

# Land Cover and Land Use Change in Eastern Europe



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Land-Cover and Land-Use Change Program



October 16<sup>th</sup> 2014

# Sopron, Hungary: the picnic that changed the world

Twenty-five years ago today, a diplomatic picnic helped bring down communism in Eastern Europe. Adrian Bridge explains

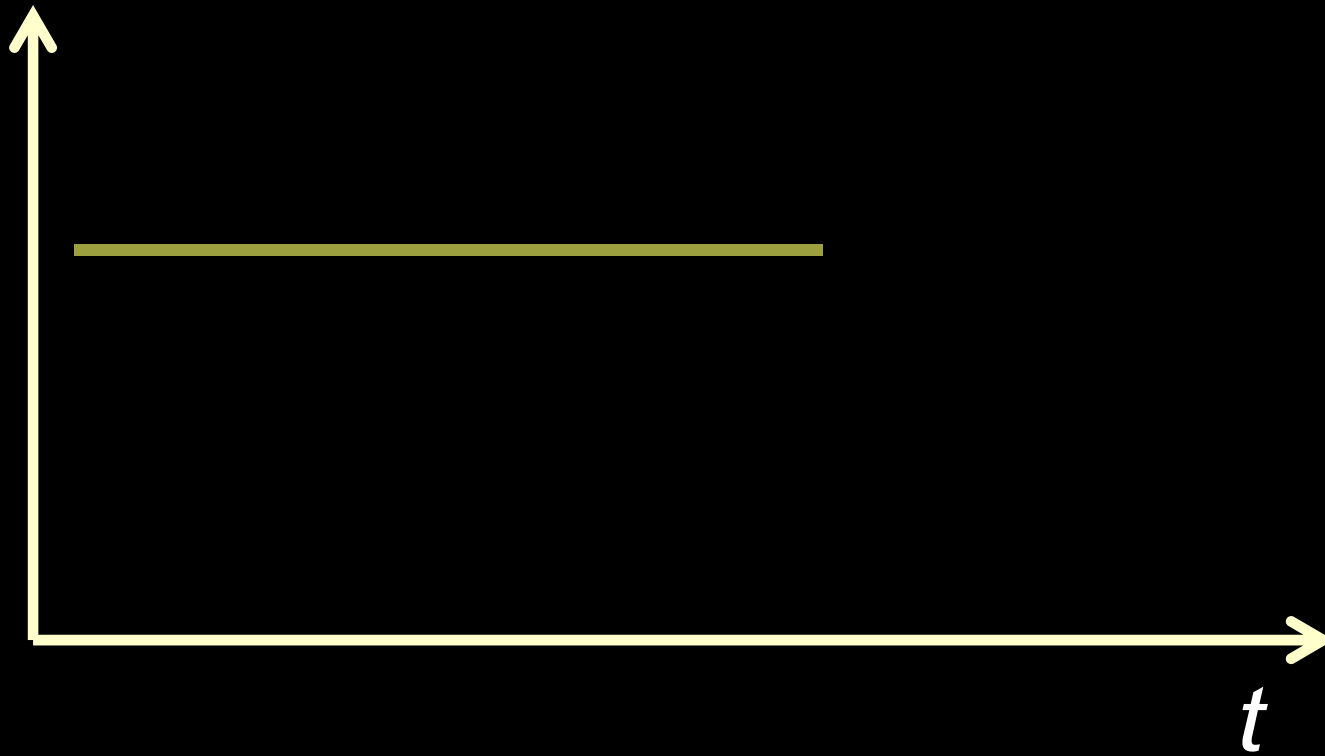


Alois Mock and Gyula Horn take down the Iron Curtain separating Austria and Hungary Photo: AP

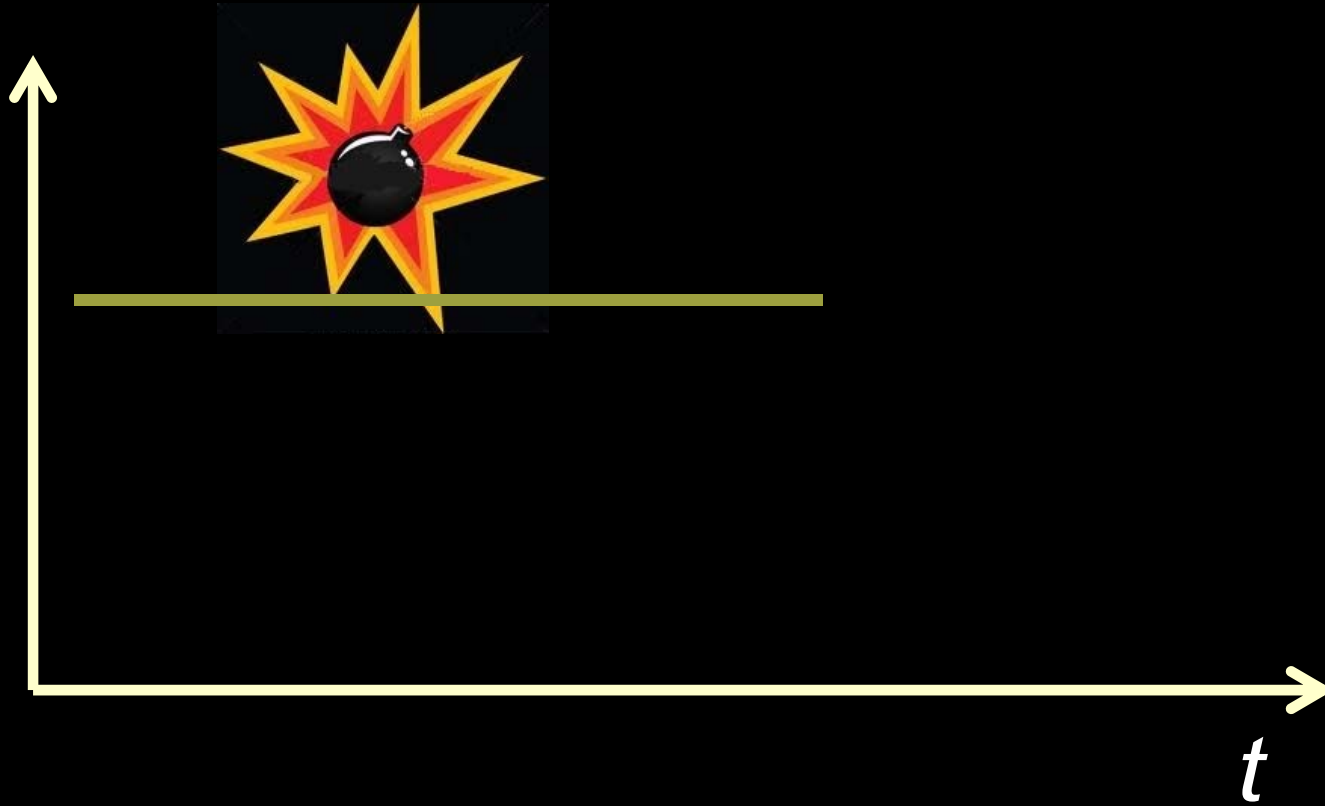




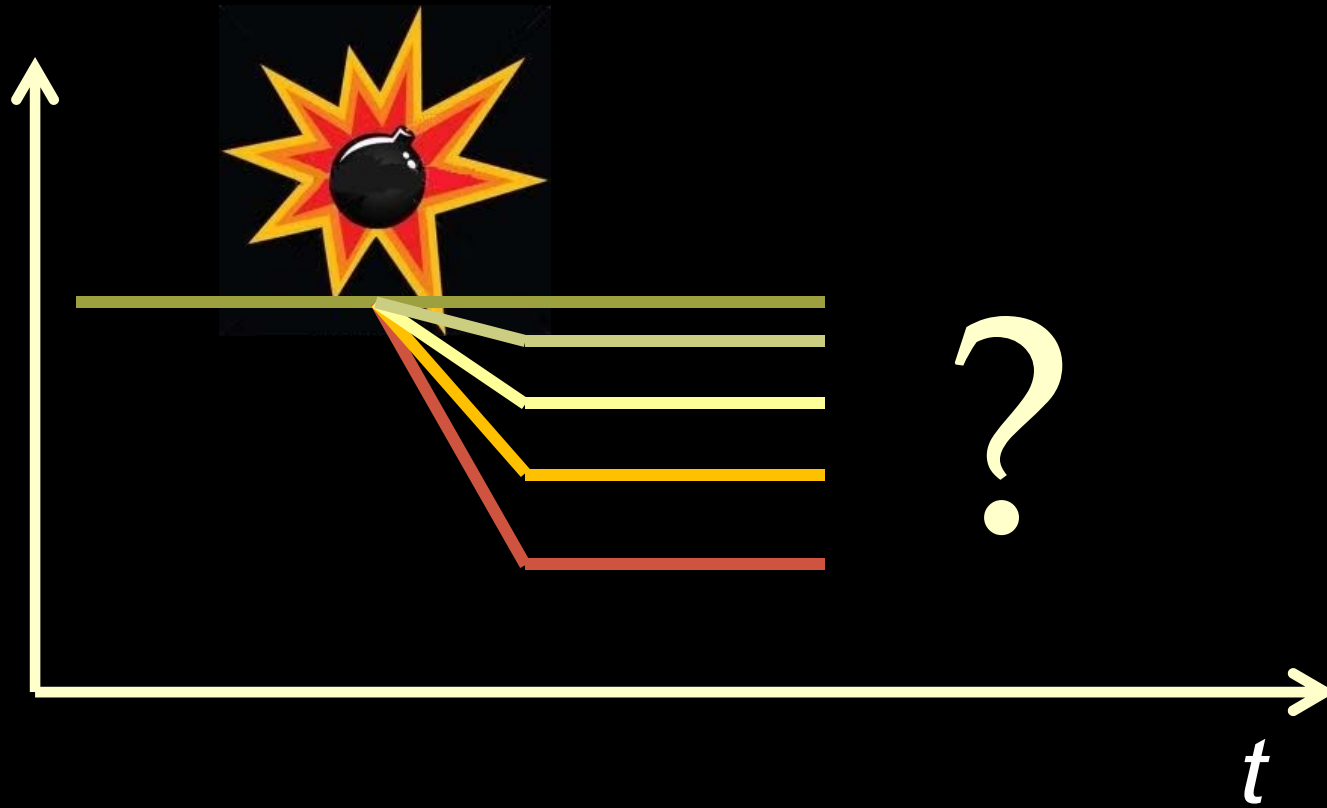
# Effects of shocks

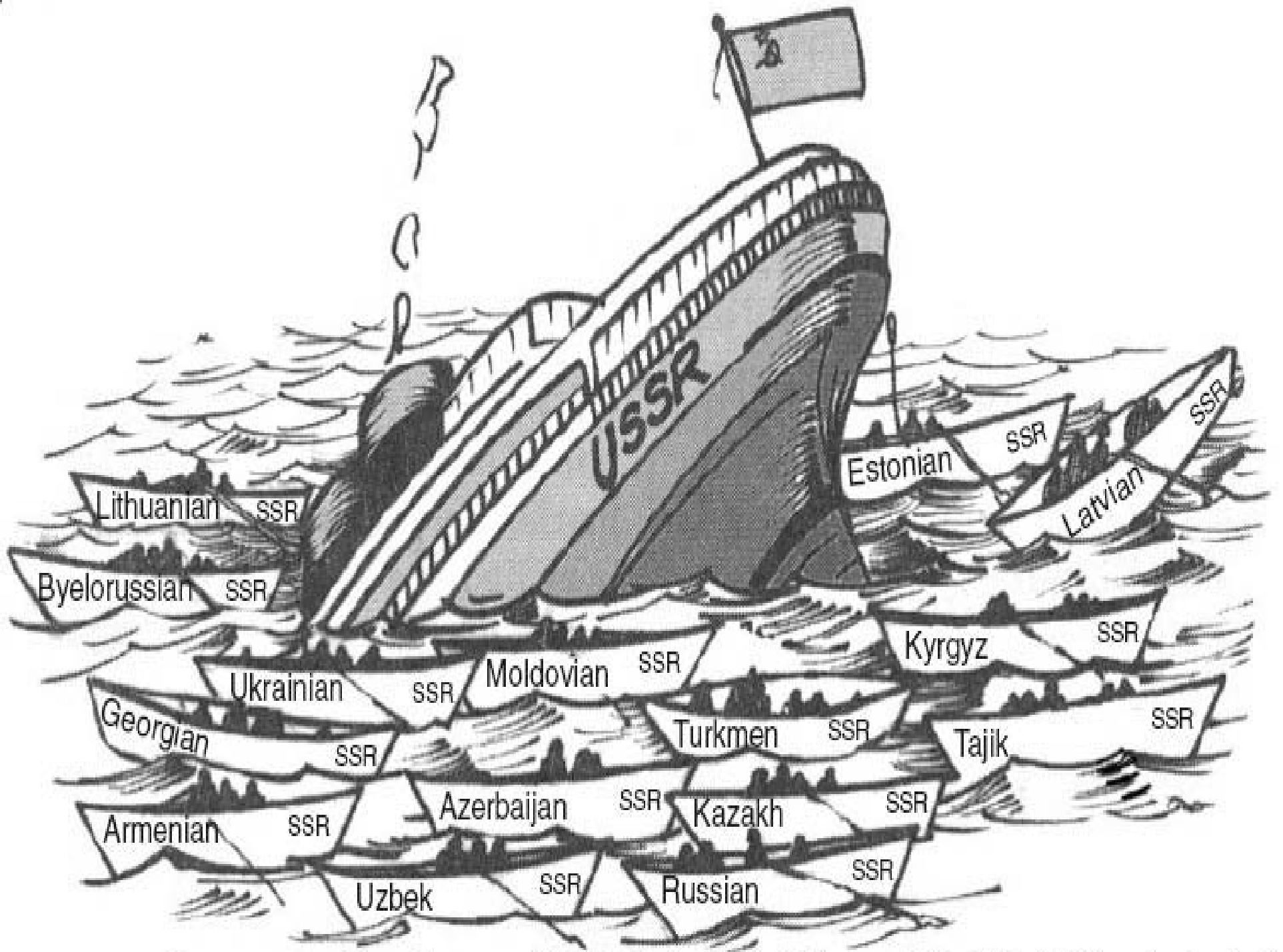


# Effects of shocks



# Effects of shocks







# Outline

The effects of the collapse  
of the Soviet Union on:

a) Agriculture

b) Forestry

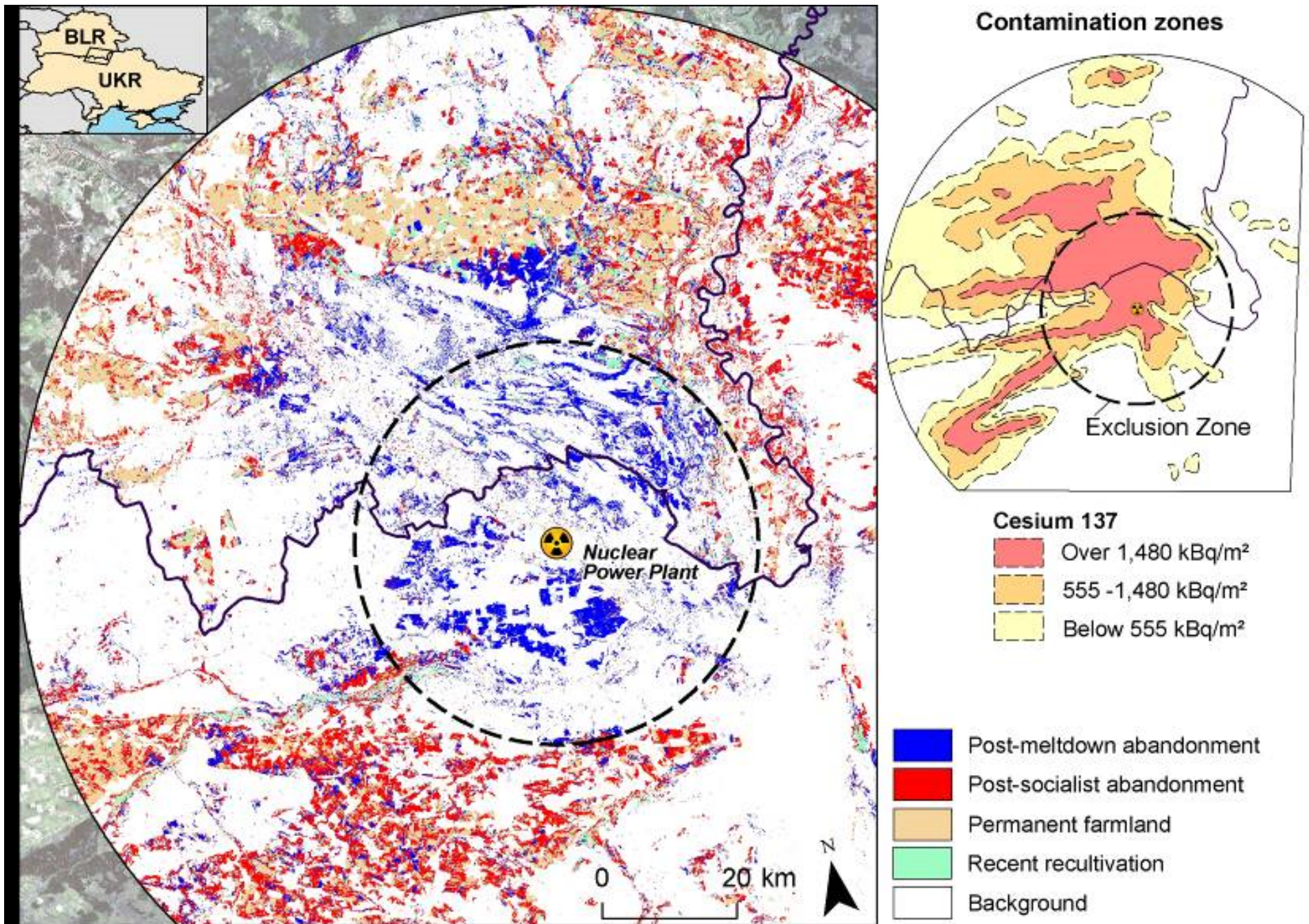
c) Wildlife

# Поднимай

Этим землям нет цены.  
Больше год от года  
Брать должны мы с целины  
Хлеба для народа!

# ЦЕЛИНЫ!



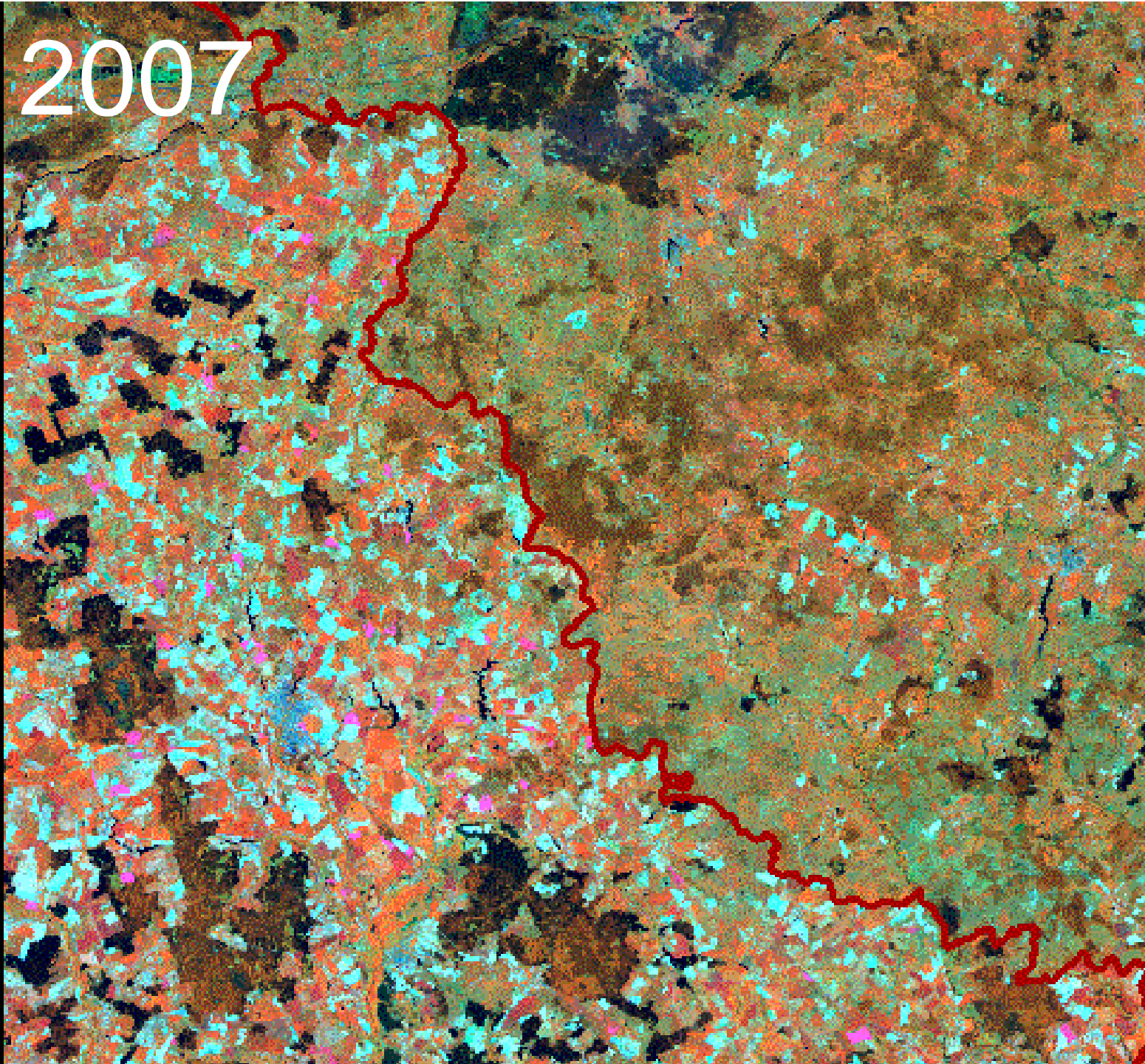


Hostert et al., ERL, 2011

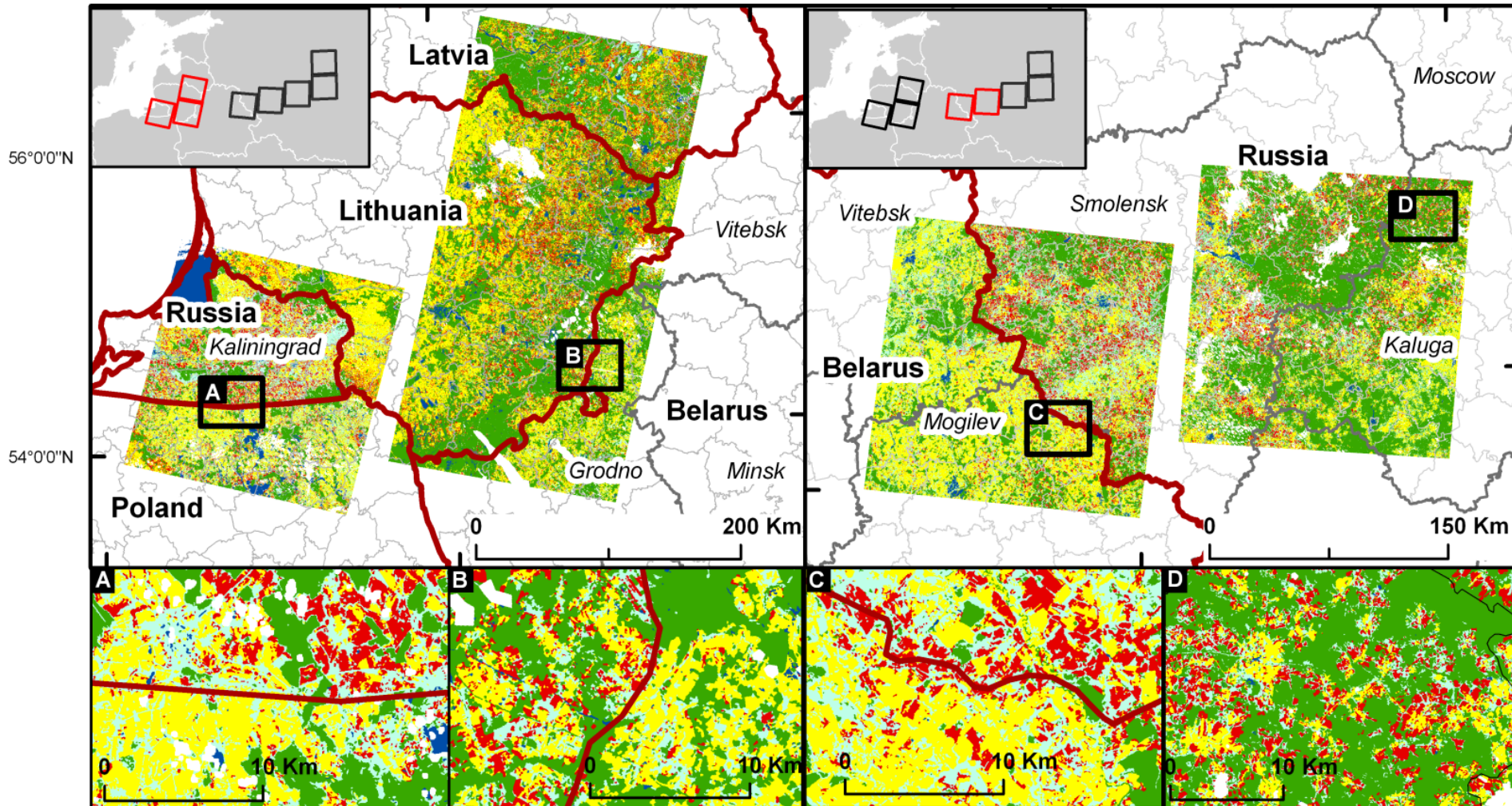


Photo: A. Prishchepov






2007



20°0'0"E      24°0'0"E      28°0'0"E      32°0'0"E      36°0'0"E



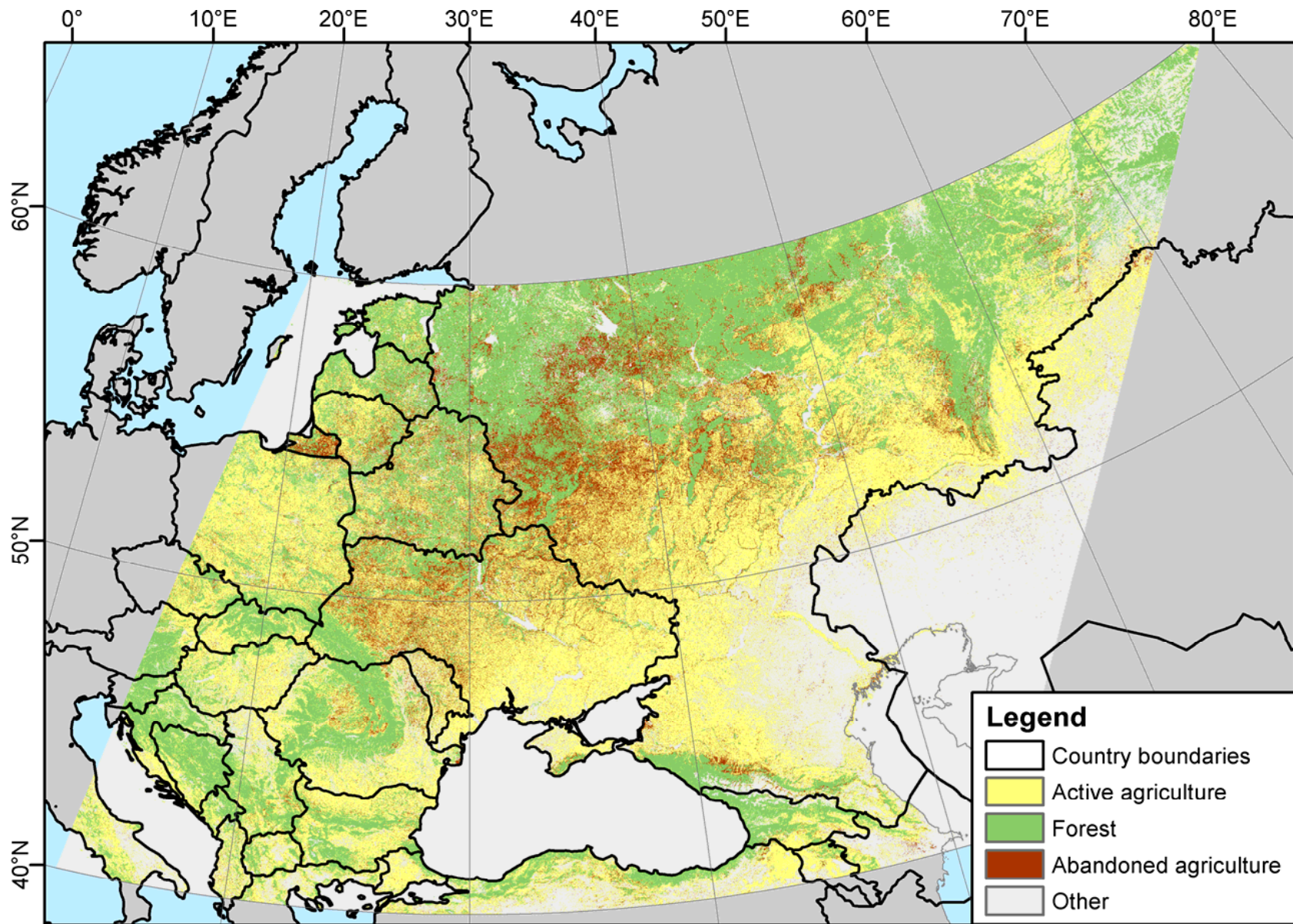
**Classes**

- |   |                               |   |  |
|---|-------------------------------|---|--|
|  | - Forest, Wetlands            |  | - Permanent, shrubs, tree lines, riparian vegetation |
|  | - Stable agriculture          |  | - Other (water, impervious surface)                  |
|  | - Abandoned agricultural land |   |  |



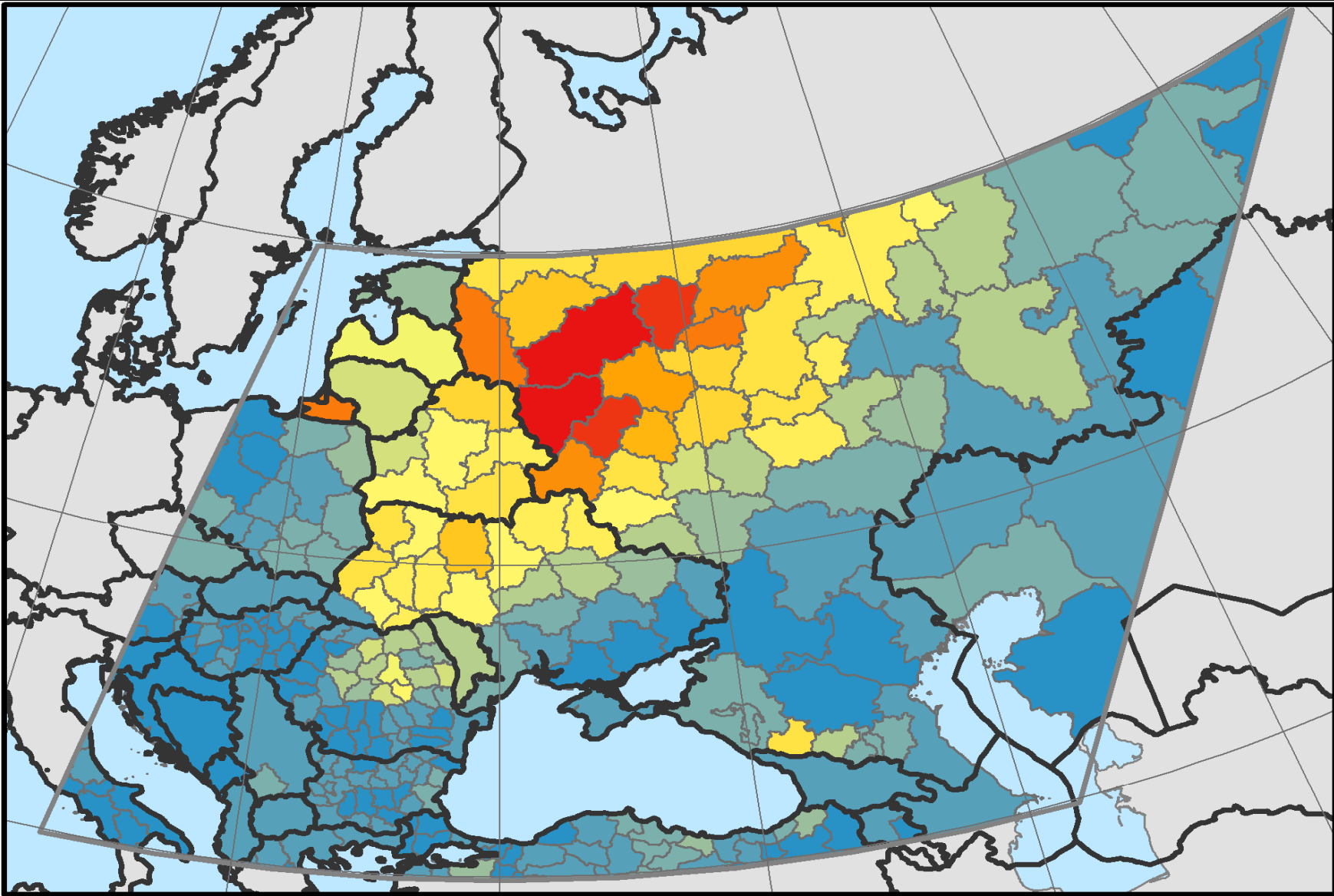
- National Boundaries
- Regional Boundaries
- District Boundaries

- Belarus** - Countries
- Mogilev* - Regions



Alcantara, 2013, ERL





Study region



Country boundaries

Abandonment rate



0%

20%

40%

60%

80%

# Поднимай

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Хлеба для народа!

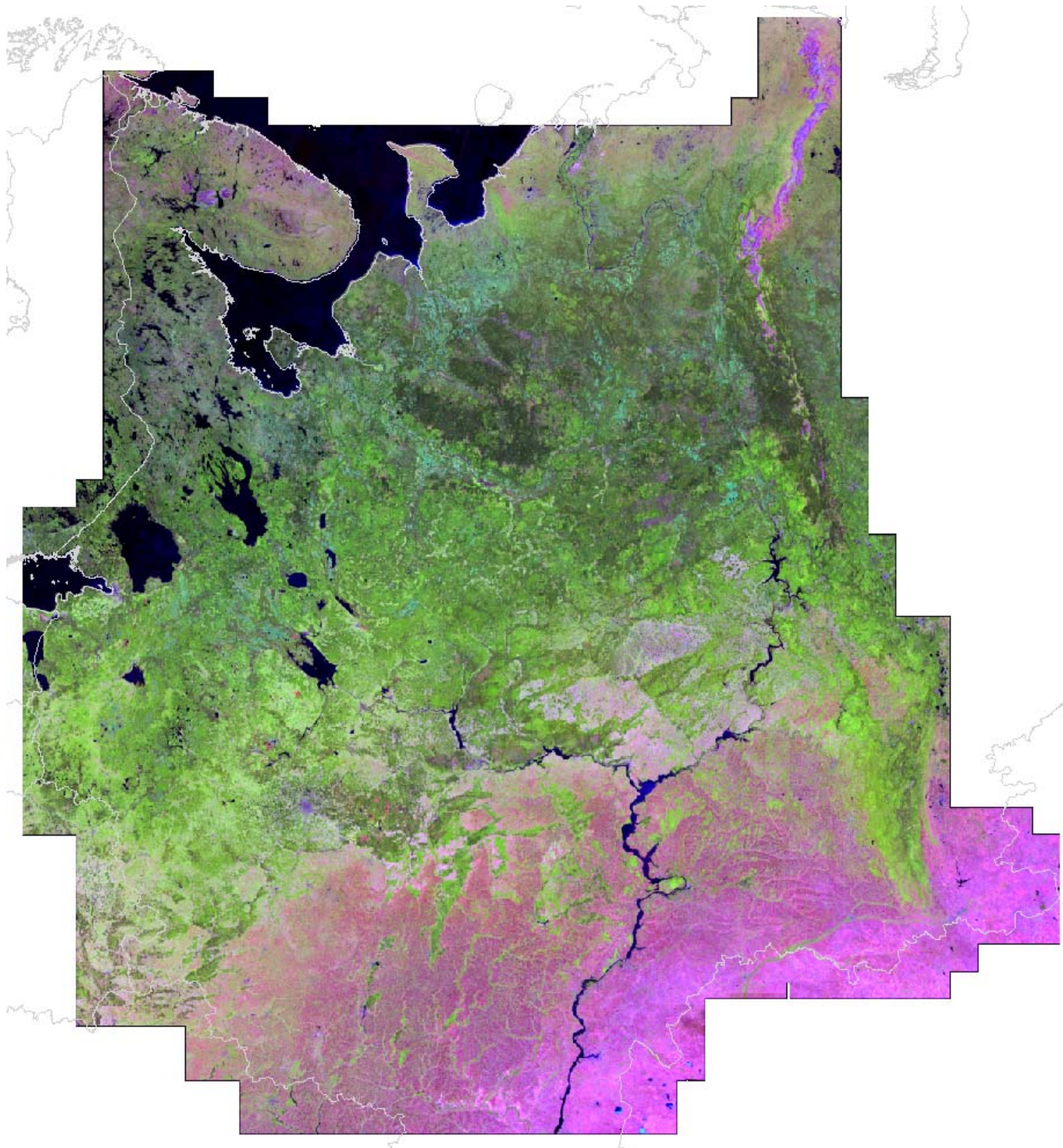
# ЦЕЛИНЫ!

ТОВАРИЩИ  
ЛЕСОРУБЫ!  
С Д Е Р Ж И М  
С Л О В О , Д А Н Н О Е  
Т О В А Р И Щ У  
С Т А Л И Н У !

даём  
сверх  
плана!

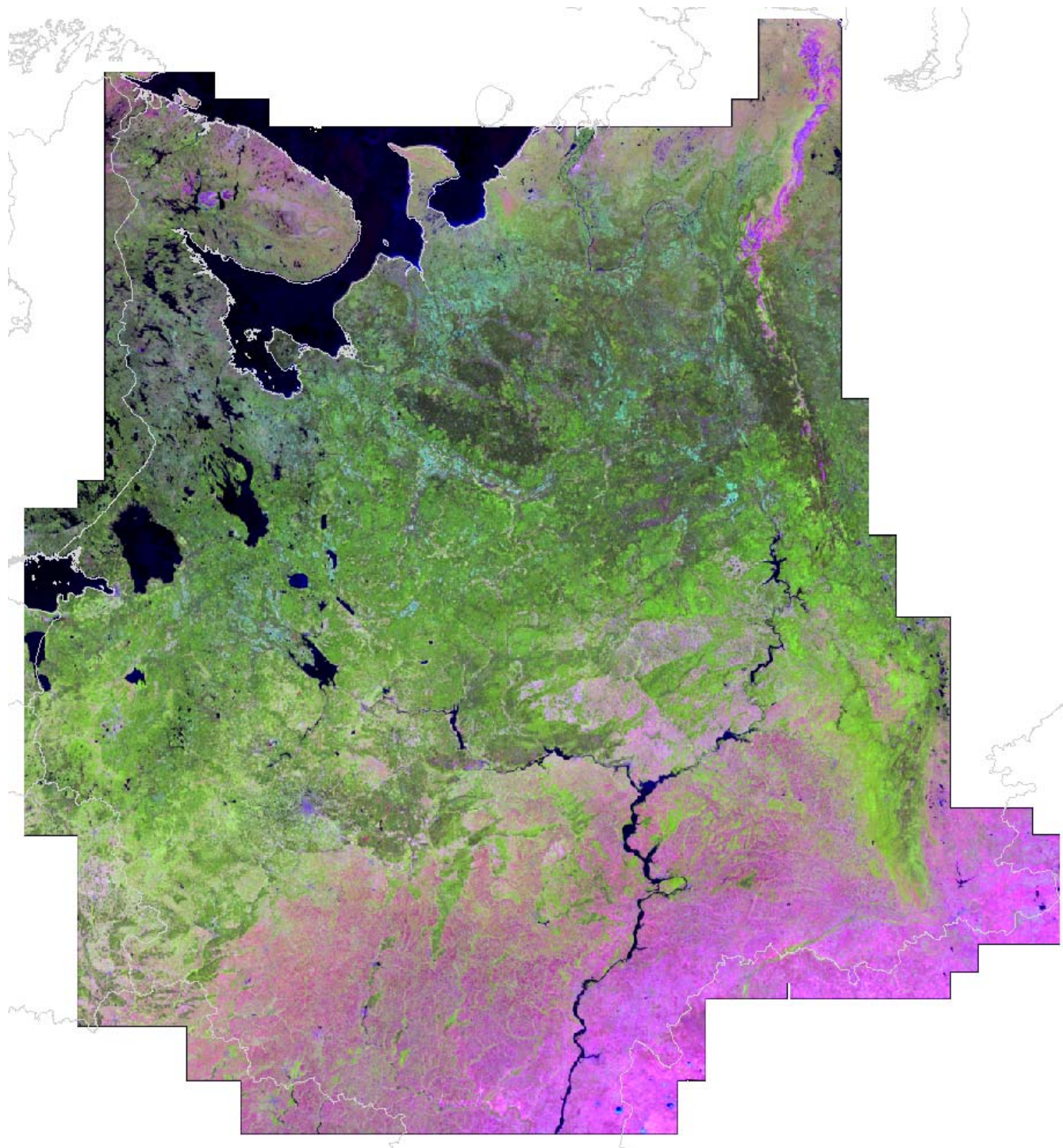


А. Кокоркин  
48



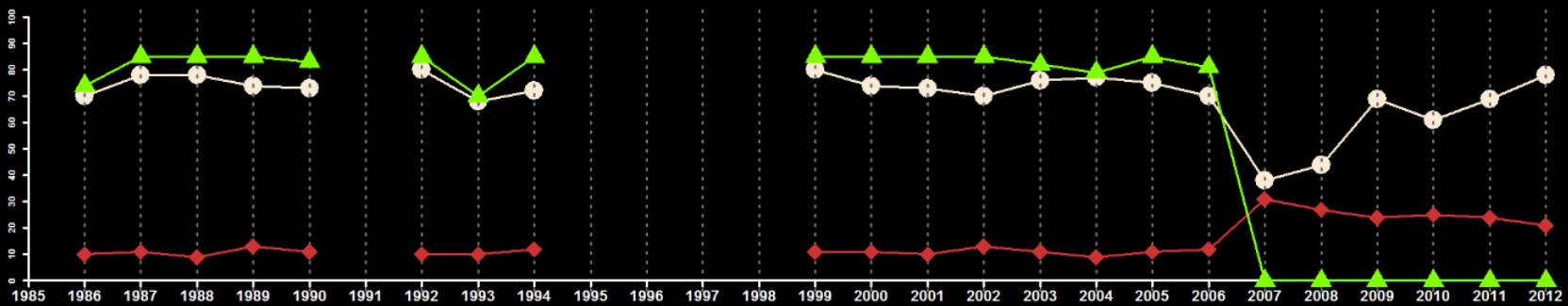
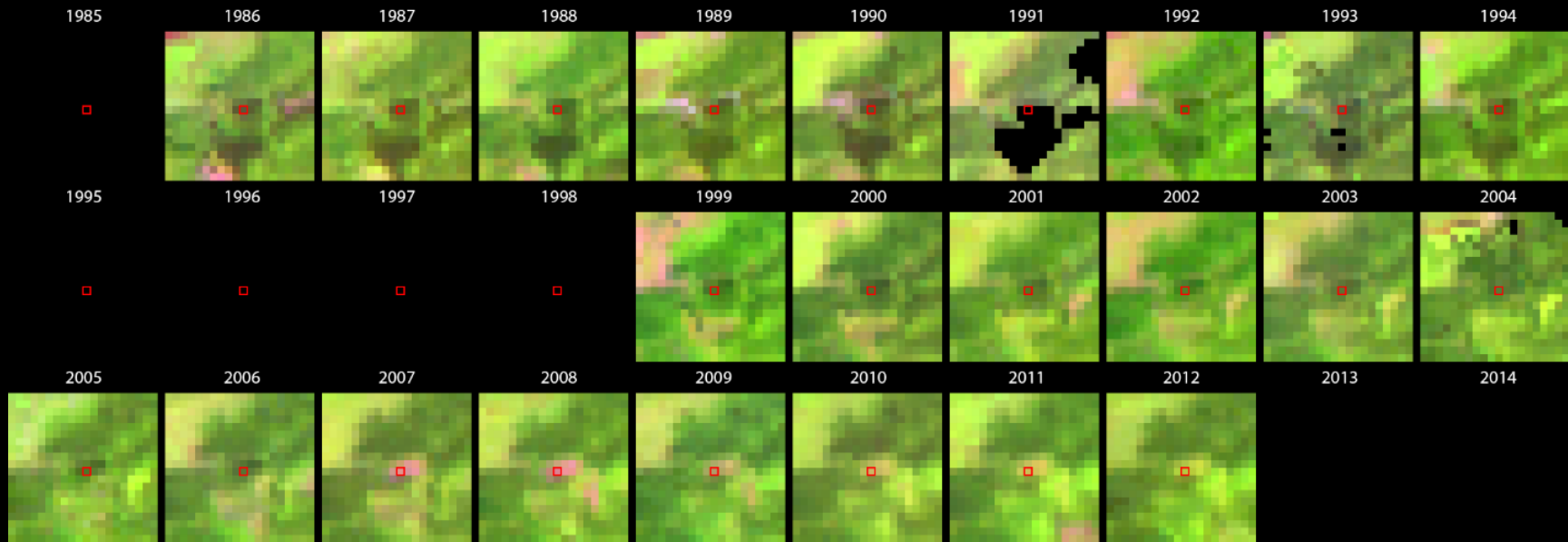
1985

Potapov, P.,  
A. Krylov,  
et al.



2012

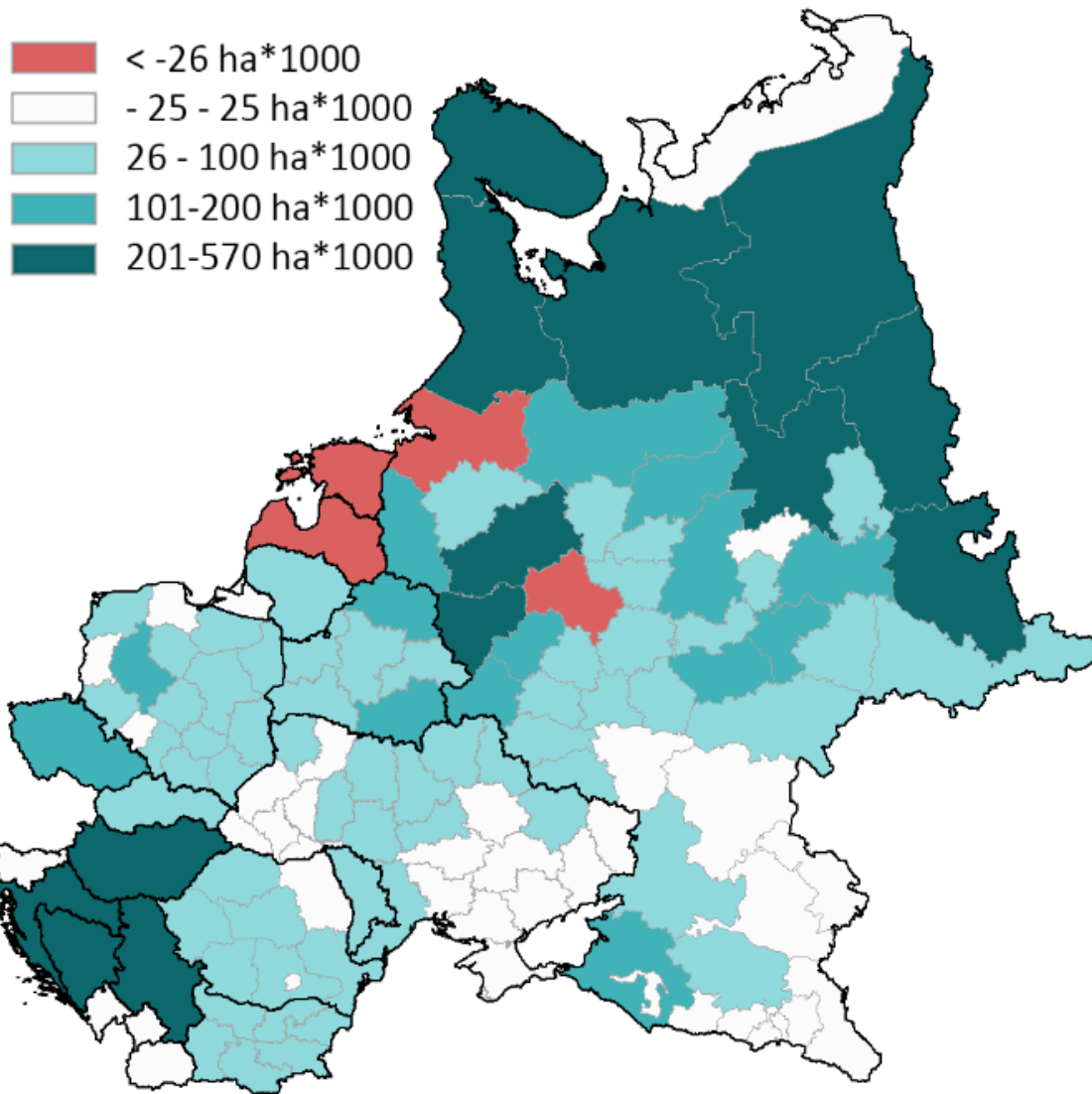
Potapov, P.,  
A. Krylov,  
et al.



Green: Tree Cover    White: NDVI    Red: SWIR reflectance

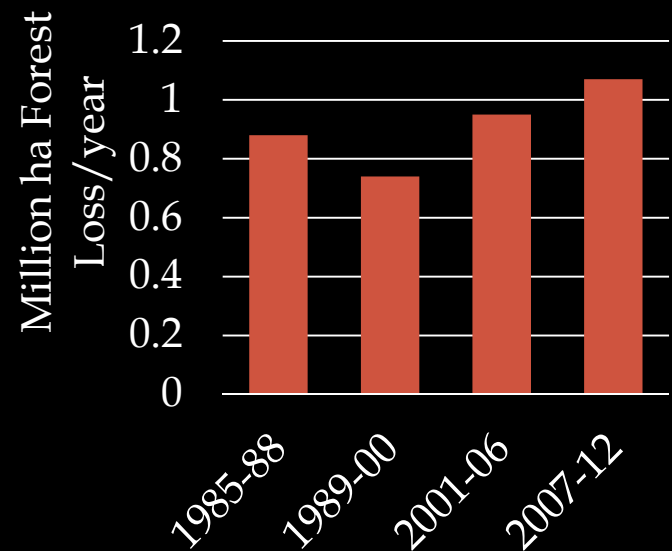
Potapov, P., A. Krylov, et al.





216 Million ha Forest in 1985  
 - 24 Million ha Forest Loss  
 +34 Million ha Forest Gain

-----  
 226 Million ha Forest in 2012



Potapov, P., A. Krylov, et al.



# Potential determinants of forest cover change

## Supply-side variables

- Percent fertile area
- Access to nearby cities
- Percent evergreen forest

## Demand-side variables

- Distance to nearest major city
- Percent urban
- GRP per capita

## Governance variables

- Size of forest bureaucracy
- Regional governance
- Autonomous status

Gehlbach,  
et al.

## Correlates of fire loss, 1989–2000 vs. 2001–2012

Dependent variable:	Fire loss, 1990s	Fire loss, 2000s
Percent fertile area	0.005** (0.002)	0.061*** (0.013)
Access to nearby cities	0.073*** (0.006)	0.267*** (0.066)
Percent evergreen forest	0.009** (0.003)	0.094*** (0.026)
Distance to nearest major city	0.002 (0.068)	-0.422 (0.500)
Percent urban population	0.000 (0.003)	-0.010 (0.023)
GDP per capita (log)	-0.148 (0.197)	-1.780* (0.961)
Forest bureaucrats (log)	0.088 (0.054)	0.533 (0.377)
Total forest area (log)	0.009 (0.038)	-0.085 (0.293)
Governance score	0.003 (0.006)	0.037 (0.046)
Autonomous status	-0.018 (0.054)	0.838 (0.696)

Gehlbach,  
et al.

## Correlates of logging loss, 1989–2000 vs. 2001–2012

Dependent variable:	Logging loss, 1990s	Logging loss, 2000s
Percent fertile area	0.020** (0.011)	-0.466** (0.221)
Access to nearby cities	0.014 (0.048)	-0.377 (0.654)
Percent evergreen forest	0.052** (0.021)	-0.016 (0.254)
Distance to nearest major city	-1.408** (0.455)	-8.967* (5.052)
Percent urban population	0.001 (0.029)	0.471 (0.324)
GDP per capita (log)	-2.849 (2.476)	7.800 (9.828)
Forest bureaucrats (log)	1.344** (0.391)	21.056** (7.815)
Total forest area (log)	0.914** (0.309)	3.690 (2.970)
Governance score	0.093** (0.045)	-0.273 (0.457)
Autonomous status	1.678** (0.619)	-2.277 (7.004)

Gehlbach,  
et al.

ТОВАРИЩИ  
ЛЕСОРУБЫ!  
С Д Е Р Ж И М  
С Л О В О , Д А Н Н О Е  
Т О В А Р И Щ У  
С Т А Л И Н У !

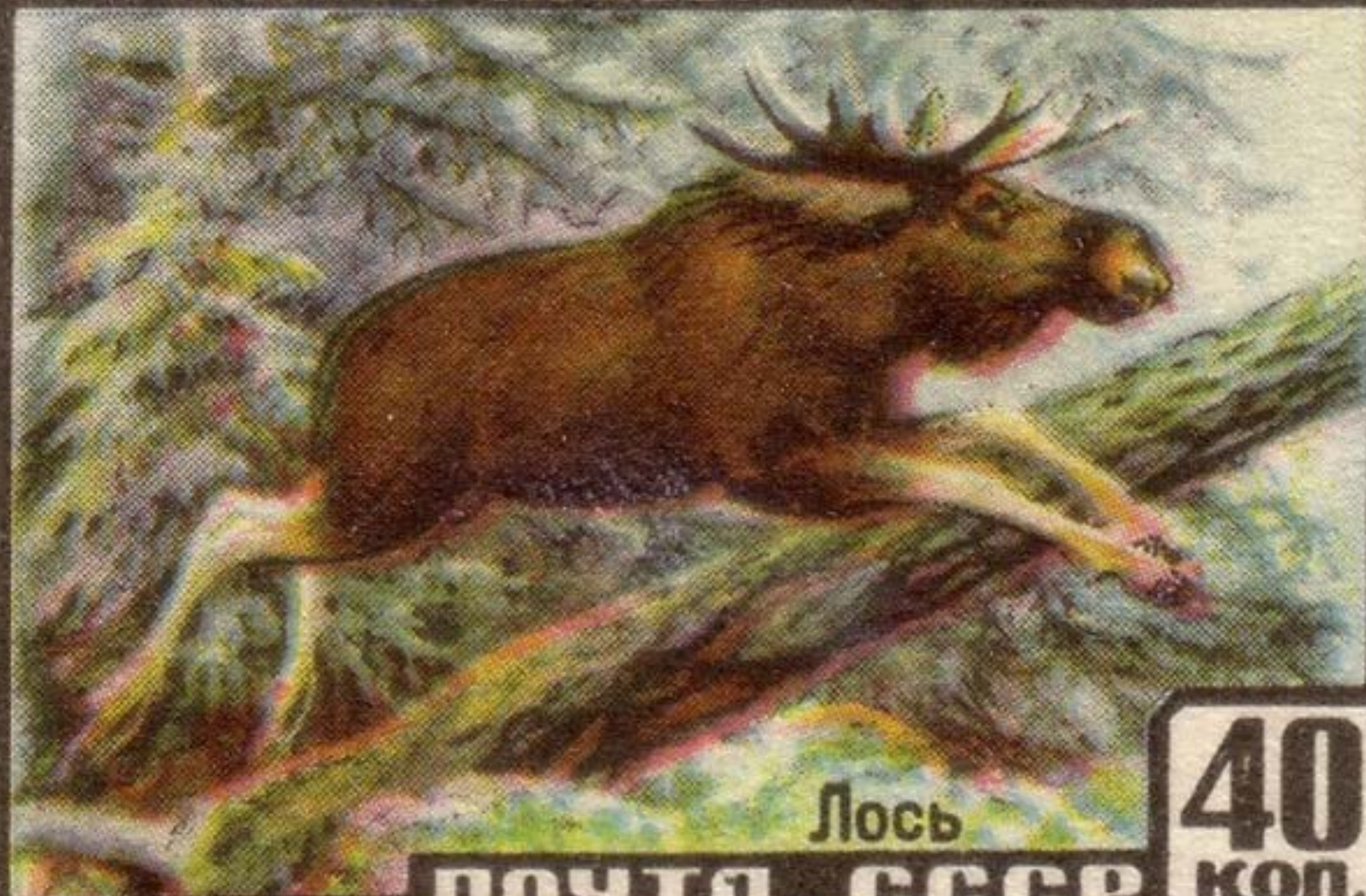
даём  
сверх  
плана!

А. Кокоркин  
48

ИЗДАТЕЛЬСТВО

ИЗДАТЕЛЬСТВО

ОХРАНЯЙТЕ ПОЛЕЗНЫХ ЖИВОТНЫХ



Лось

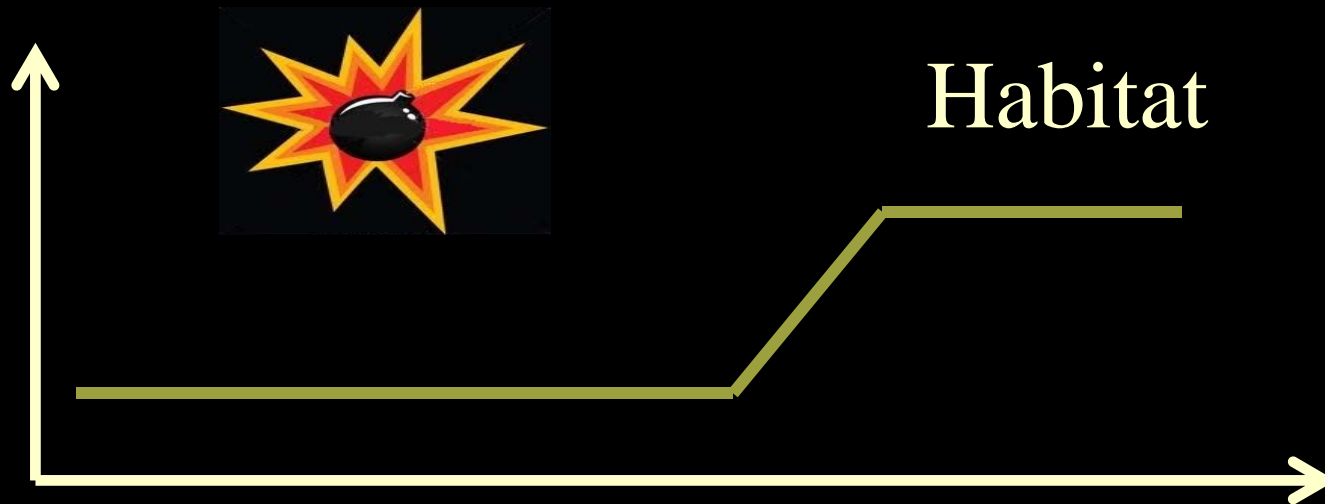
ПОЧТА СССР

40  
КОП.

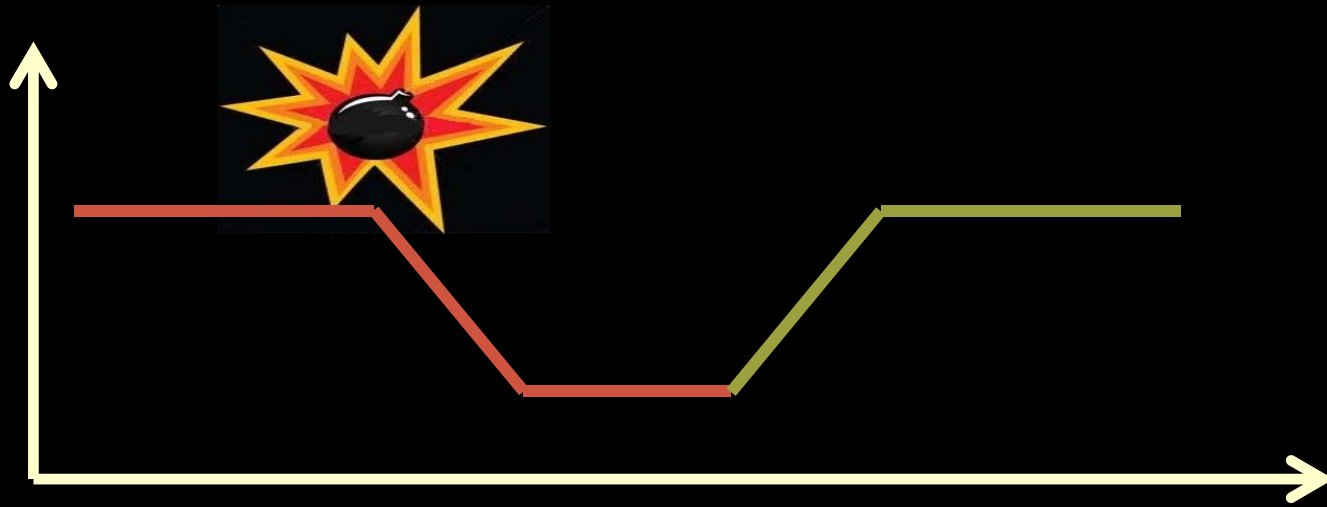
# Shocks and large mammals



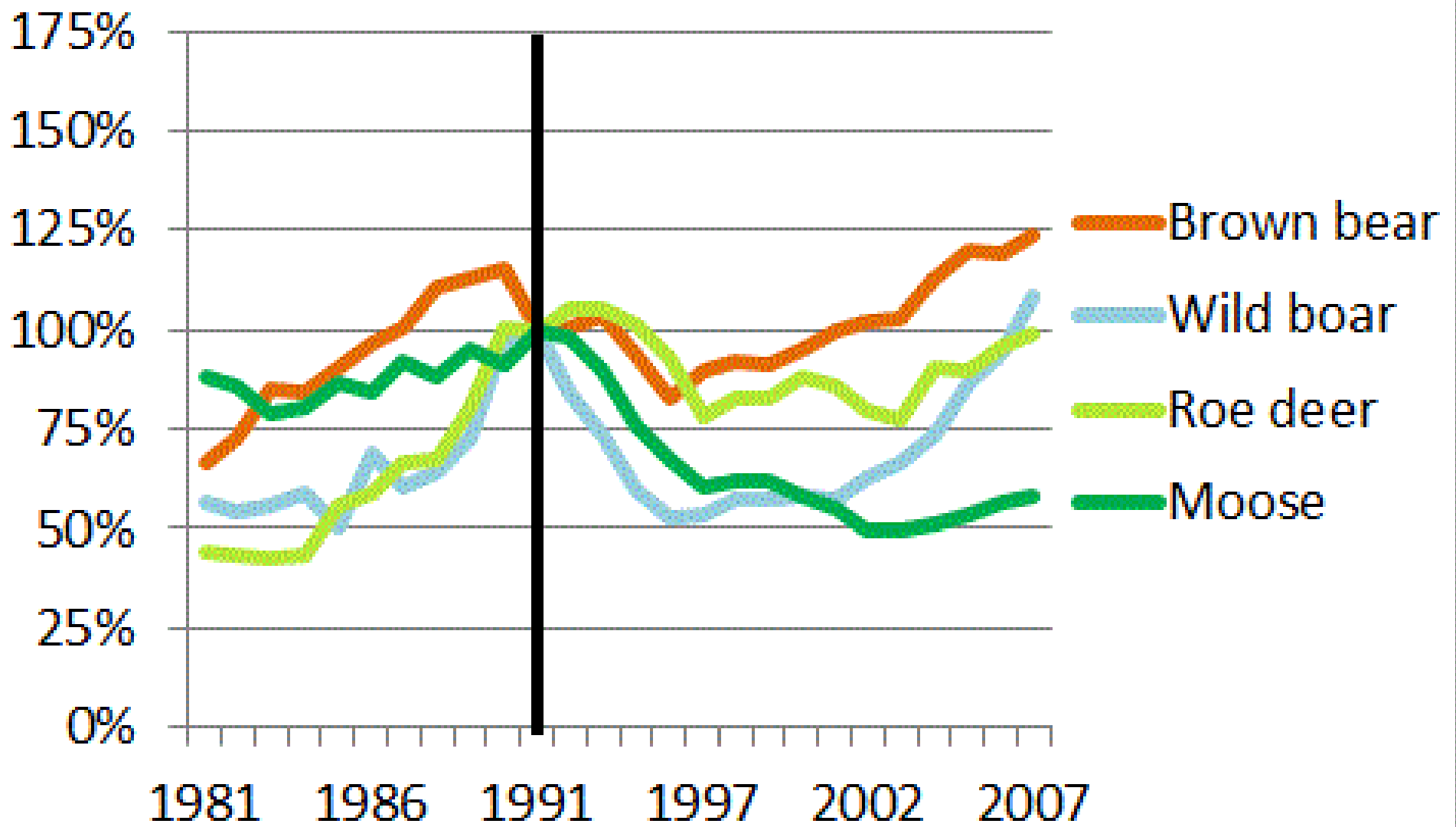
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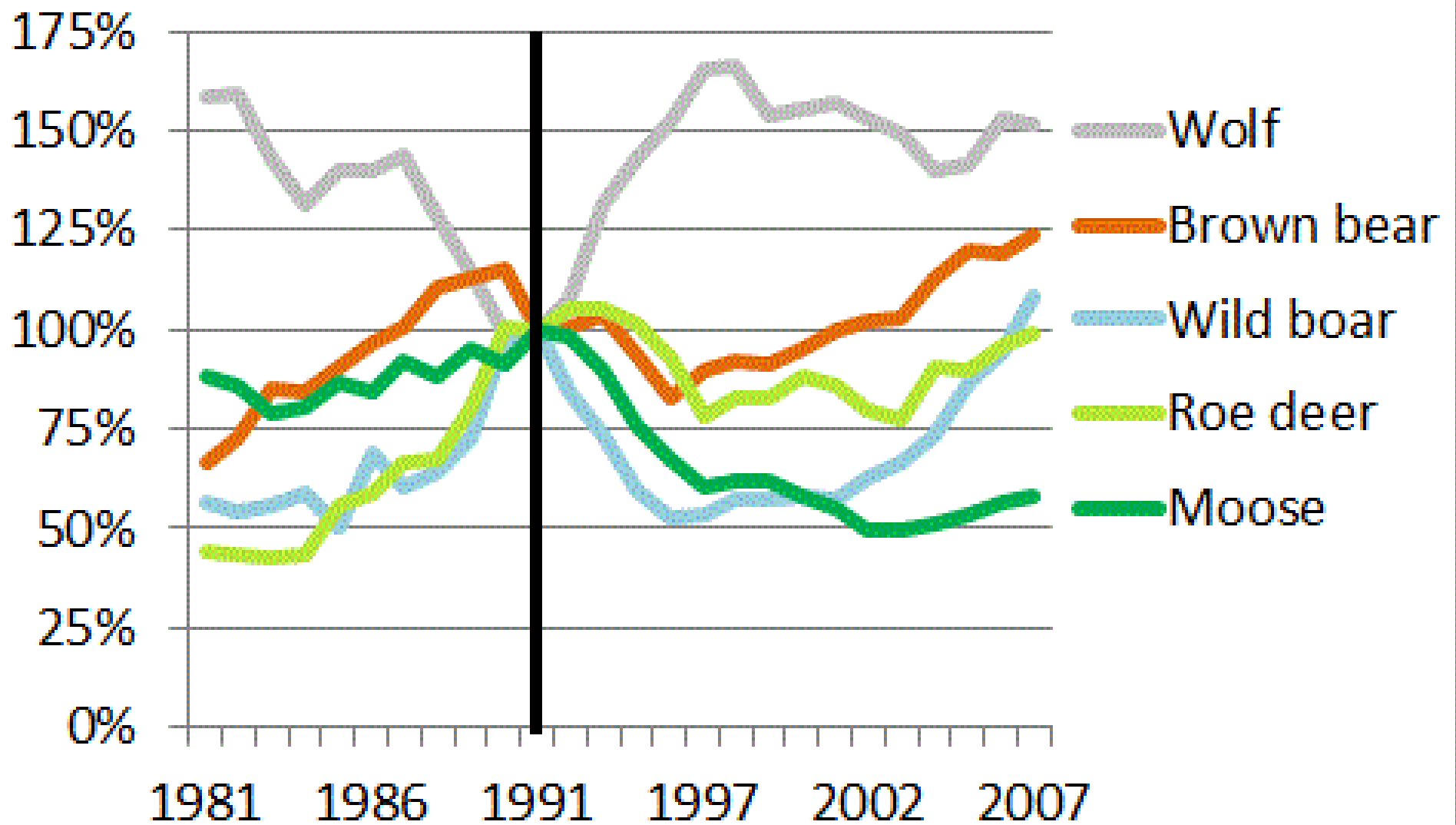


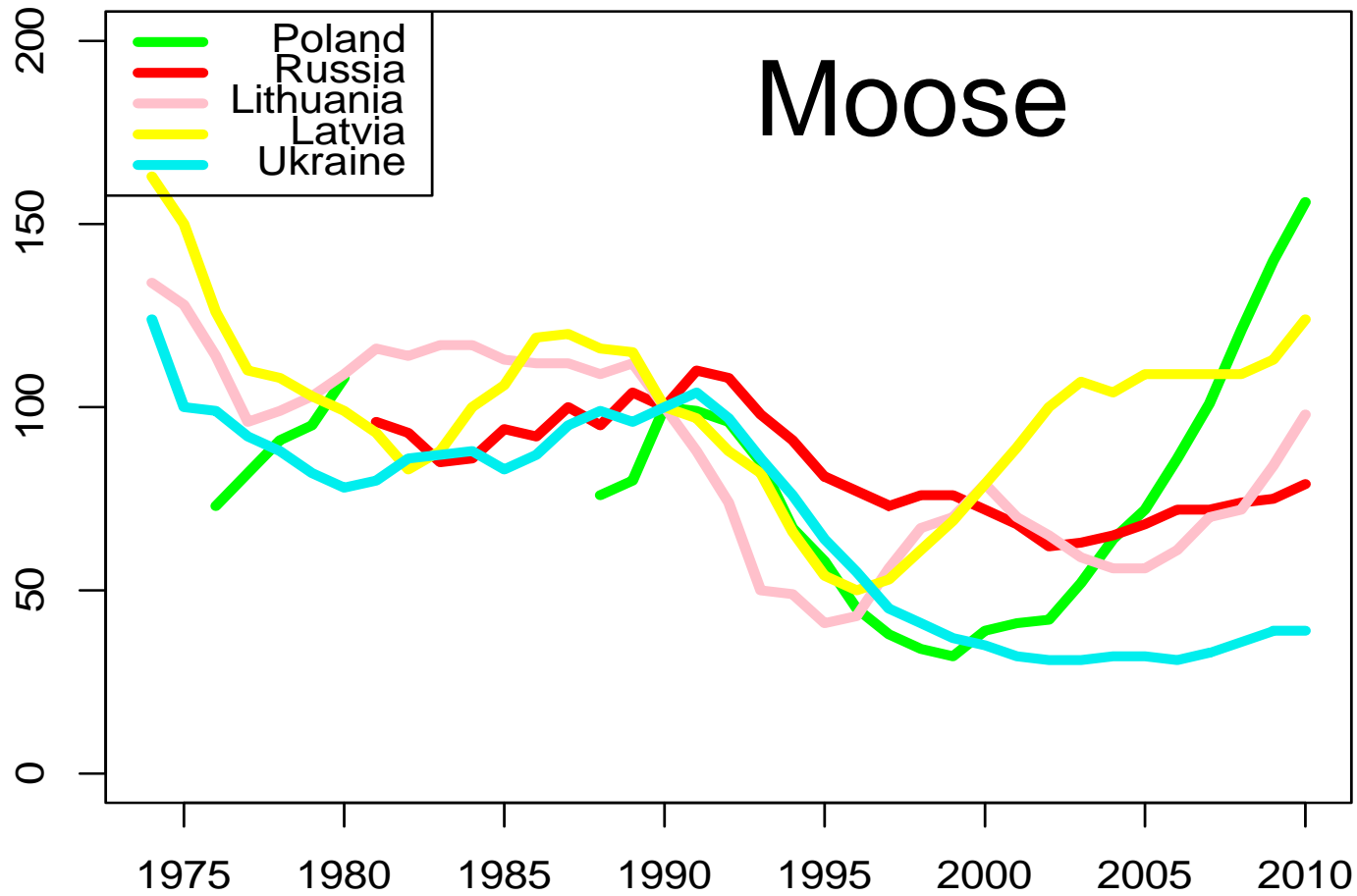
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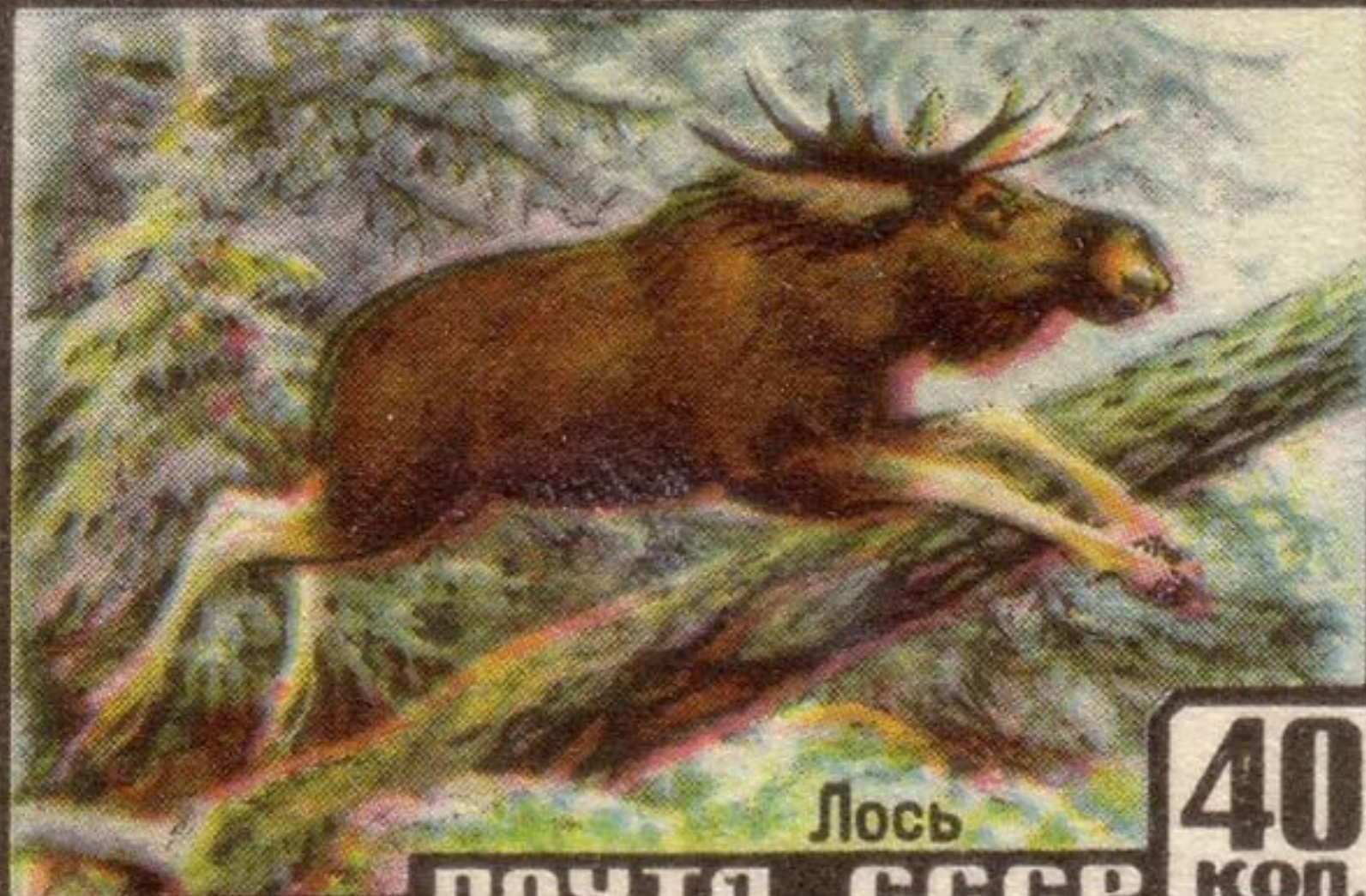








ОХРАНЯЙТЕ ПОЛЕЗНЫХ ЖИВОТНЫХ



Лось

ПОЧТА СССР

40  
КОП.



# Agriculture

Widespread abandonment

Some recultivation and higher yields

Countries matter

# Forestry

Logging first declined

Now higher rates than pre-collapse

Governance matters

# Wildlife

Declines and recovery

Species matter

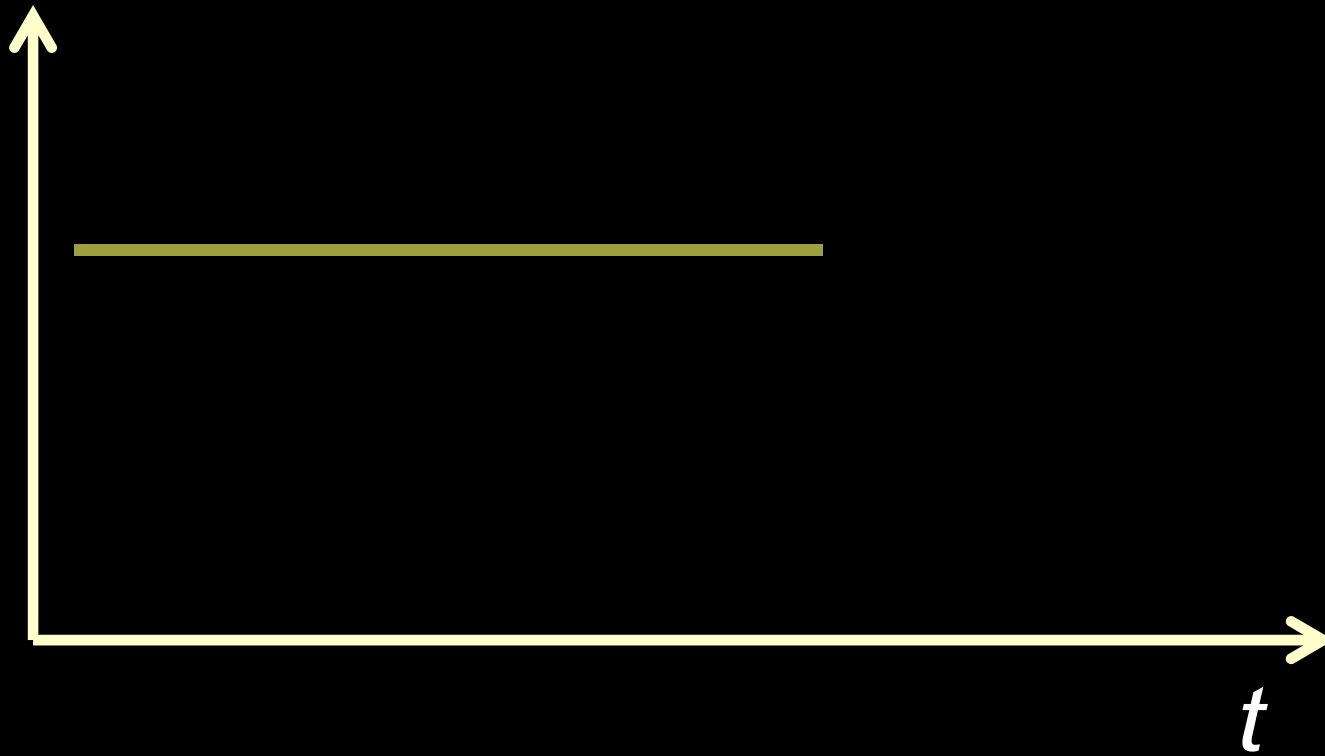
Socioeconomics matter



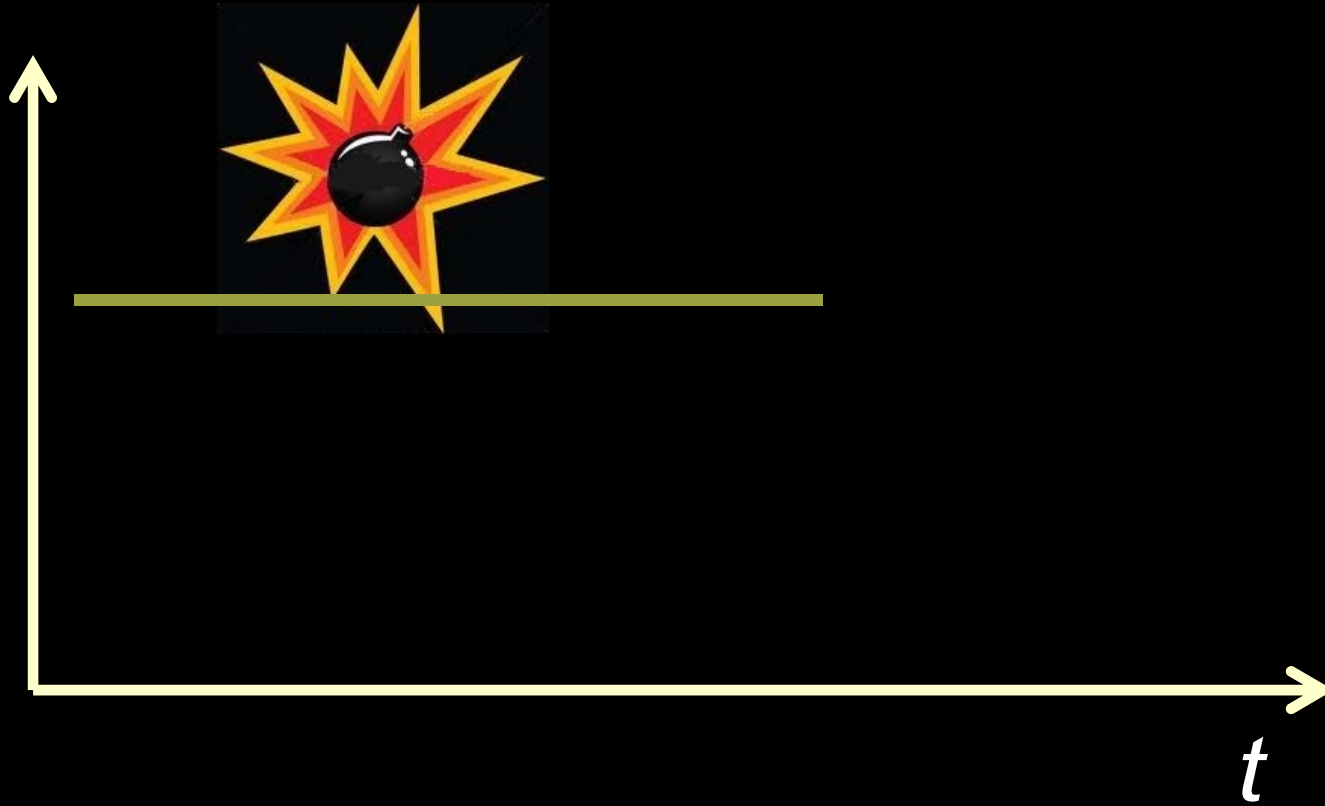
# Larger Lesson

Socioeconomic shocks  
greatly affect  
land use  
and land cover change

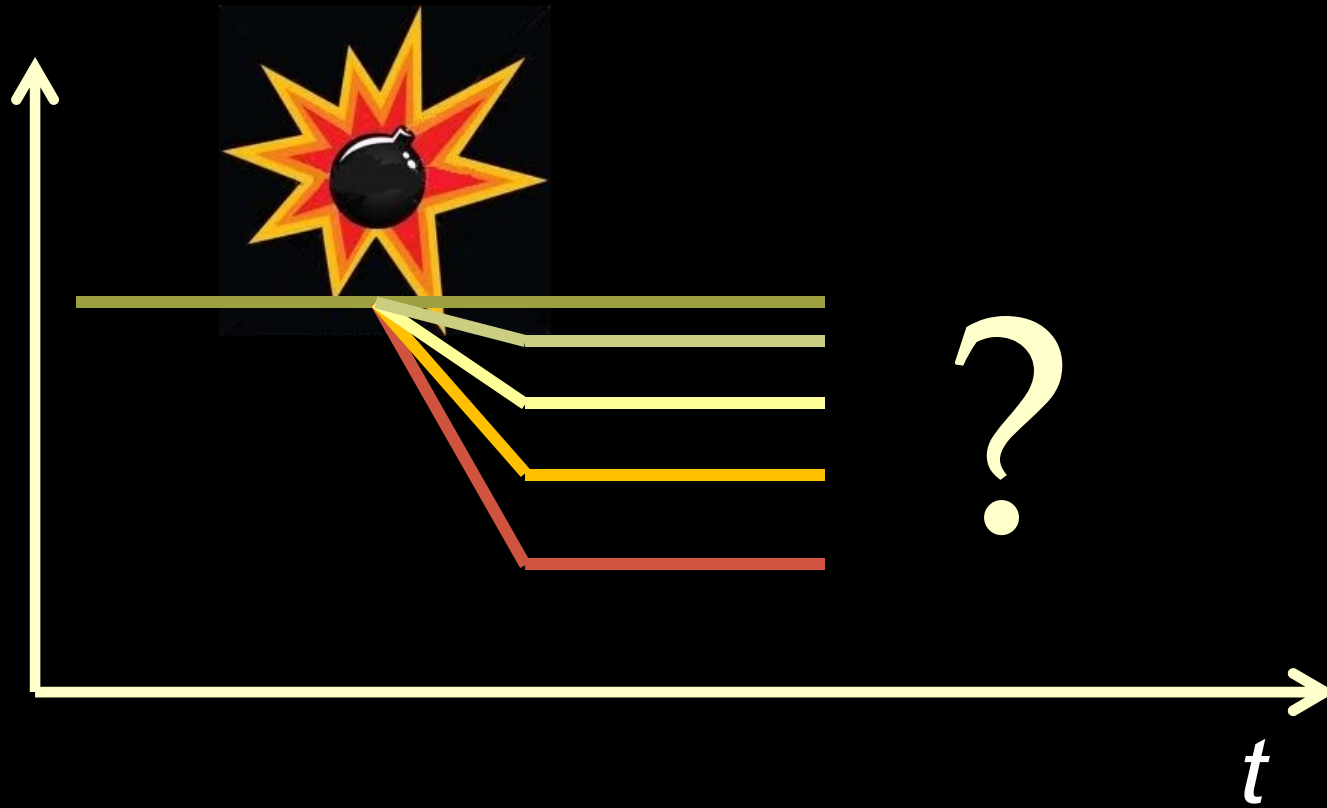
# Effects of shocks



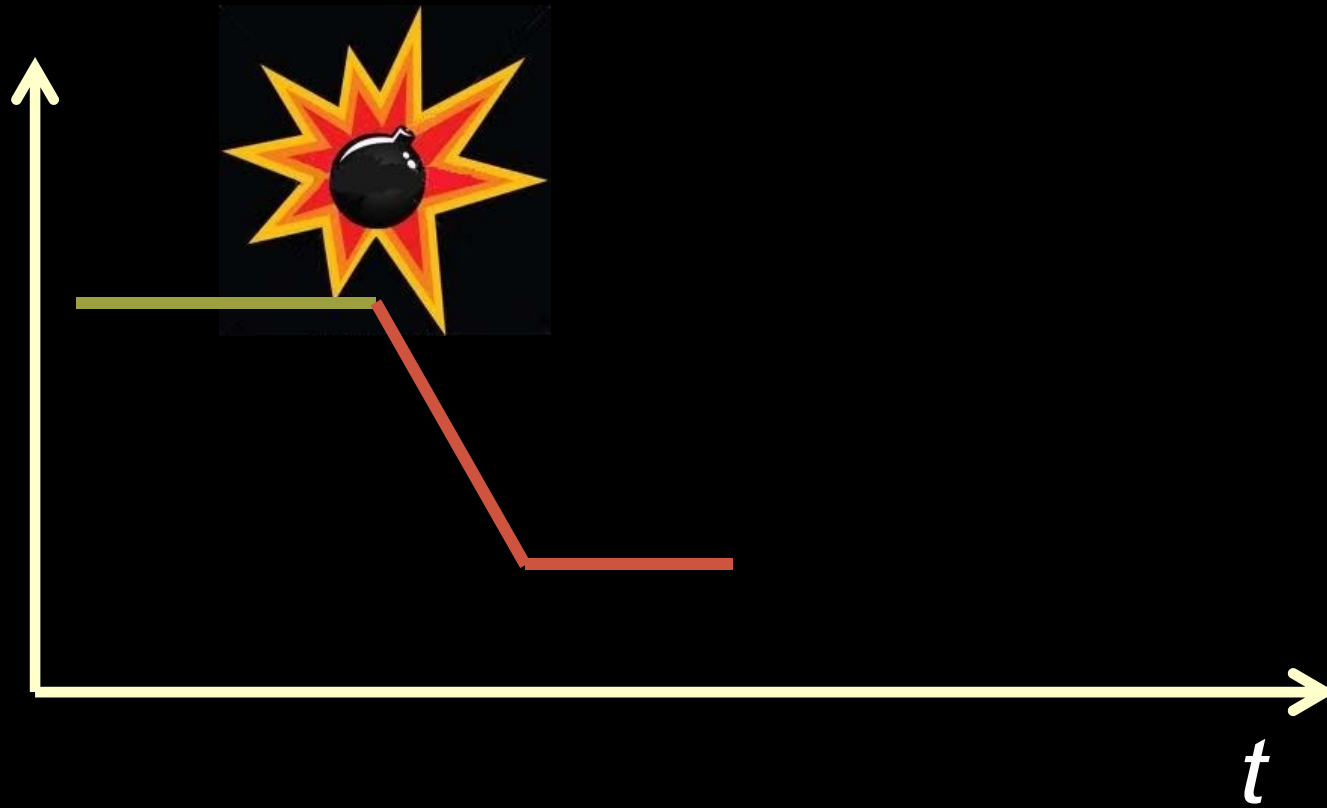
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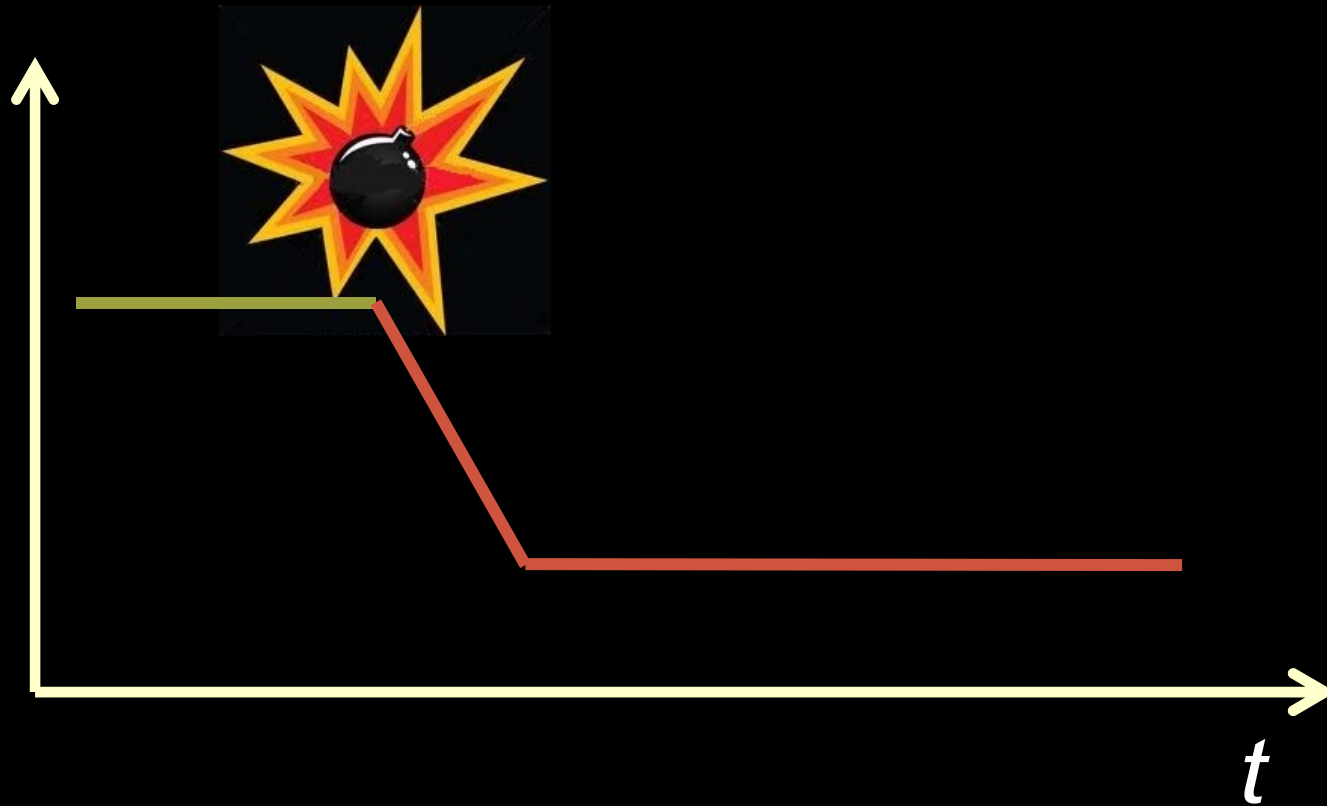


# Effects of shocks



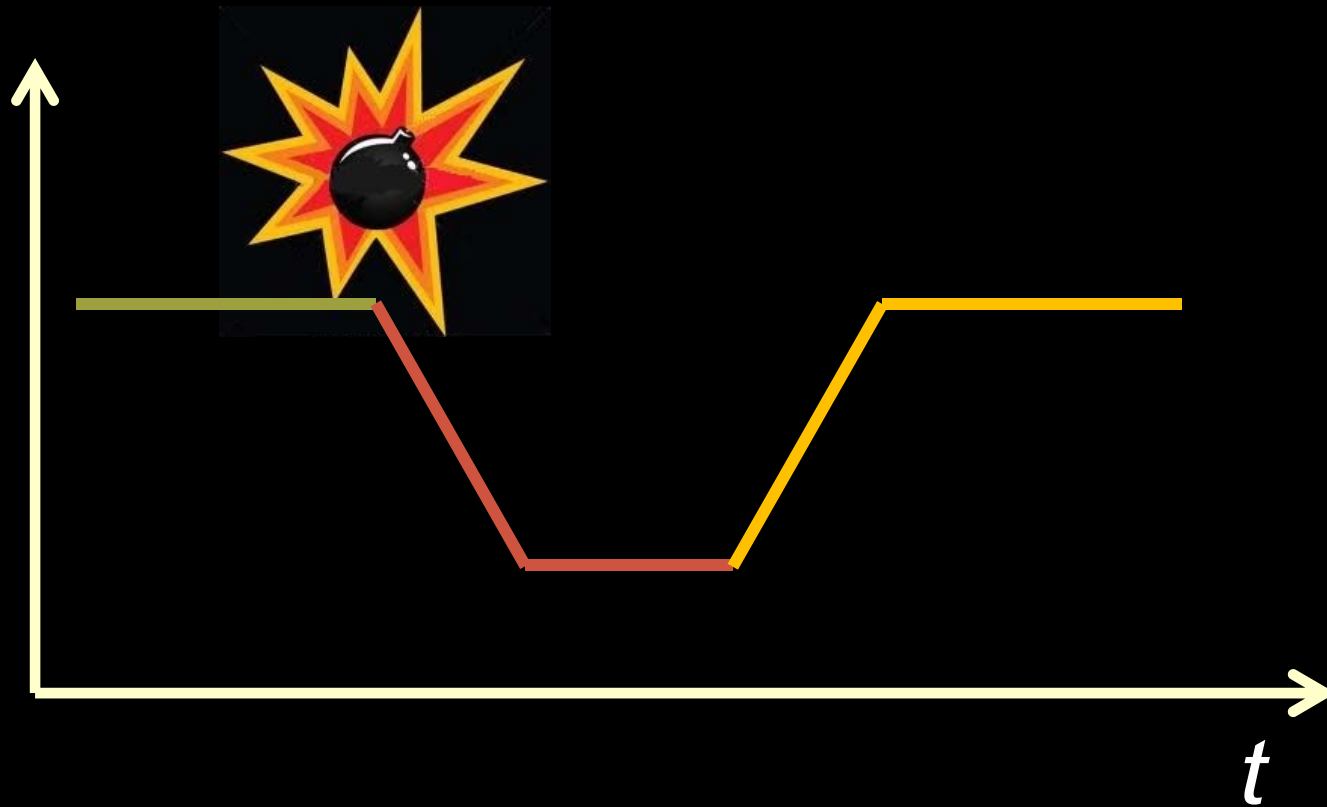
Strong effects!

# Effects of shocks



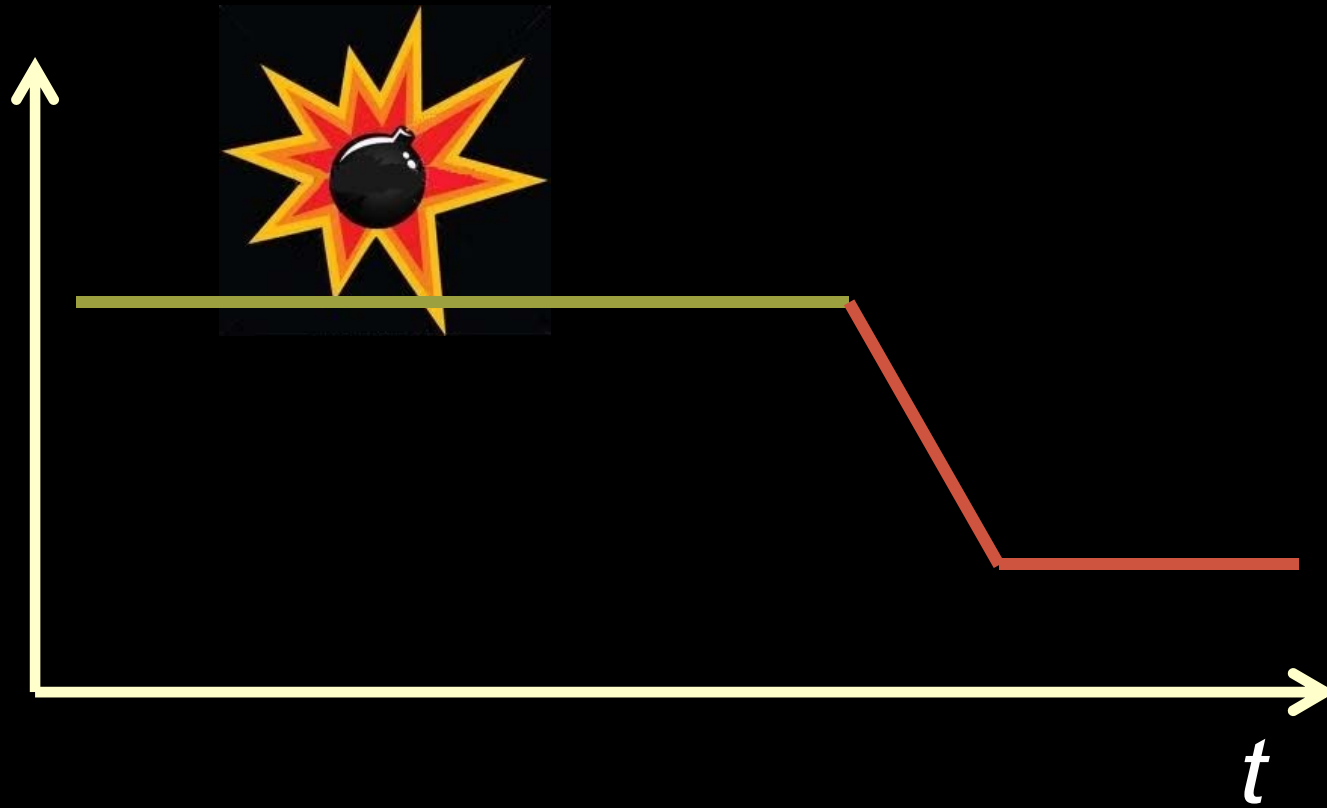
Multiple stable states

# Effects of shocks



Recovery

# Effects of shocks



Time lags



# Sopron, Hungary: the picnic that changed the world

Twenty-five years ago today, a diplomatic picnic helped bring down communism in Eastern Europe. Adrian Bridge explains



Alois Mock and Gyula Horn take down the Iron Curtain separating Austria and Hungary Photo: AP

# Larger Lesson

Eastern Europe provides  
a great 'natural experiment'  
to understand  
the complexity of  
land use and land cover change







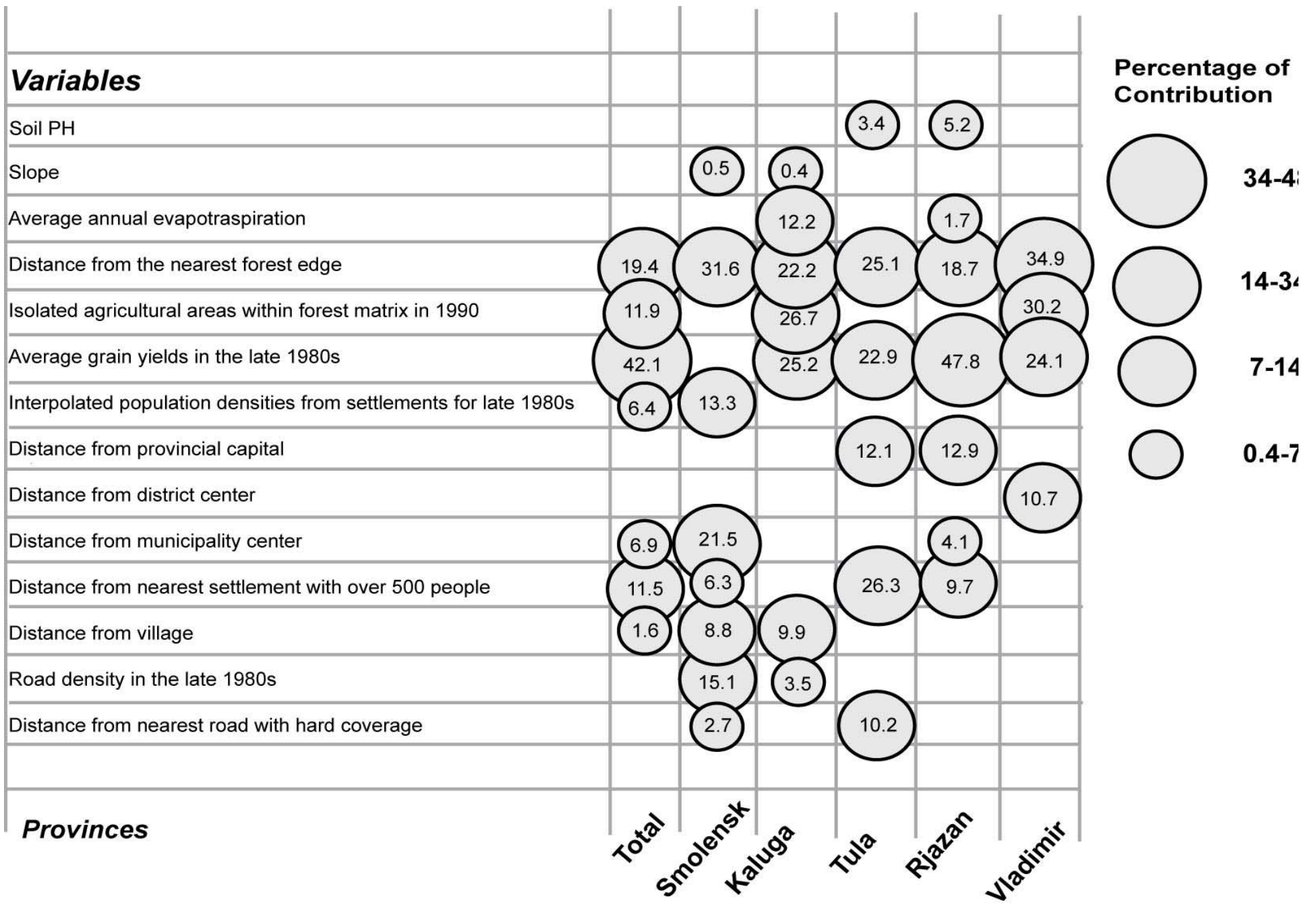






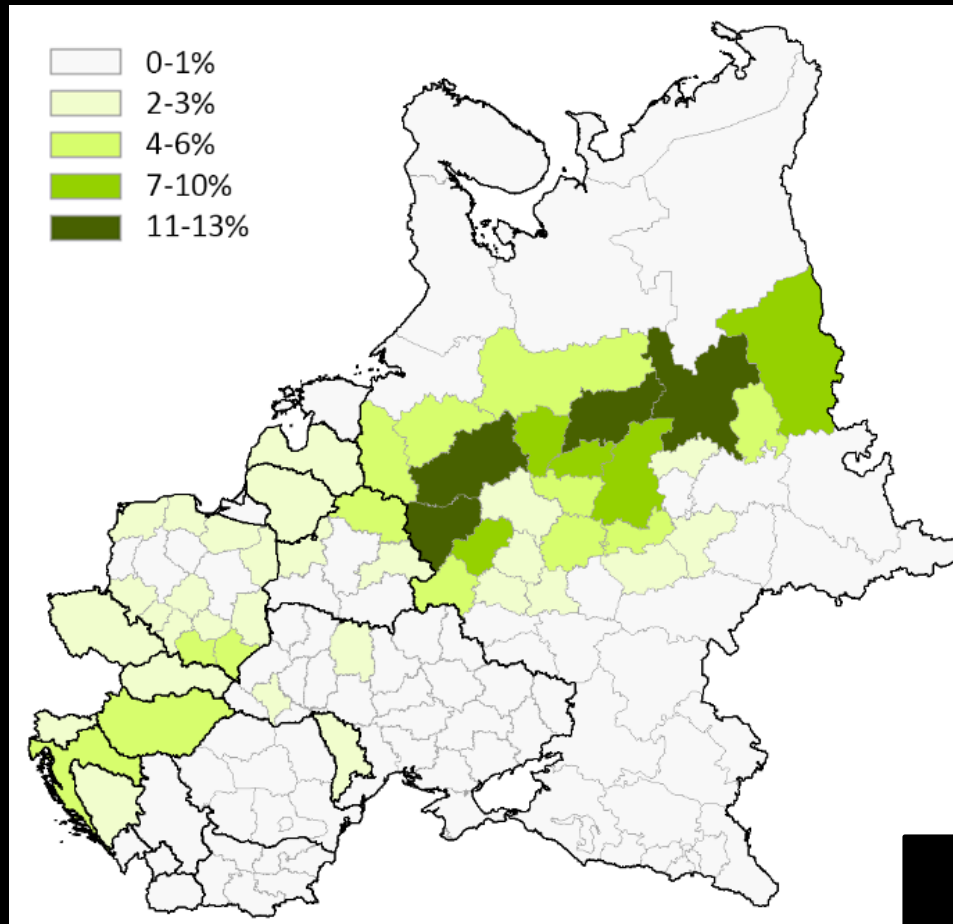






# Result: afforestation

or 6.4 million ha - forest growth on former agricultural land



Percent afforested former agricultural areas of total non-forest land area for year 1985