CLIMATE CHANGE AND WILDLAND FIRES IN CENTRAL ASIA

Dr. Leonid Kondrashov
Regional Central Asia Wildland Fire Network
Pacific Forest Forum

Climate change:

-A REALITY and

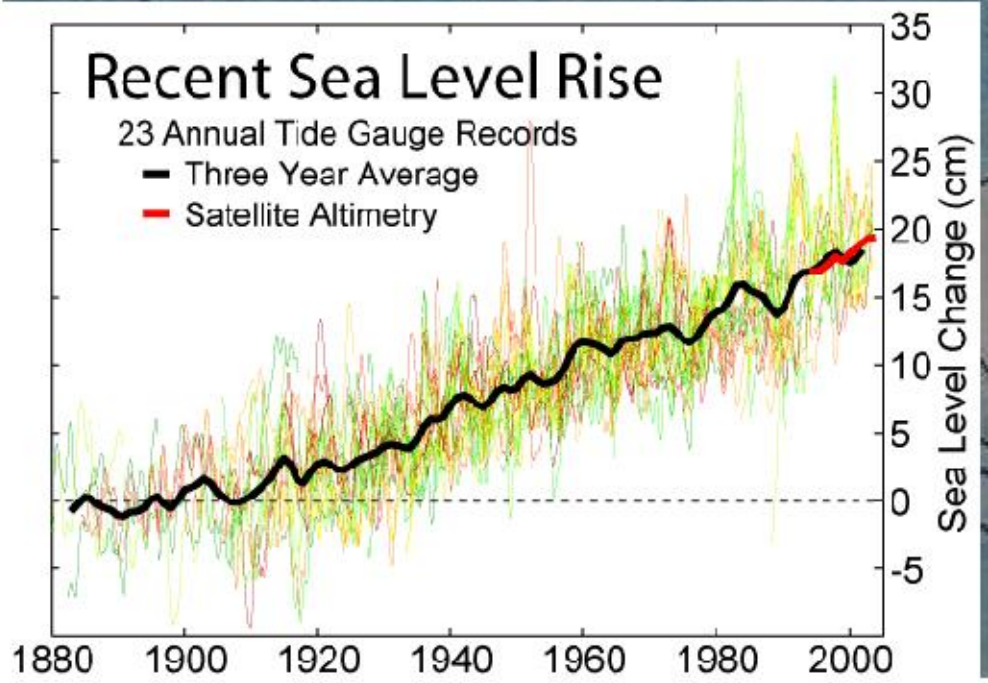
A SCALE EVENT
introducing changes in nature and society
linked directly with human activity

-Mitigation of Climate Change
is the defining challenge of our ages

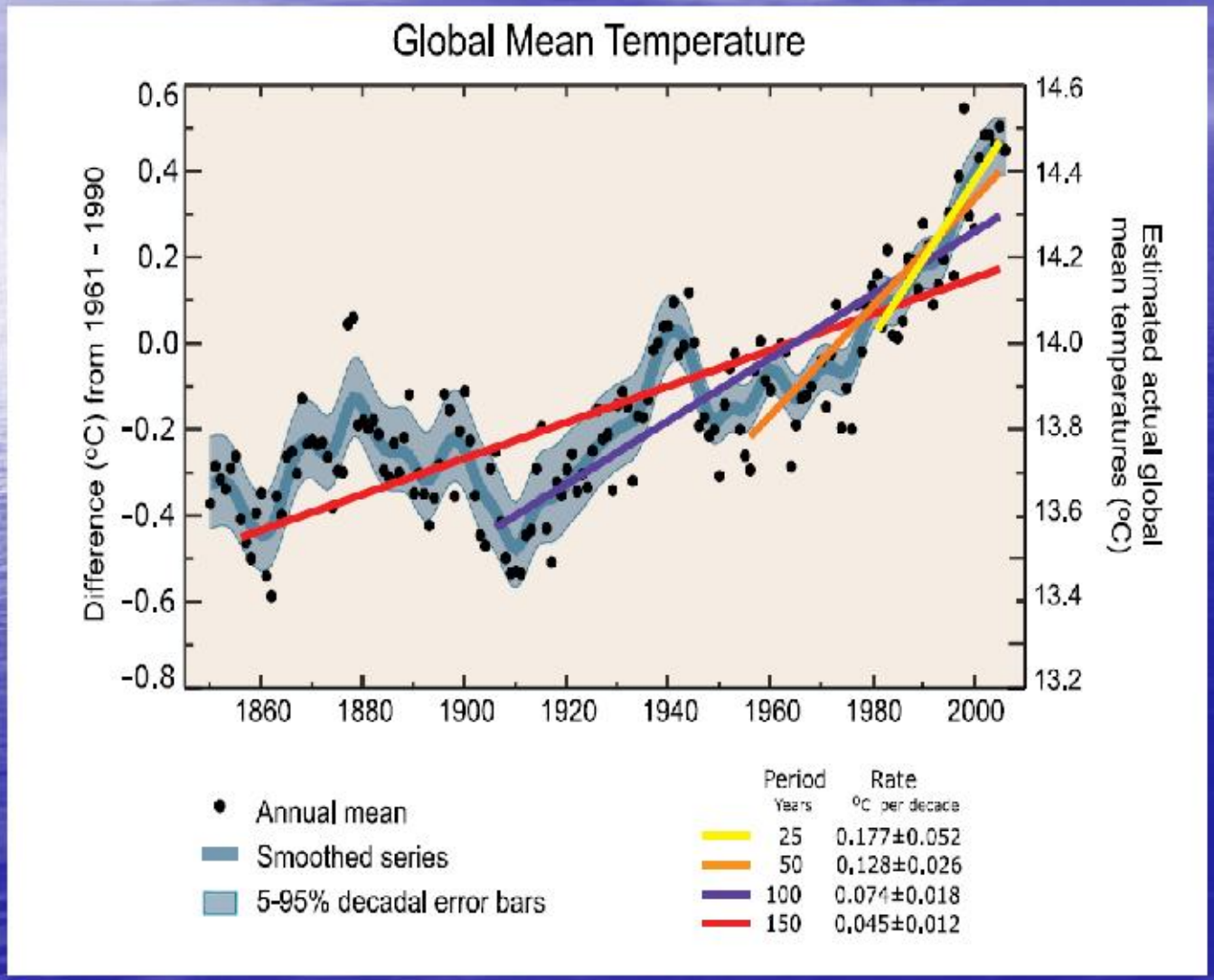
-International actions on global warming must
be among main priorities of world community

Geographic distribution of biomes are dependent on temperature, precipitation, altitude and latitude.

Weather patterns dictate the type of plants that will dominate an ecosystem.



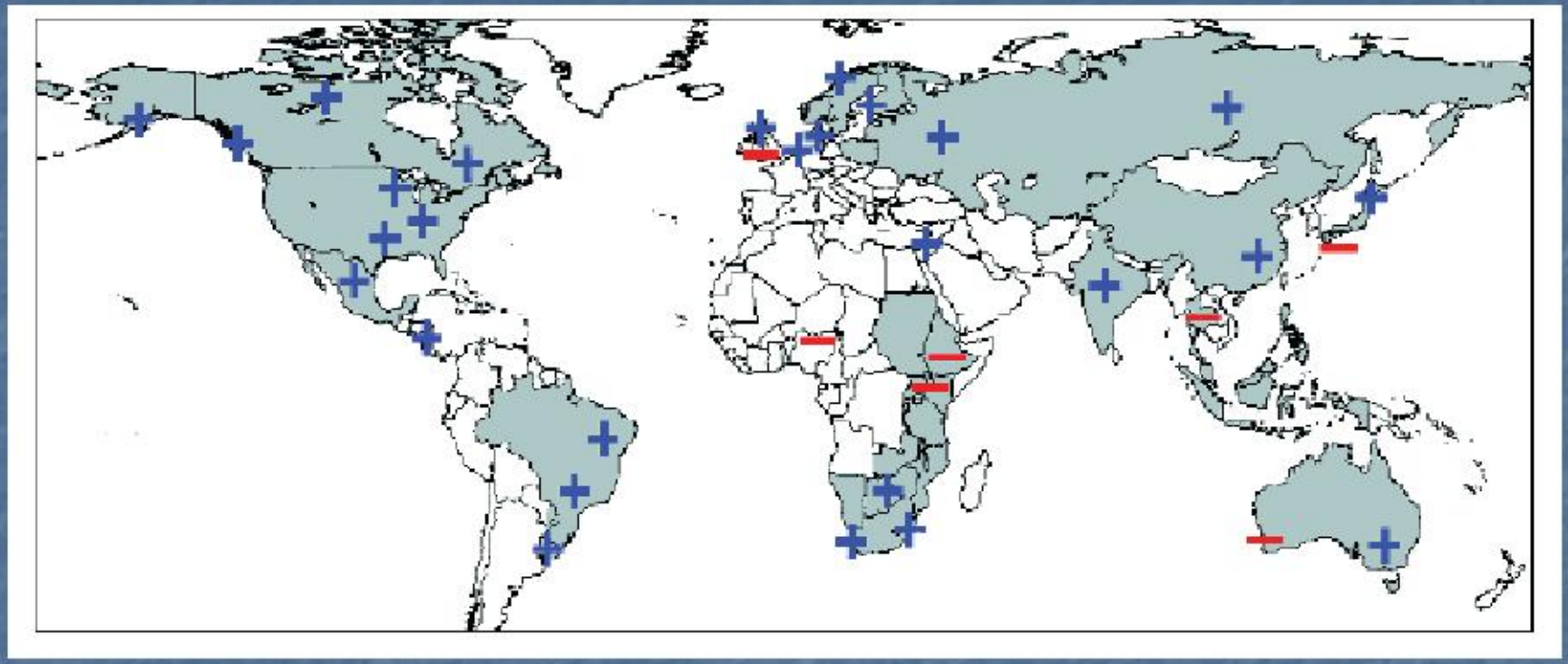
GLOBAL WARMING



According to the recent IPCC report, the mean global surface temperature has increased by 0.74°C over the last 100 years (1906-2005)

The warmest years have
been recorded in the past decade

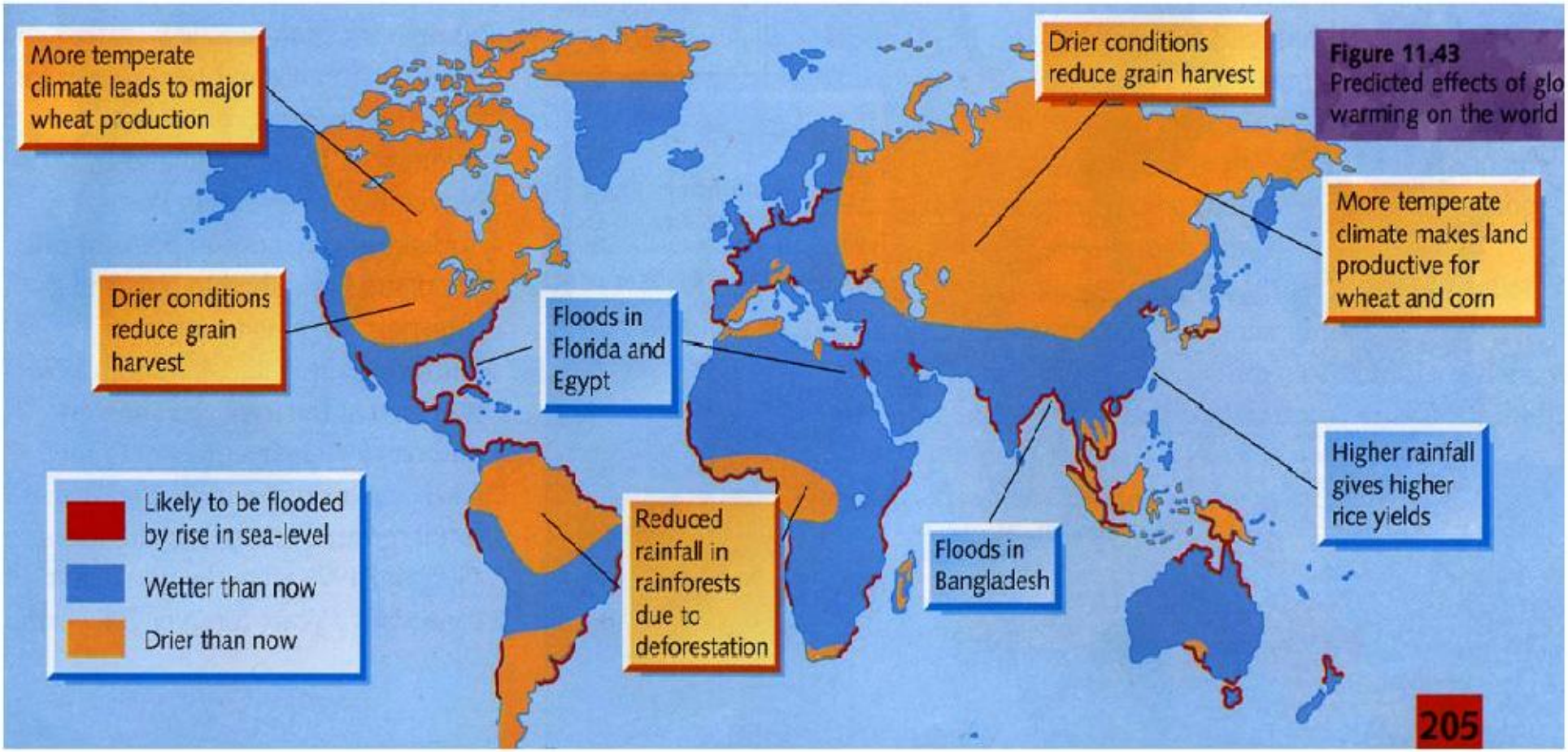
Changes in the precipitation pattern : IPCC Report (2007)



Precipitation has significantly increased (+) in eastern North and South America, northern and central Asia and northern Europe

There has been decline (-) in precipitation in the Mediterranean, some regions in southern Asia, southern Africa and Sahel

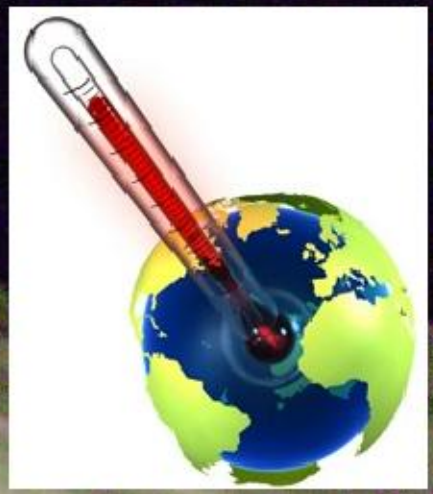
Global warming effects

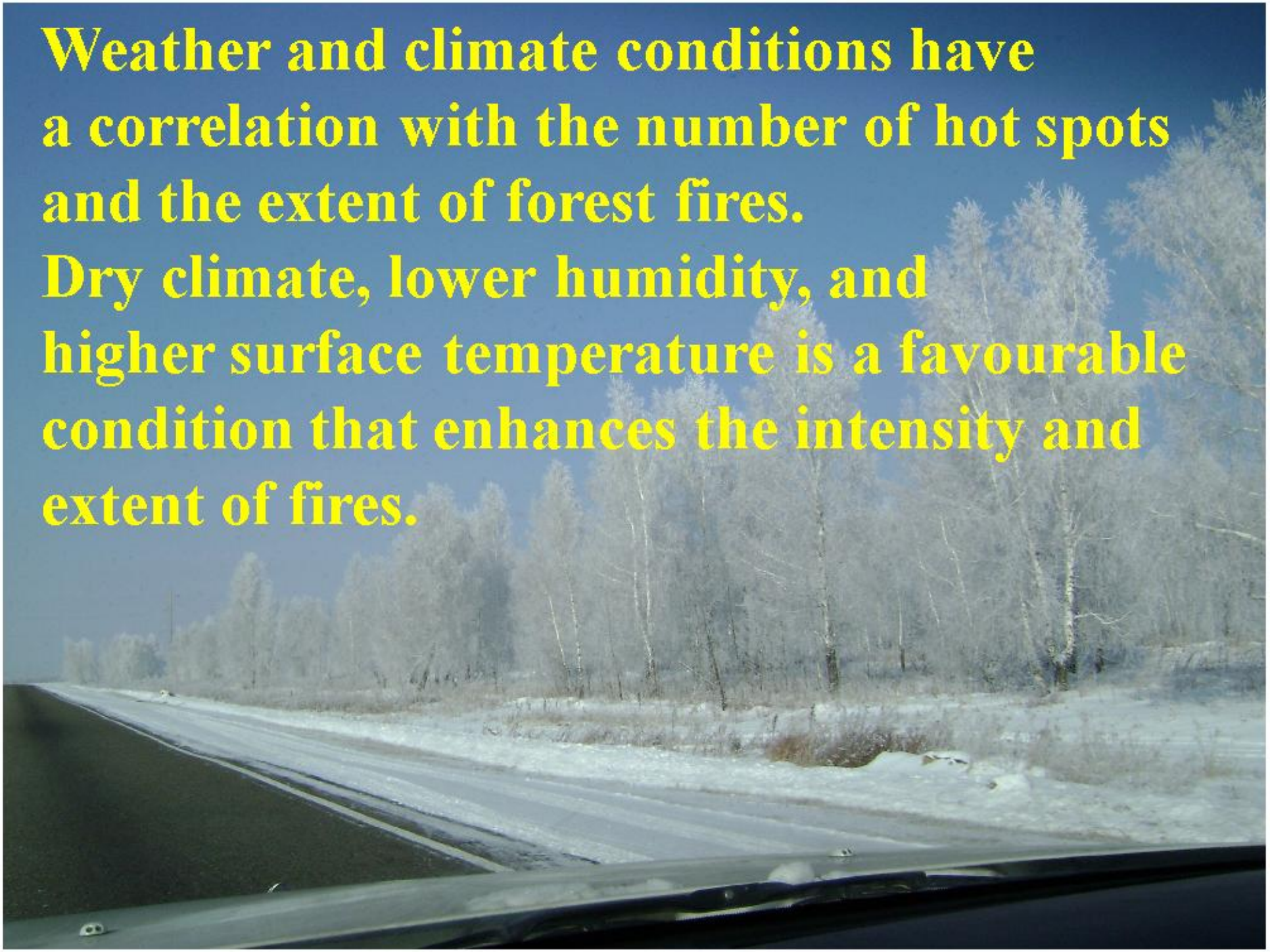


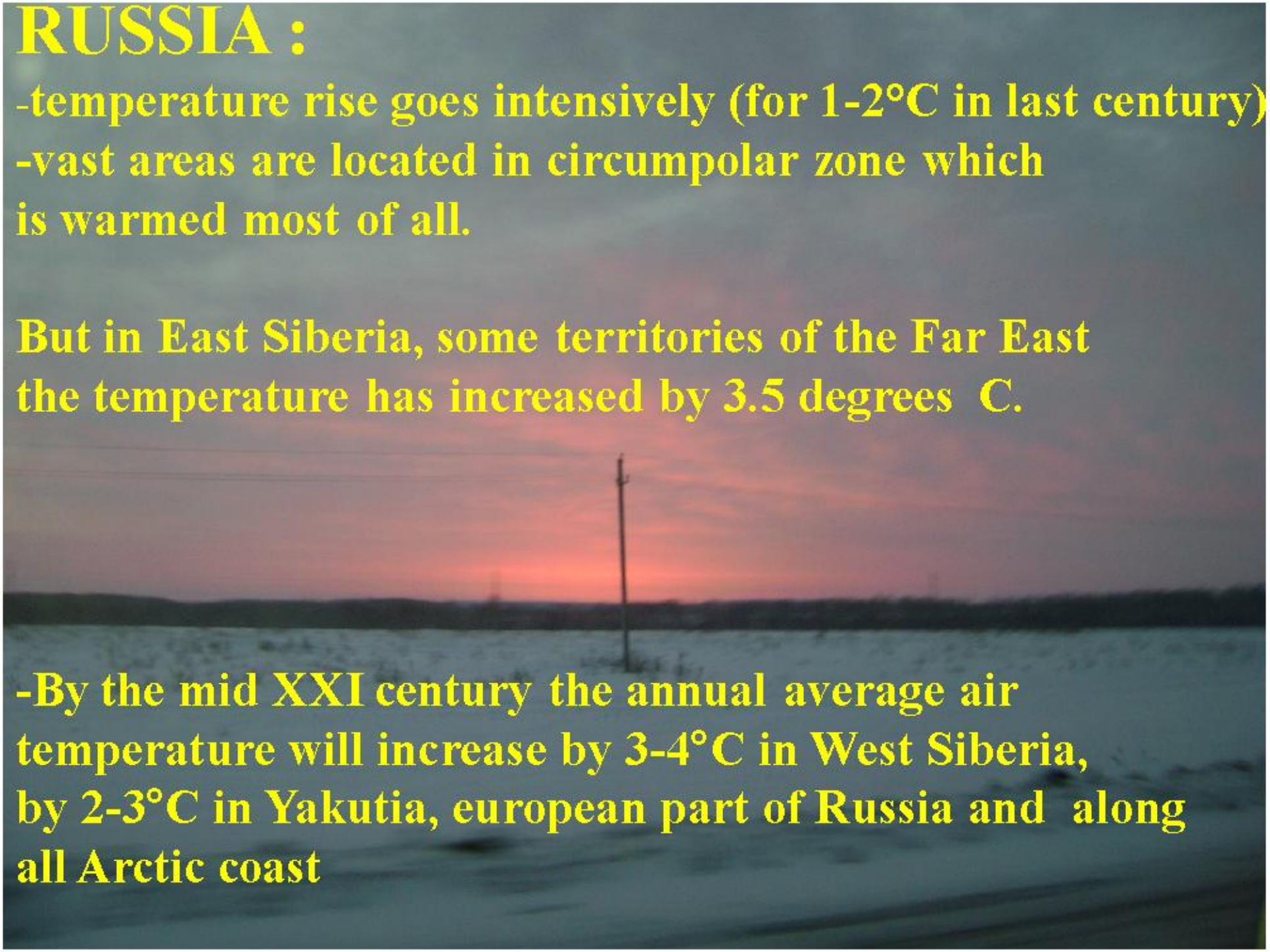

Projected trends of climate change impacts on vegetation cover and fire regimes, as well as observed demographic and socio-economic trends suggest that
fire may continue to play a major role in the destruction of vegetation cover in Central Asia,
resulting, among others, in accelerating formation of steppe conditions.

CLIMATE CHANGE CAN AFFECT FORESTS BY ALTERING FREQUENCY, INTENSITY, DURATION, AND TIMING OF FIRE, DROUGHT, INTRODUCED SPECIES, INSECT AND PATHOGEN OUTBREAKS, HURRICANES, WINDSTORMS, ICE STORMS, OR LANDSLIDES

35% of world's existing terrestrial habitat predicted to be altered




Weather and climate conditions have
a correlation with the number of hot spots
and the extent of forest fires.
Dry climate, lower humidity, and
higher surface temperature is a favourable
condition that enhances the intensity and
extent of fires.



RUSSIA :

-temperature rise goes intensively (for 1-2°C in last century)
-vast areas are located in circumpolar zone which is warmed most of all.

But in East Siberia, some territories of the Far East the temperature has increased by 3.5 degrees C.

-By the mid XXI century the annual average air temperature will increase by 3-4°C in West Siberia, by 2-3°C in Yakutia, european part of Russia and along all Arctic coast

By 2070s the average temperature will increase by 4-6 degrees mainly due to warming in the north, in south parts of Russia the summer will become warmer by 1 degree.

North winters become more humid while south experience more droughts.

By mid XXI century the duration of heating period can decrease by 1-2 weeks in the mid part of Russia and by 3 weeks and more in the northern regions.

Negative impact will be made by more frequent extreme climatic events:

very hot days,

strong precipitation,

storms,

droughts,

floods.

Shift of nature geographic zones:

The borders of polar tundra, forest tundra and south taiga forest zones will shift to the north by 200-350 km.

The steppe zone will increase significantly while dry steppe zone area decreases.

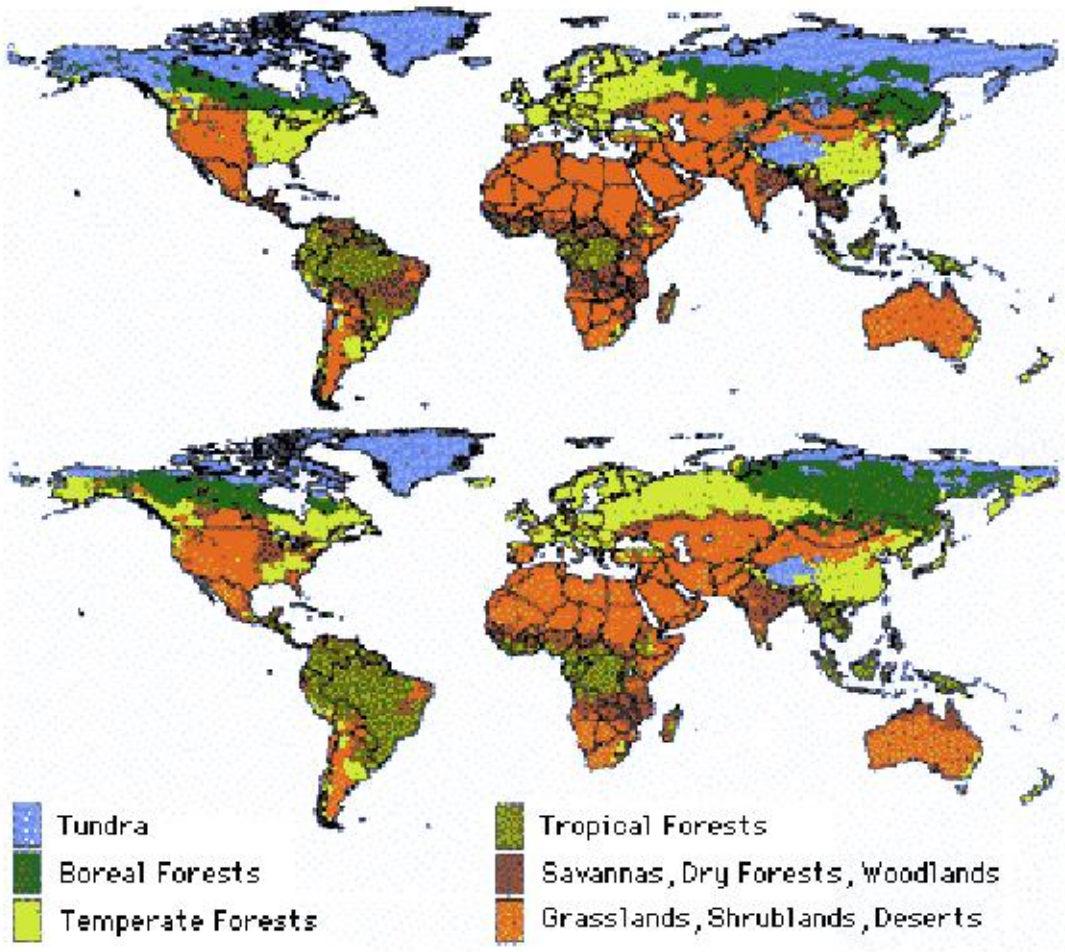
Forest steppe territory will increase in the west part of Russia and decrease in Preduralie.

Shifts in Terrestrial Habitat

- It is predicted that at the end of this century there will be large scale shifts in the global distribution of vegetation in response to anthropogenic climate change.

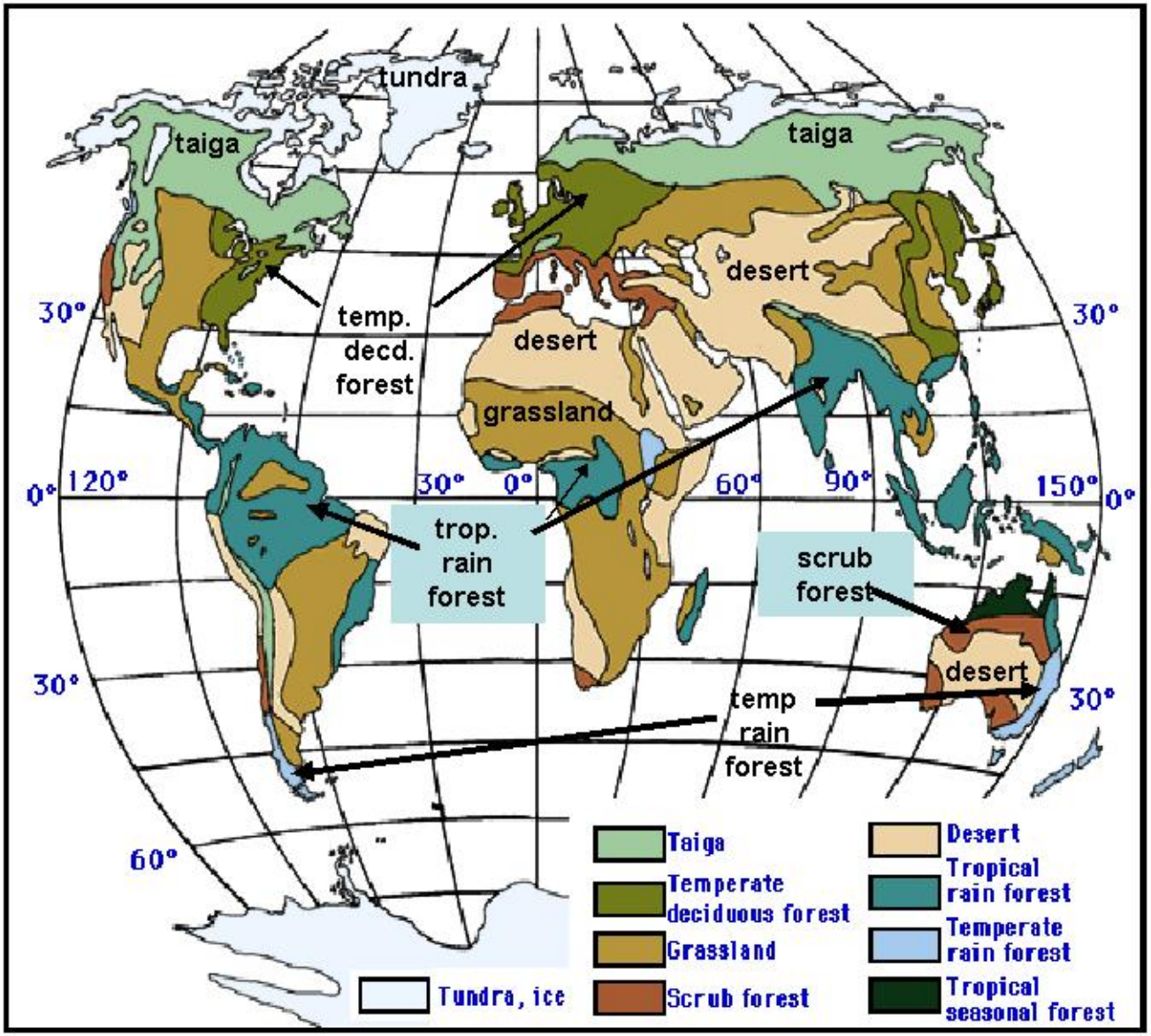
- With man doubling the amount of carbon dioxide entering into the atmosphere the climate is changing more rapidly then plant migration can keep up.

Potential distribution of the major world biomes under current climate conditions



Projected distribution of the major world biomes by simulating the effects of 2xCO2-equivalent concentrations

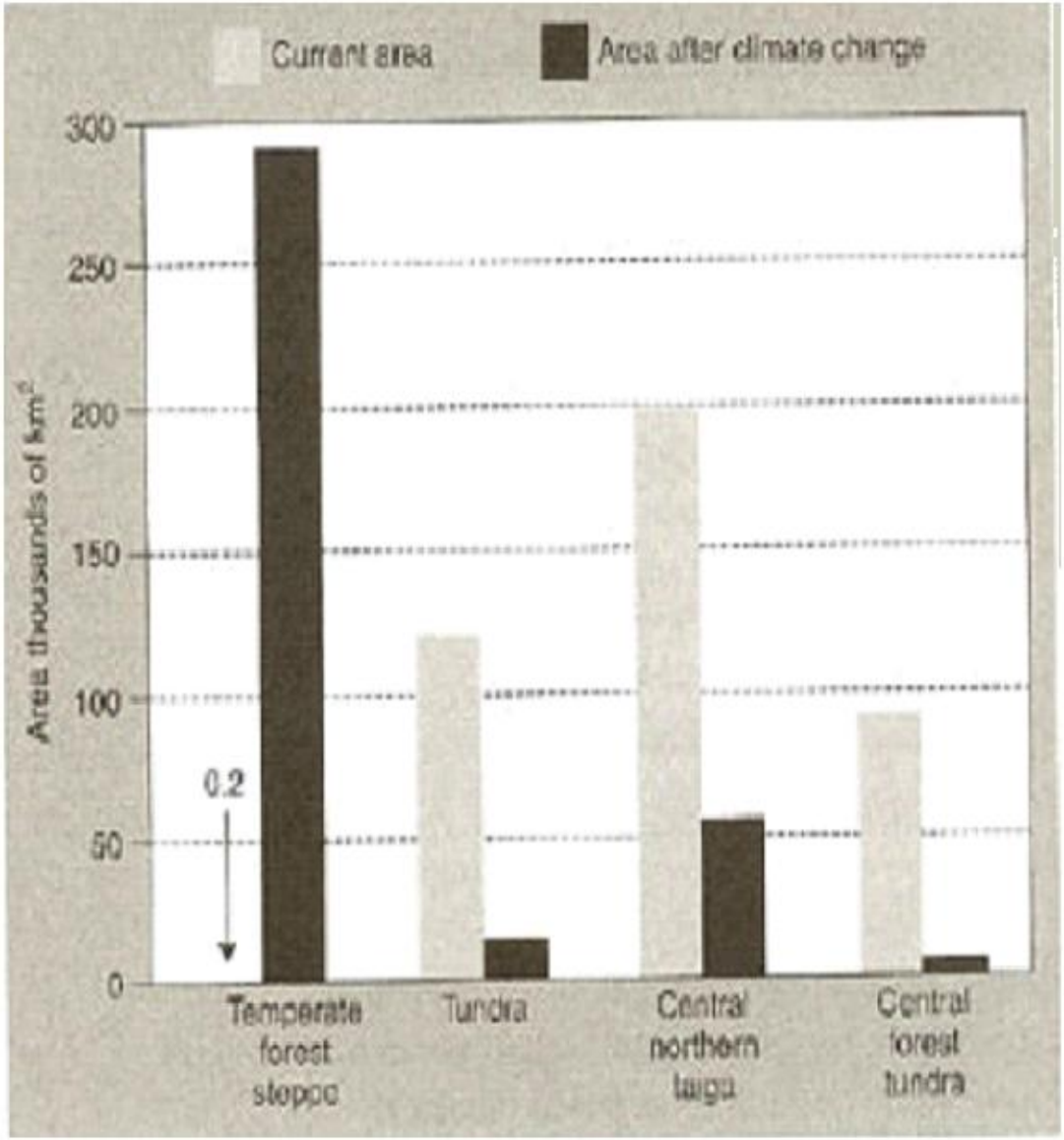
PRESENT DAY BIOMES



Boreal Vegetation

- Research indicates the greatest amount of change will occur at the higher latitudes
- Vegetation existing in these areas will be replaced with temperate forest species
- Tundra, Taiga and Temperate forests will migrate pole ward
- Some plants will face extinction because habitat will become too small (ex. Mountain tops)

Predicted changes in Siberian vegetation in response to doubling of CO_2



Forest Fires in Siberia:

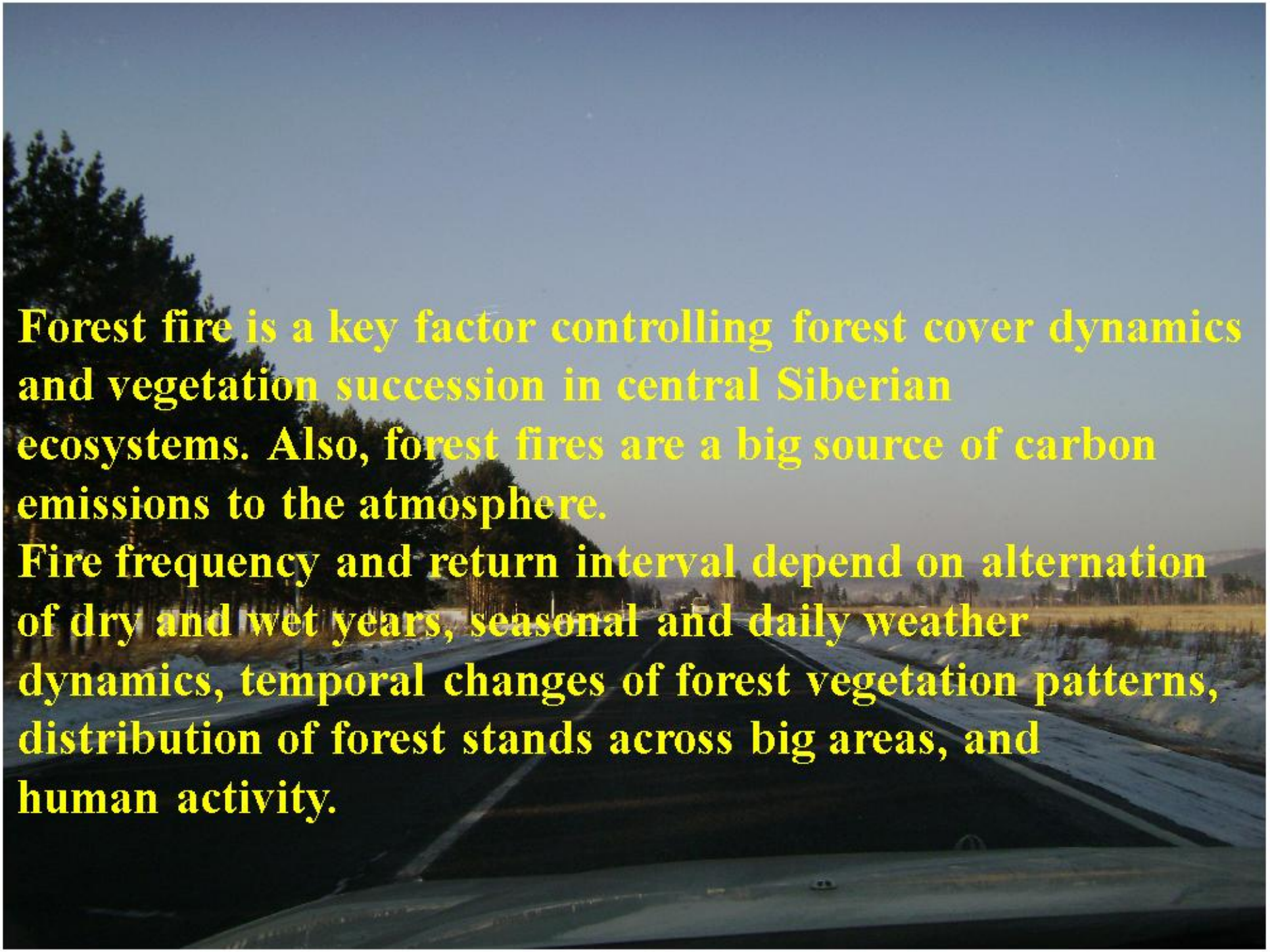
-a major ecological factor since prehistoric time;
-there is no forest stand now, which had not experienced fire at least once.

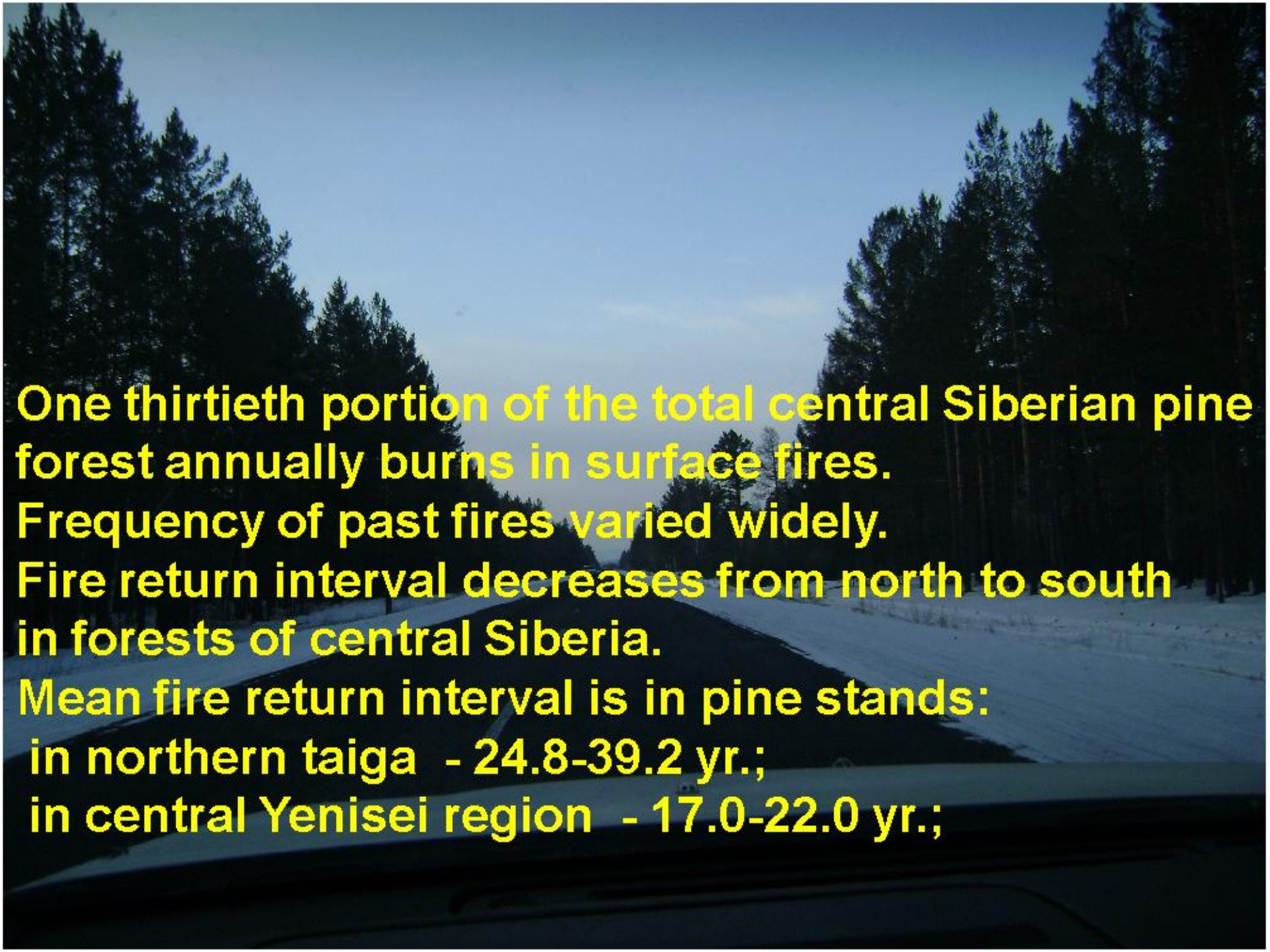
Fire regime is characterized by particular

fire behavior,

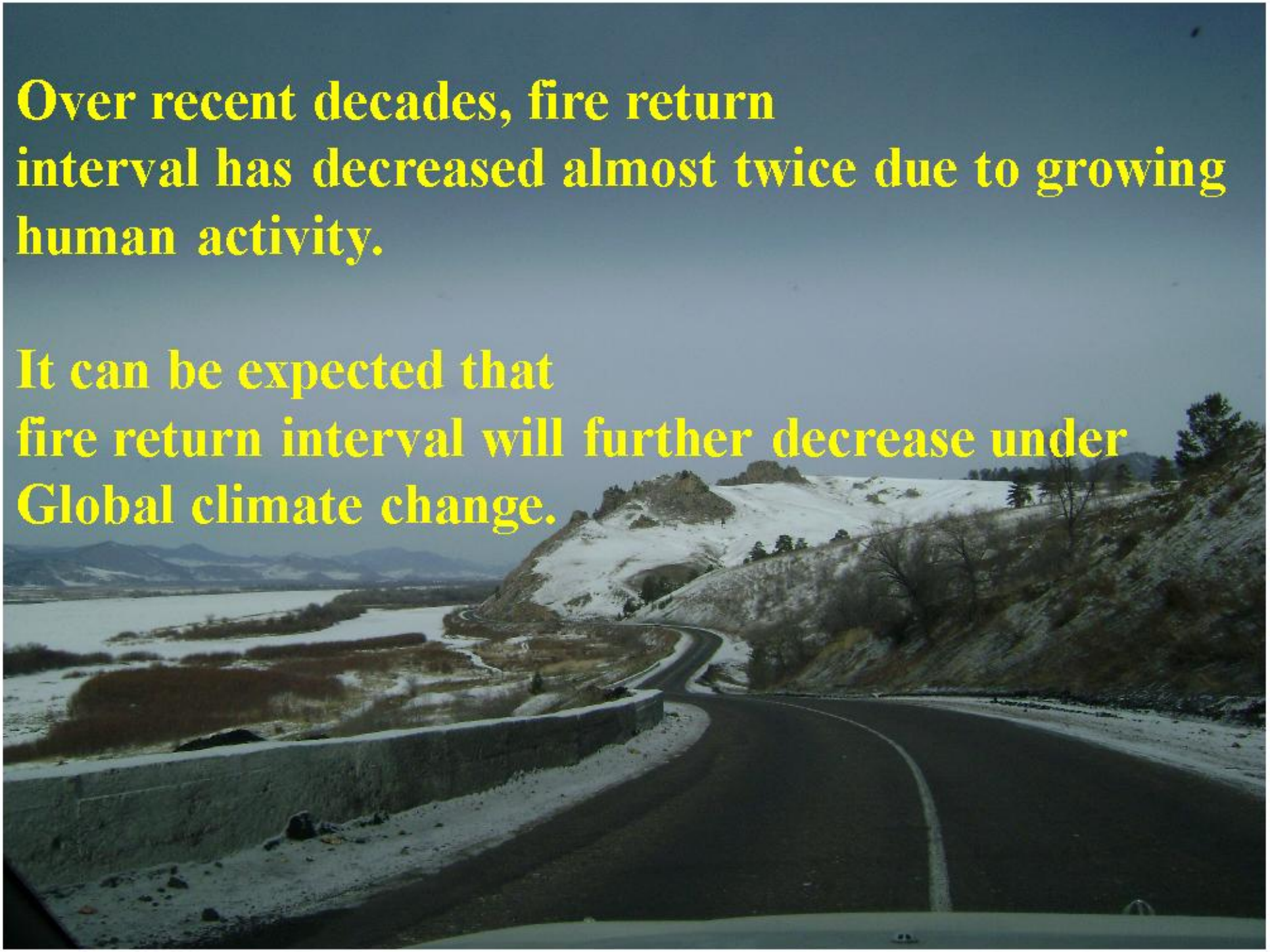
fire return interval, and

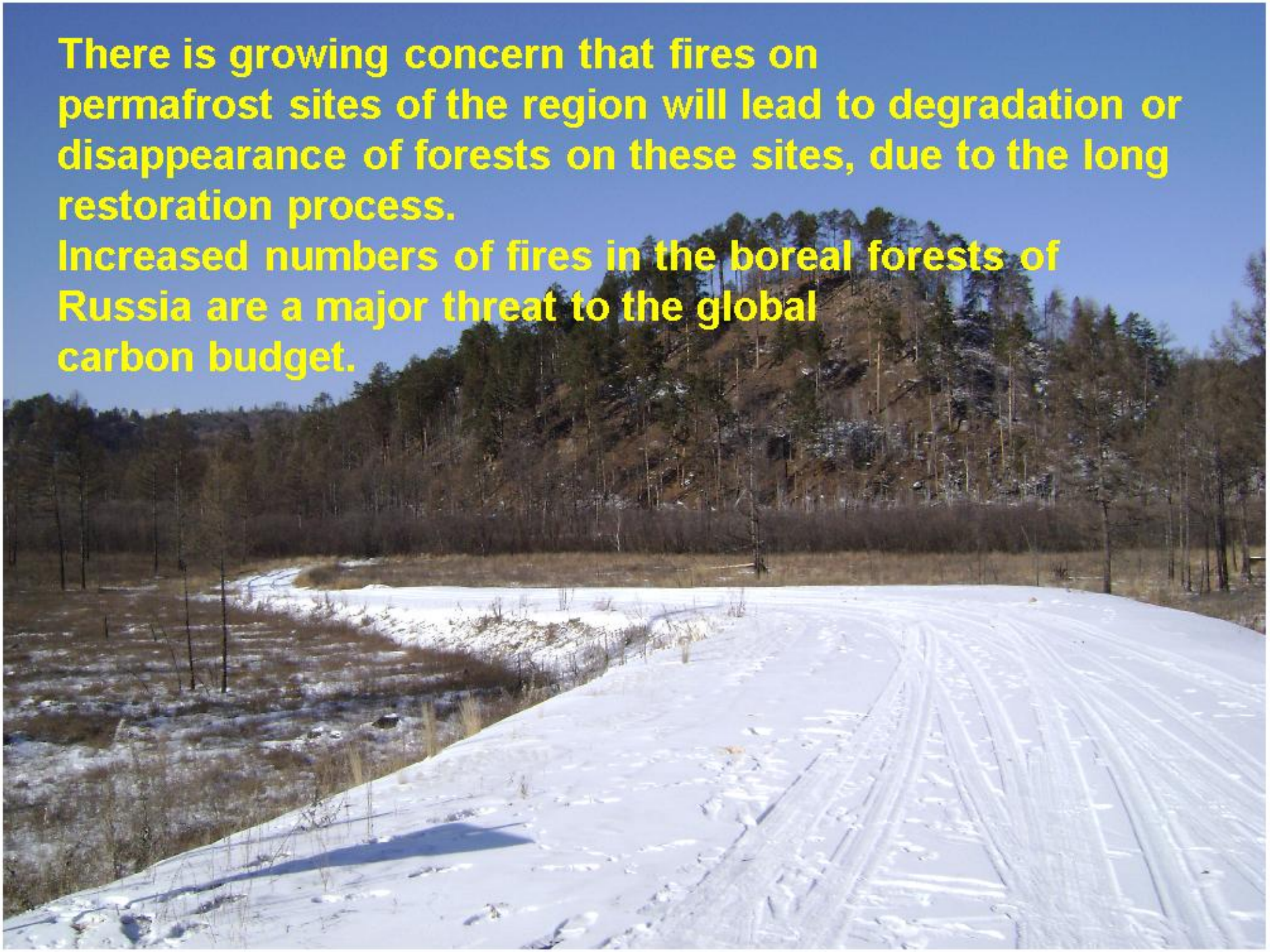
postfire forest regeneration dynamics.


Forest fire is a key factor controlling forest cover dynamics and vegetation succession in central Siberian ecosystems. Also, forest fires are a big source of carbon emissions to the atmosphere.
Fire frequency and return interval depend on alternation of dry and wet years, seasonal and daily weather dynamics, temporal changes of forest vegetation patterns, distribution of forest stands across big areas, and human activity.

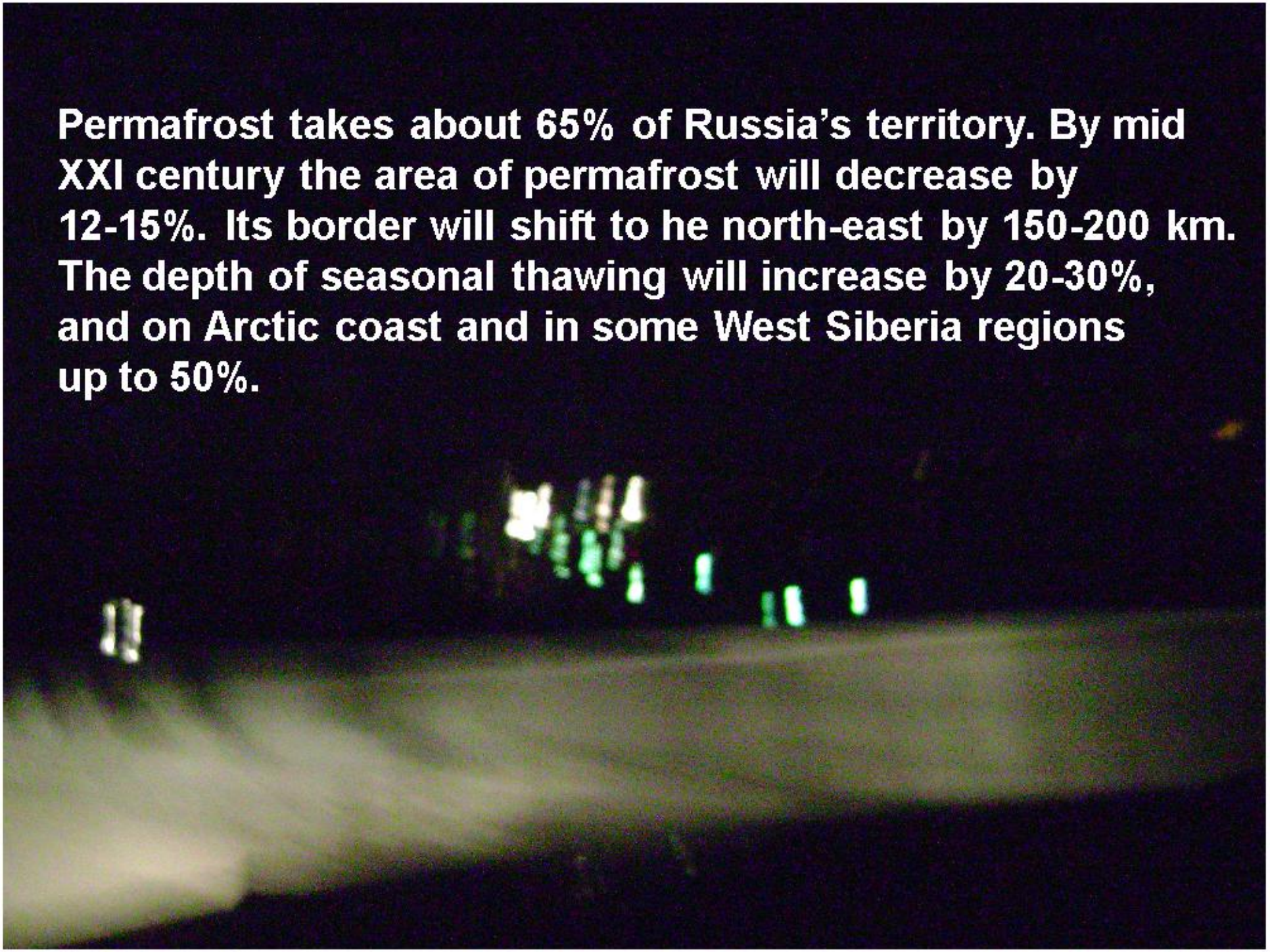

One thirtieth portion of the total central Siberian pine forest annually burns in surface fires.
Frequency of past fires varied widely.
Fire return interval decreases from north to south in forests of central Siberia.
Mean fire return interval is in pine stands:
in northern taiga - 24.8-39.2 yr.;
in central Yenisei region - 17.0-22.0 yr.;

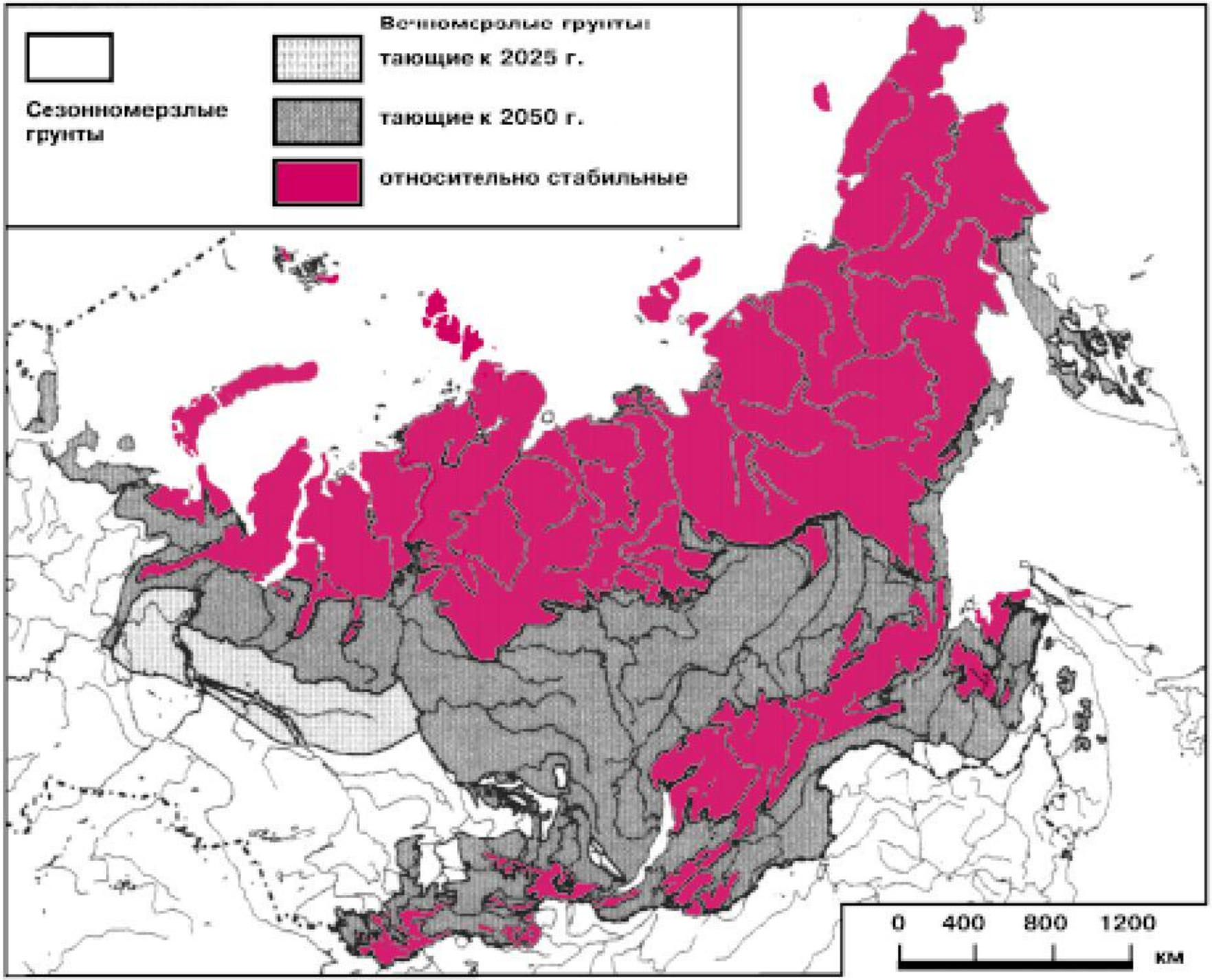

in Angara region - 10.0-17.0 yr.;
in East Sayan mountains - 11.6 yr.;
in Krasnoyarsk forest steppe - 6.0-9.3 yr.;
in southern taiga - 6.5-10.9 yr.


Over recent decades, fire return interval has decreased almost twice due to growing human activity.
It can be expected that fire return interval will further decrease under Global climate change.


There is growing concern that fires on permafrost sites of the region will lead to degradation or disappearance of forests on these sites, due to the long restoration process.
Increased numbers of fires in the boreal forests of Russia are a major threat to the global carbon budget.

Permafrost takes about 65% of Russia's territory. By mid XXI century the area of permafrost will decrease by 12-15%. Its border will shift to he north-east by 150-200 km. The depth of seasonal thawing will increase by 20-30%, and on Arctic coast and in some West Siberia regions up to 50%.




Сезонномерзлые грунты
Вечномерзлые грунты:
тающие к 2025 г.
тающие к 2050 г.
относительно стабильные
0
400
800
1200
км

Дуванный Яр в верхнем течении р. Колымы

80% of Baikal-Amur Railway runs on permafrost.
Permafrost thawing leads to constructions damage demanding significant expenditures for restoration. Besides, many constructions are already in unsatisfactory condition.
E.g., about 37% of oil pipelines are exploited more than 30 years, only 20% of them are exploited less than 10 years.
To repair them it is necessary to spend about 6.5 billion USD in the nearest decades even without taking into account permafrost thawing).

Permafrost thawing will impact also stability of residential and industrial buildings.

More than quarter of standard five storey residential buildings in Yakutsk, Vorkuta and Tixi, erected in 1950-1970s, could become unsuitable for exploitation in the nearest 1-2 decades.

Permafrost thawing will lead to underflooding of forests, change of specie
Composition.

Plants in permafrost

Permafrost on the depth 12 meters


Polar bears facing extinction by prolonged ice melts
in feeding areas along with decline in seal population

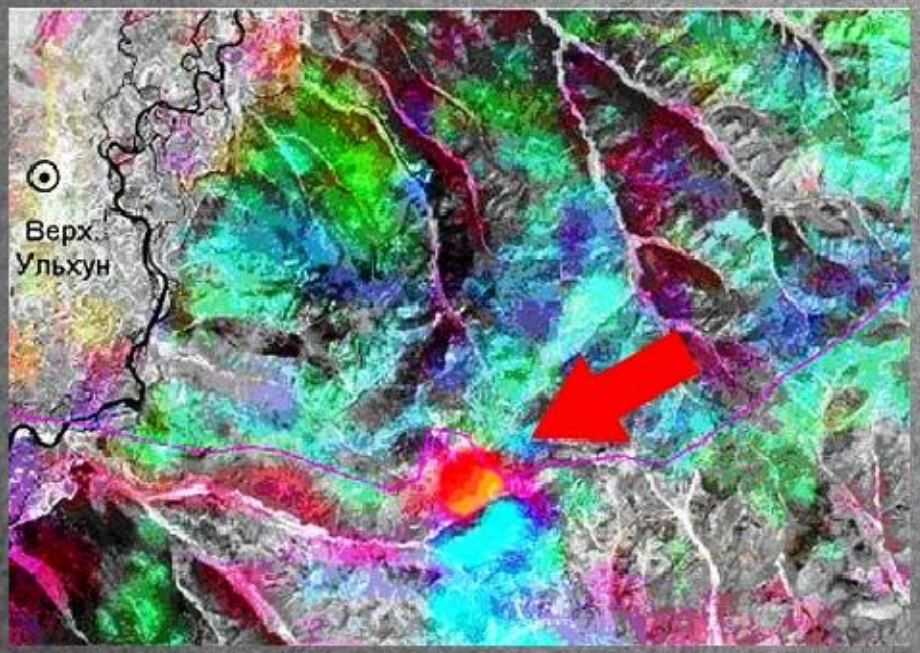
Phenological Changes

- Life-cycles of plants and animals have been affected by global change
- Temperatures affecting plants growing season, flowering time and timing of pollination by insects have all been altered
- Studies already showing
  - Plants in temperate zones: flowering time occur earlier in the season
  - Growing season increased in Eurasia 18 days over past two decades


Temperature rise assists to forest fires spread. Mainly forests of Siberia and Far East will burn. This is connected with the decrease of precipitation around Baikal Lake and in mid and east Siberia. 2°C warming will increase the number of fire incidents as well as burned area in Russia by 1.5-2 times.
Vegetation fires frequently lead to acceleration of vegetation cover transformation.
Besides, global warming assists to pests spread.

Given the high significance of Eurasia's/Central Asia's boreal forest in the functioning of the Earth's climate, and the continuing and predicted loss of forest cover and terrestrial carbon storage potential,

the increasing destruction of these forests should be addressed vigorously at national and international levels.




THANKS FOR YOUR ATTENTION !