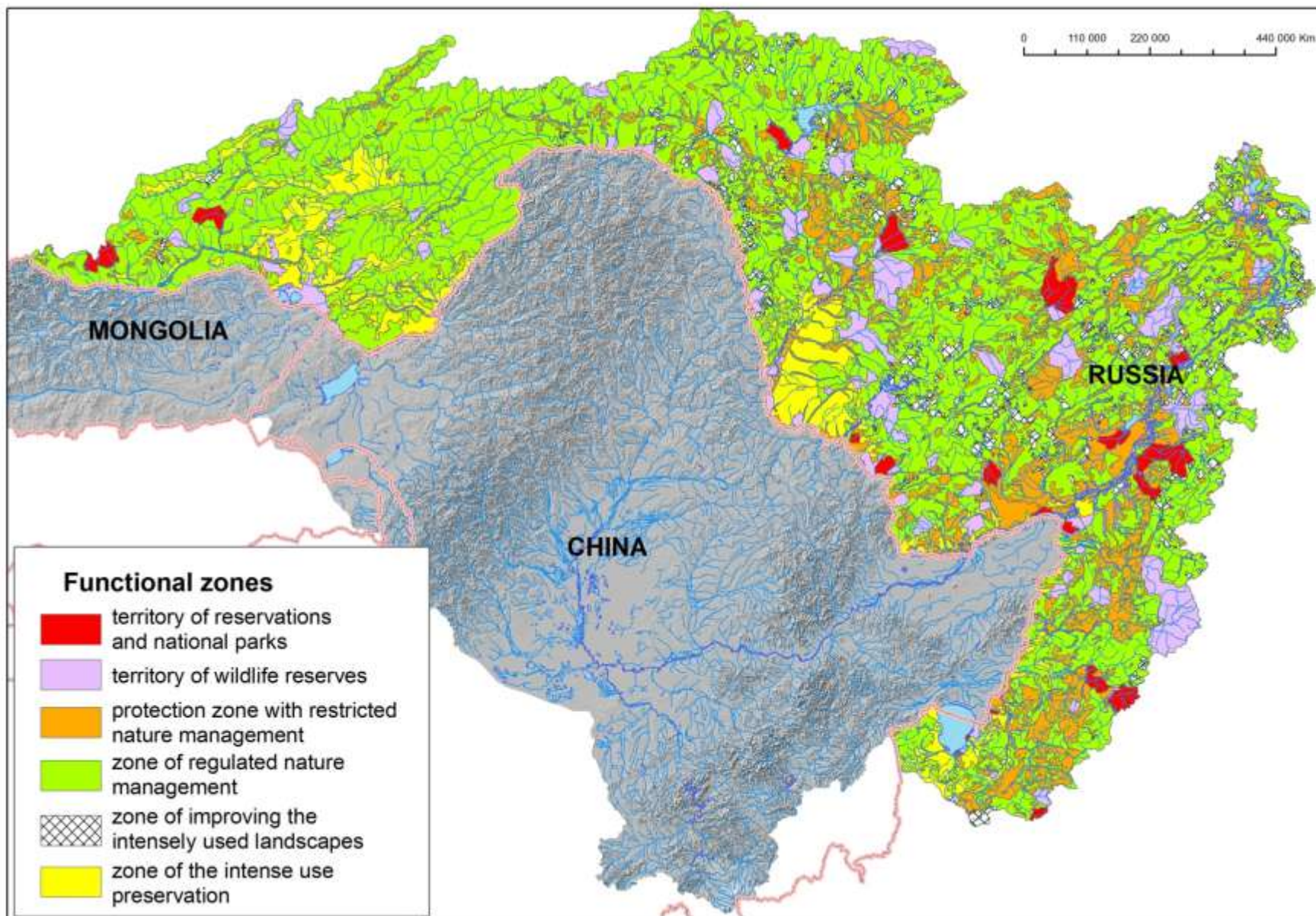
Landscapes. Russian part of Amur basin



Mapping of functional zoning has been implemented on the basis of specially prepared correlation tables between the types of landscapes and their role in the environment

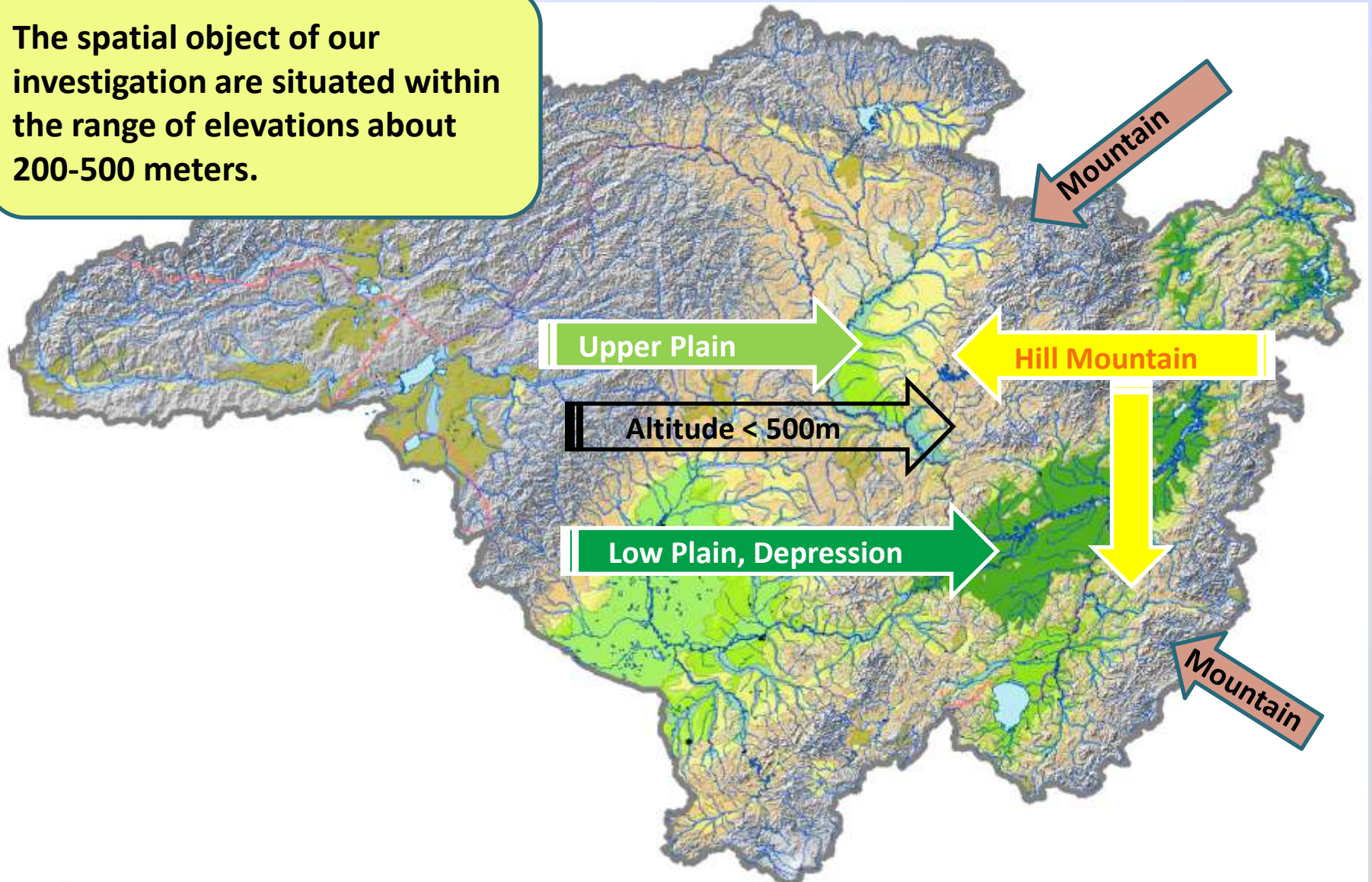
Functional zone	Vegetation	Natural peculiarities
1. Protected area without any economic activity	Specially protected natural areas	<i>Prohibition of any economic activity</i>
2. Zone of the limited environmental management	Mountain tundra	<i>On the apical surfaces and steep slopes. High sensibility and low productivity.</i>
	Mountain pine thickets with tundra	<i>On the apical surfaces and steep slopes. High sensibility and low productivity.</i>
	Fir-spruce open woods with mountain pine and stone birch	<i>On the apical surfaces and steep and steepness slopes. High sensibility and low productivity.</i>
	Cedar forests	<i>Middle sensibility and high productivity. Prohibition on cedar cutting.</i>
	Cedar-large leaved forests	<i>Middle sensibility and high productivity. Prohibition on cedar cutting.</i>
	Larch open woods on the swamped territories (bogs)	<i>On the apical surfaces and steep slopes. High sensibility and middle productivity.</i>
	Grass-moss swaps with dwarf birch thickets	<i>High sensibility and low productivity.</i>
	Reed swaps	<i>High sensibility and low productivity.</i>
	Sedge swaps	<i>High sensibility and low productivity.</i>

Functional zones of Amur Basin. Russian part.



Spatial location of Contact territories of Amur River Basin

The spatial object of our investigation are situated within the range of elevations about 200-500 meters.



Infrastructure of Contact territories

The plain territories are most developed. More than 90% of populated localities and industrial centers, about 80% of agricultural lands and more than 70% of road network are concentrated here.

In this case the contact territories realize the buffer function in a greater degree. The environmental health of the mountain territories will depend on Buffer zone's response to the anthropogenic impact and transfer and transformation by them of this impact.

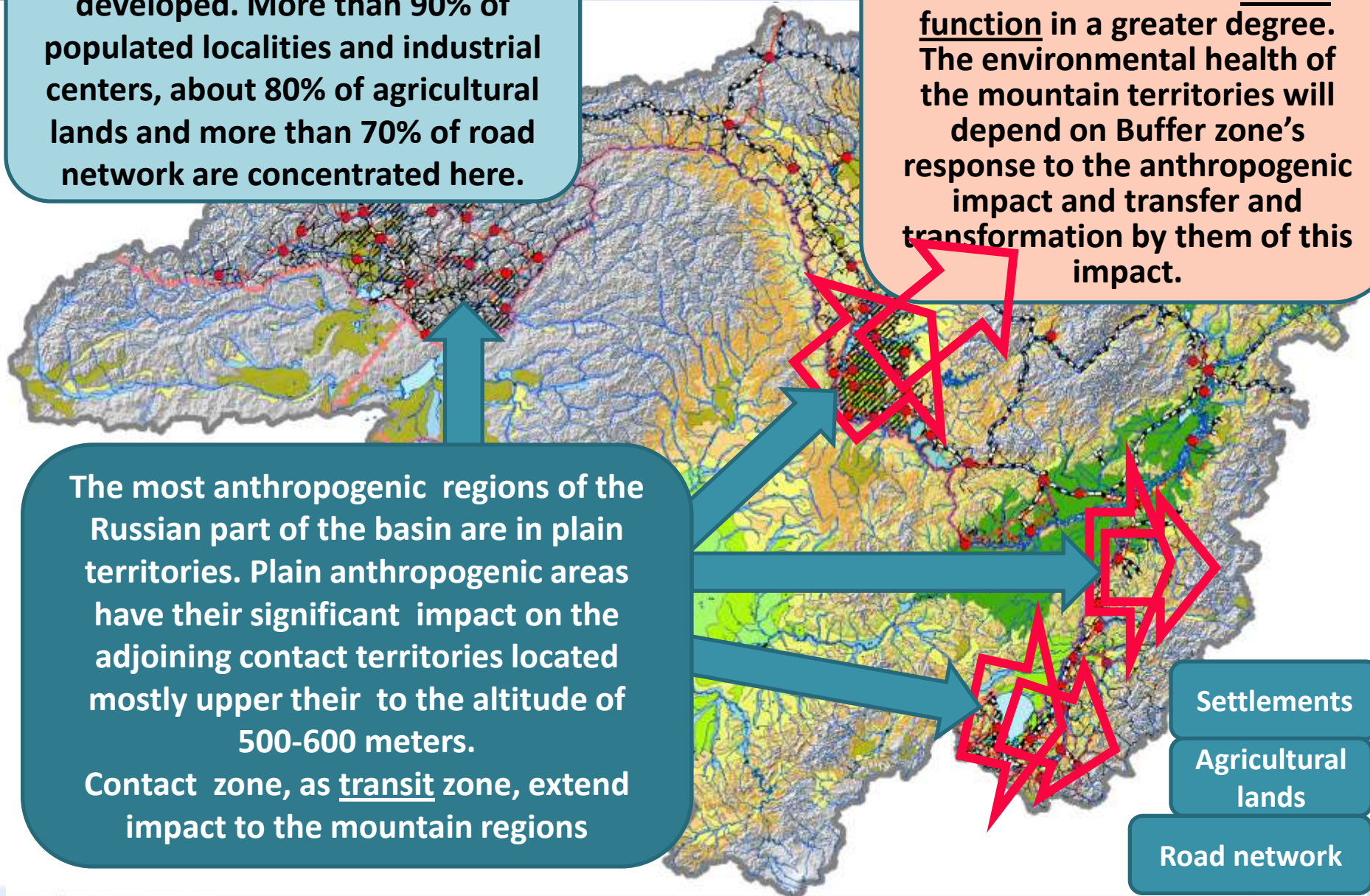
The most anthropogenic regions of the Russian part of the basin are in plain territories. Plain anthropogenic areas have their significant impact on the adjoining contact territories located mostly upper their to the altitude of 500-600 meters.

Contact zone, as transit zone, extend impact to the mountain regions

Settlements

Agricultural lands

Road network



The main landscapes of Contact territories (Eastern part of Basin)

Landscapes of Wetted sparse growth Forest of Larch on Hills

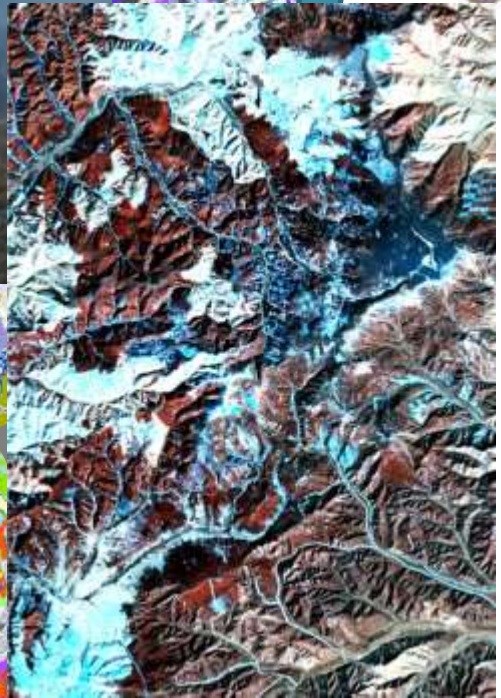


Intensive influence of contact territories on the adjacent mountain area have a place. But in this case contact zone realize the tension function as well

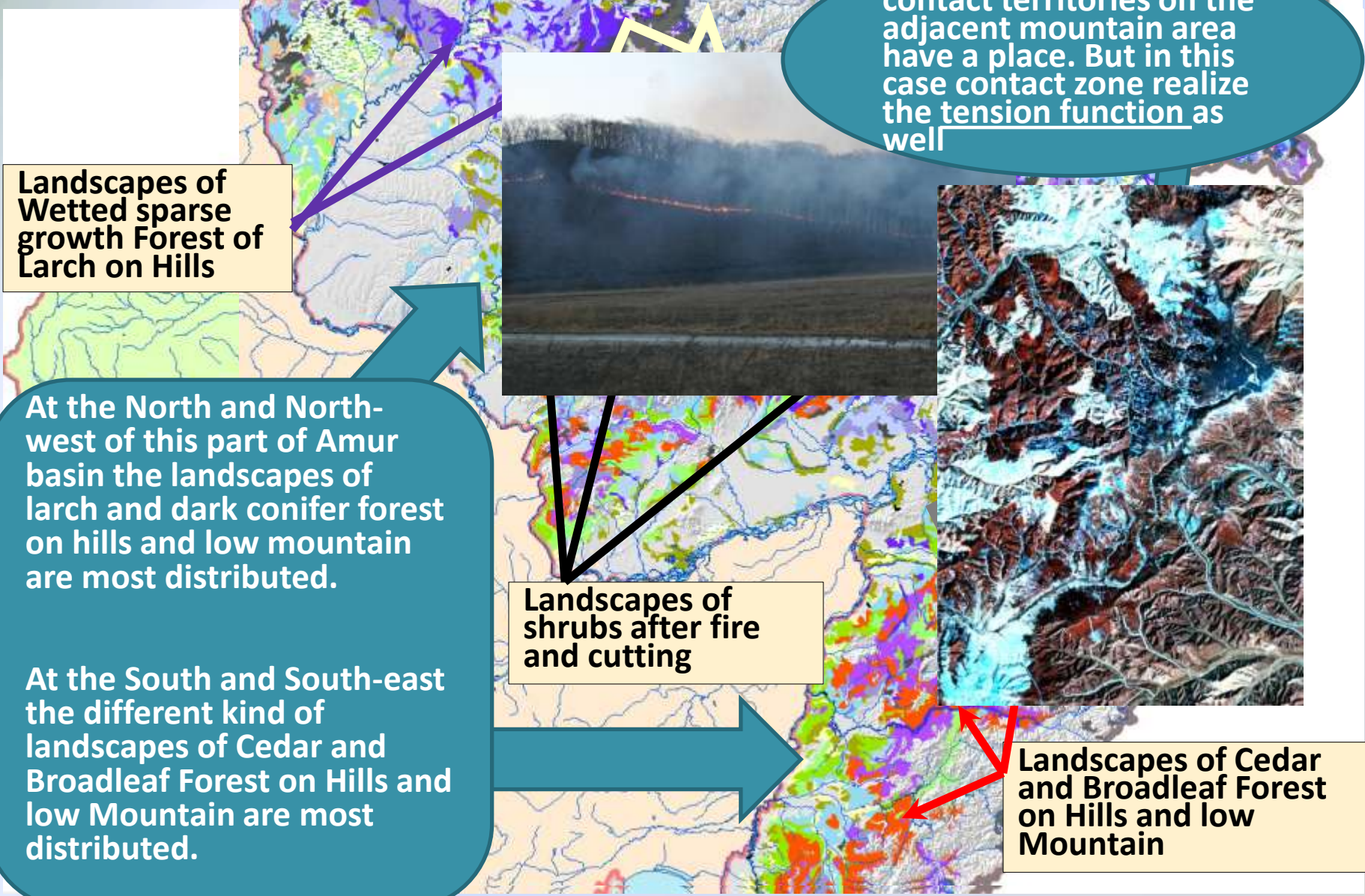
At the North and North-west of this part of Amur basin the landscapes of larch and dark conifer forest on hills and low mountain are most distributed.

At the South and South-east the different kind of landscapes of Cedar and Broadleaf Forest on Hills and low Mountain are most distributed.

Landscapes of shrubs after fire and cutting

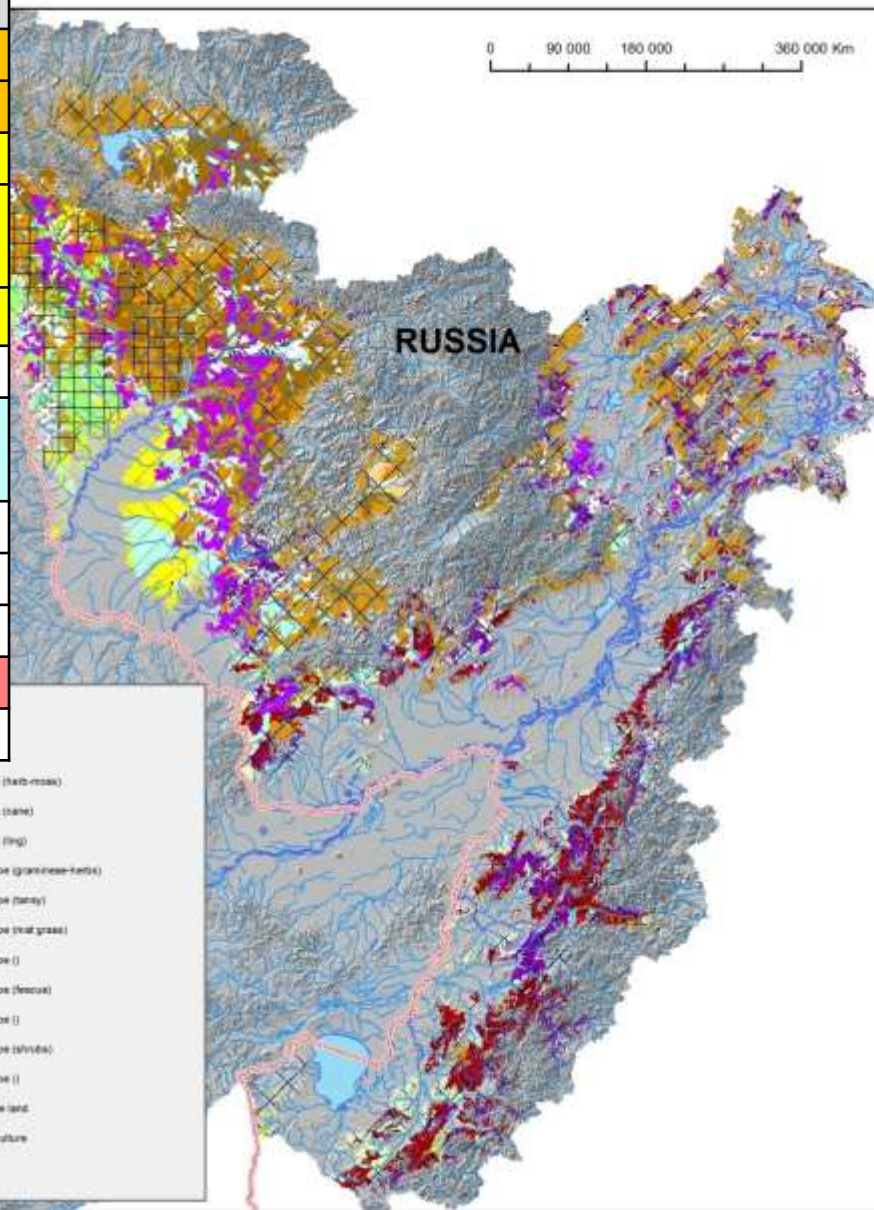


Landscapes of Cedar and Broadleaf Forest on Hills and low Mountain

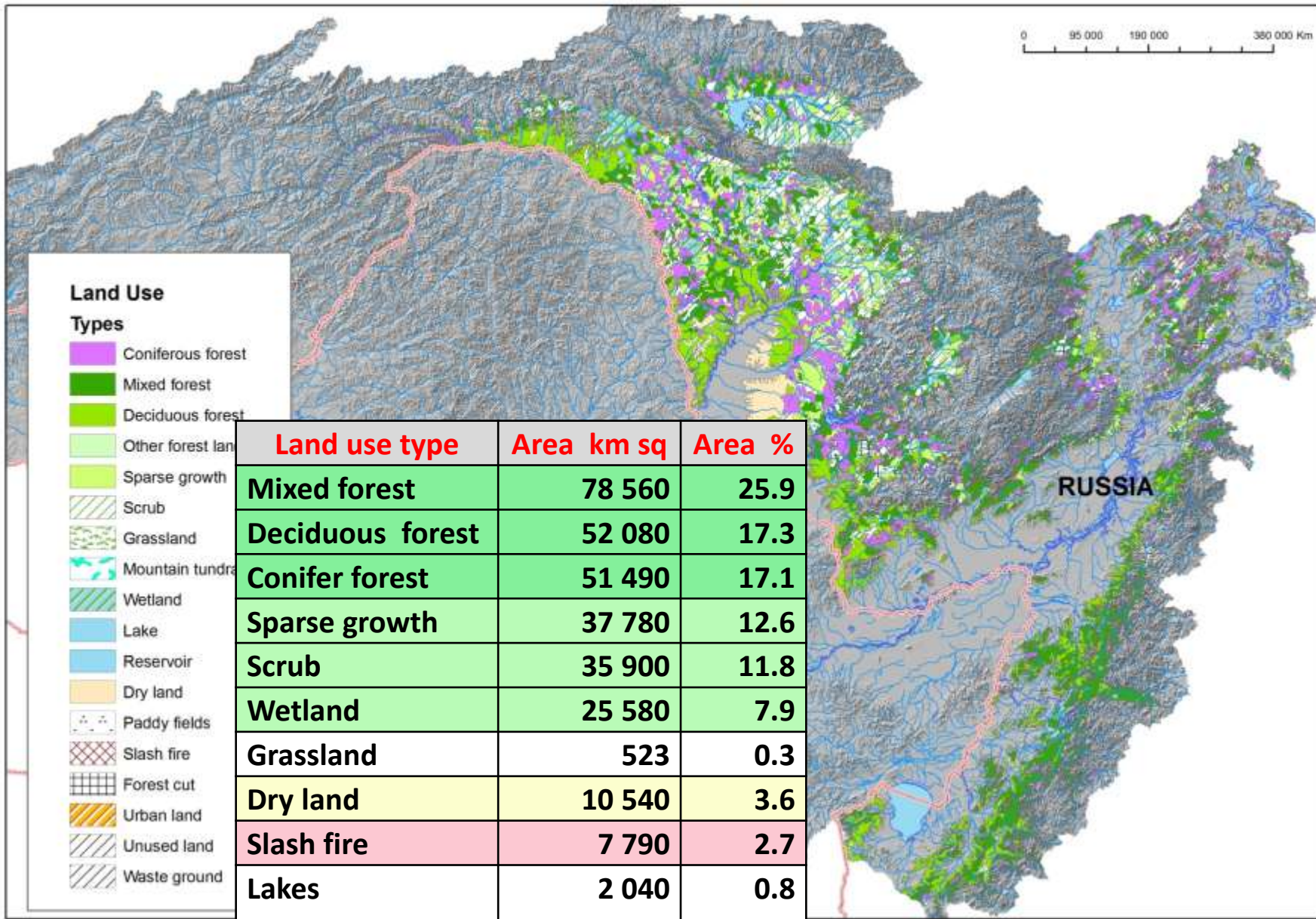


Landscape structure

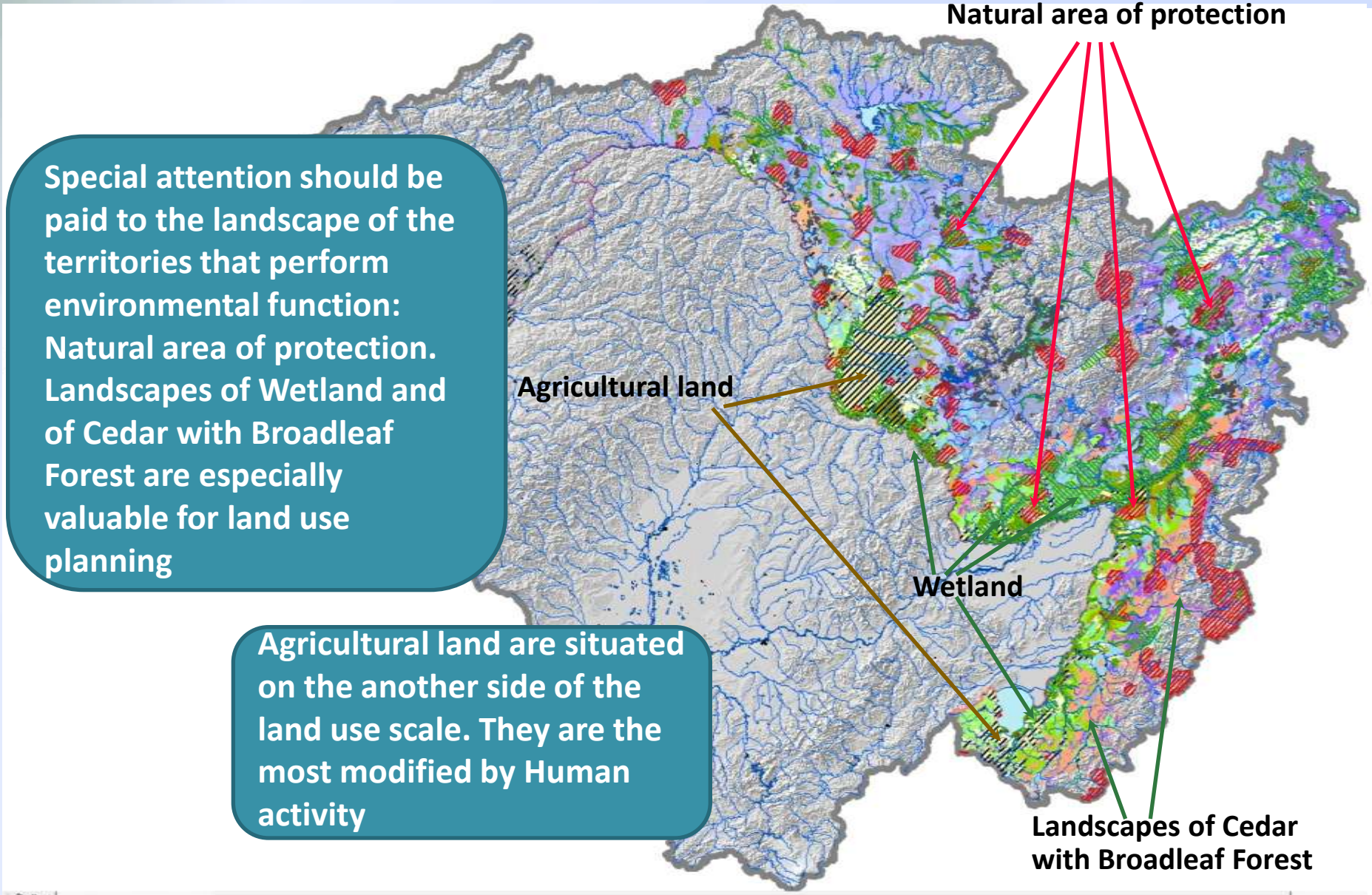
Main landscape type	Area km sq	Area %
Lurch forest	89 480	29.5
Lurch sparse growth	43 960	14.5
Spruce and Fir forest	25 990	8.6
Korean pine and Broad-leaved forest	23 380	7.7
Birch white and Lurch forest	20 600	6.8
Birch white forest	14 900	4.9
Willow, Lurch, Shrubs, Grass with wetland	14 200	4.8
Oak forest	11 140	3.7
Pine forest	10 810	3.6
Broad-leaved forest	5 250	1.7
Slash fire and cutting	19 000	6.3
Agricultural landscape	10 100	3.2



Land use/Land cover structure



Significant Landscapes for function zoning



Special attention should be paid to the landscape of the territories that perform environmental function: Natural area of protection. Landscapes of Wetland and of Cedar with Broadleaf Forest are especially valuable for land use planning

Agricultural land are situated on the another side of the land use scale. They are the most modified by Human activity

Natural area of protection

Agricultural land

Wetland

Landscapes of Cedar with Broadleaf Forest

Functional zones structure

Functional zones	Nature management	Area km sq	Area %
National parks, reservations	Forbidden	4 860	1.6
Wildlife reserves	Forbidden	29 850	9.9
Protection	Restricted	64 270	21.2
Limited	Regulated	172 760	57.0
Improving	Restored	19 480	6.4
Agricultural	Intense use preserve	9 840	3.2
Lakes and reservoirs	Regulated, Restricted	2 040	0.7
Total	Total	303 400	100



The General scheme of Functional zoning Anthropogenic and Contact territories. Russian part of Amur basin

Zone of prohibited nature management: carrying out of recreational and scientific-educational activities is permitted.






Protection zone with restricted nature management. A development of nontimber cutting and recreational economic activities is possible.

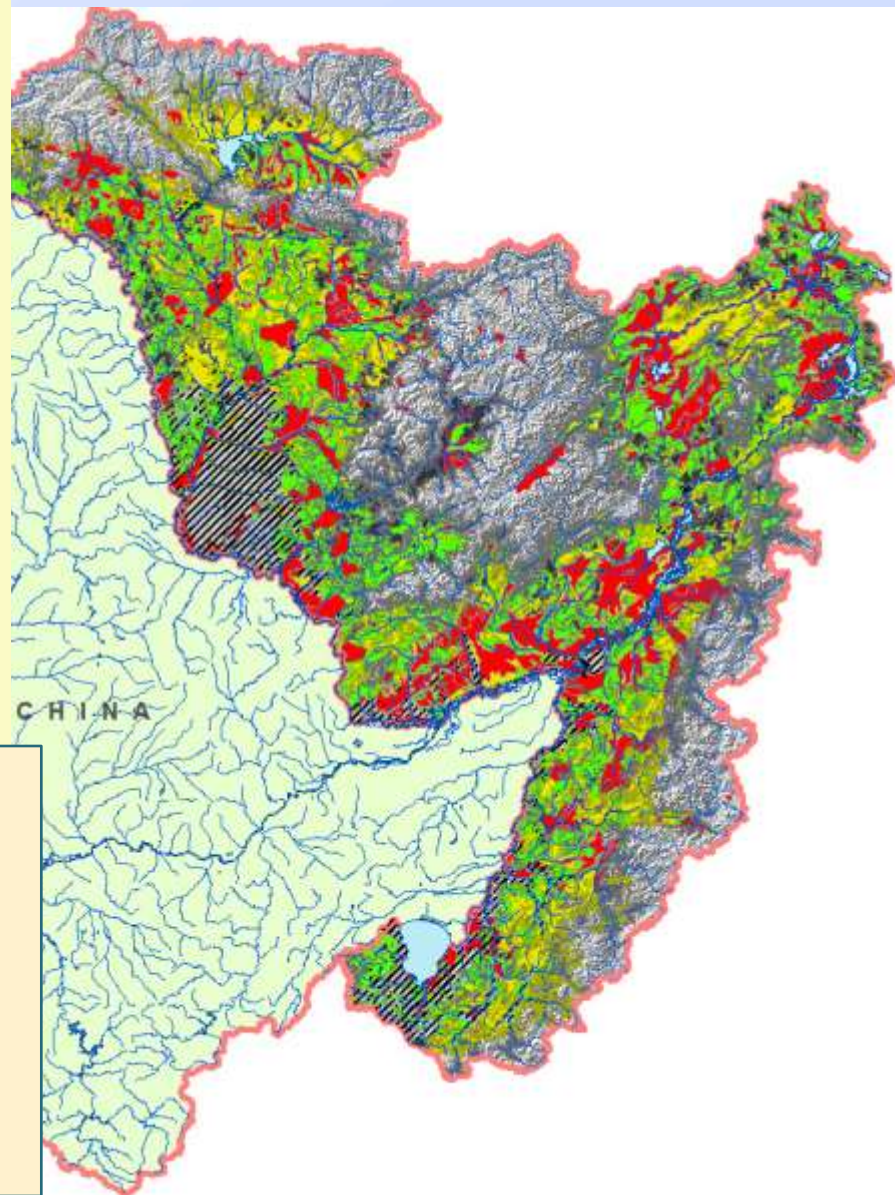
Zone of regulated nature management. A development of timber cutting, timber processing and agricultural activities is possible.

Zone of the intense use preservation. This zone is formed by existent and plan agricultural and industrial lands.

Zone of improving the used landscapes. With the aim of renewal of natural complexes and improvement of the ecological situation, it is assumed to withdraw these territories from the practical use partially or entirely with application of restoration measures.

The core functions of the landscape

-  *Zone of prohibited nature management*
-  *Protection zone with restricted nature management*
-  *Zone of regulated nature management*
-  *Zone of the intense use preservation*
-  *Zone of improving the used landscapes*



Conclusion

- **Contact zones must be considered as integrated anthropogenic-natural systems**
- **Contact zones play a key role in the system of natural dynamic and anthropogenic changes. They may have different function: transit, tension, buffer.**
- **Spatial location, structure and dynamic trends of contact zones should be taken into account when the planning environmental management will be realize**
- **Formed digital layers and maps are used as information base for Programs of sustainable nature management in transboundary Amur river basin**

A serene sunset scene over a large body of water, likely a lake or bay. The sun is a bright orange orb just above the horizon, casting a warm glow across the sky and reflecting on the water's surface. The sky transitions from a deep orange near the horizon to a lighter, hazy yellow at the top. In the distance, dark silhouettes of mountains or hills are visible against the horizon. The overall mood is peaceful and contemplative.

Thank you for attention!

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