Методические подходы к оценке уязвимости лесного сектора
России в связи с ожидаемыми изменениями климата.
Опыт Российской Федерации.
Methodological approaches for evaluation of forest sector vulnerability
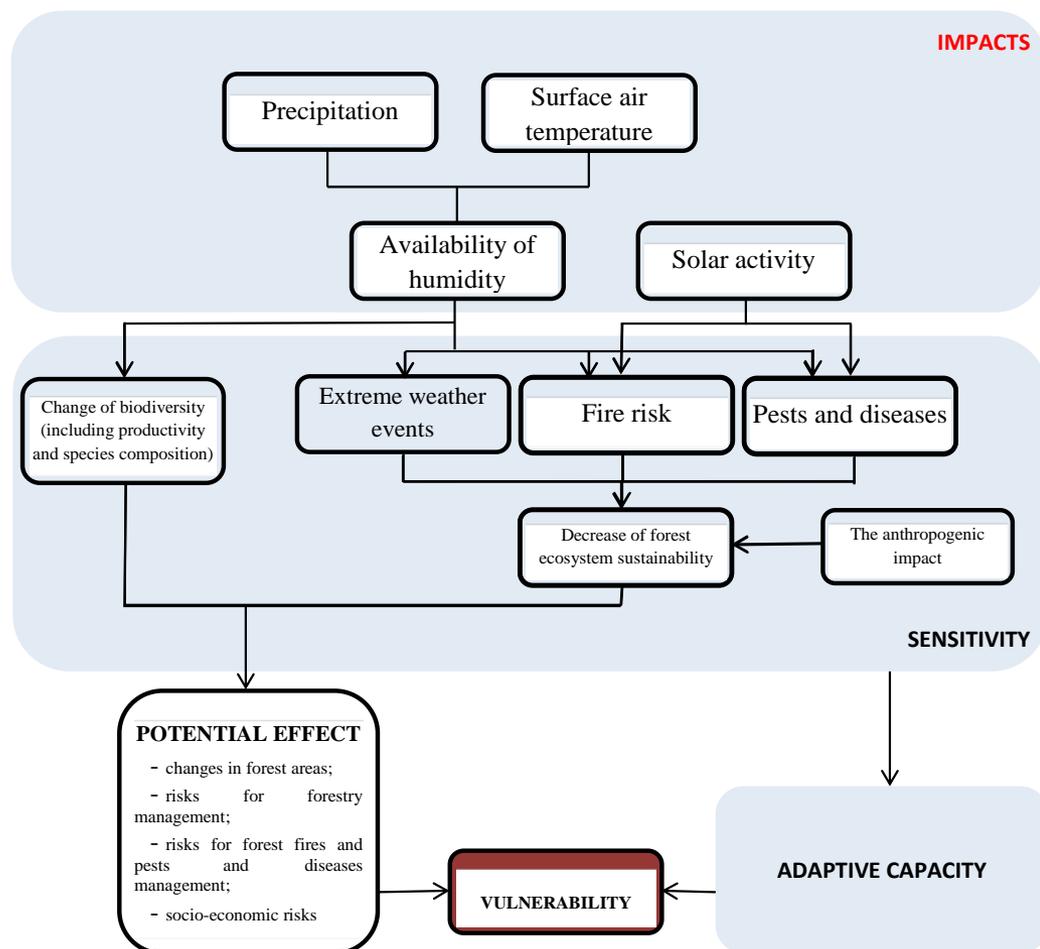caused by climate change.
Experience of the Russian Federation.

Заместитель директора по научной работе /Deputy director for science
Артем Константинов/Artem Konstantinov
12 декабря 2016 г./12 December 2016

# The impact of the expected climate change on the forest sector, taking into account the vulnerability to possible climate risks

**IMPACTS**

Precipitation

Surface air temperature

Availability of humidity

Solar activity

Change of biodiversity (including productivity and species composition)

Extreme weather events

Fire risk

Pests and diseases

Decrease of forest ecosystem sustainability

The anthropogenic impact

**SENSITIVITY**

**POTENTIAL EFFECT**
- changes in forest areas;
- risks for forestry management;
- risks for forest fires and pests and diseases management;
- socio-economic risks

**VULNERABILITY**

**ADAPTIVE CAPACITY**

**Key vulnerabilities:**
- increasing the probability of the incidence of forest fires;
- increasing the probability of pests and diseases damage;
- Increasing the probability of extreme weather events;
- increasing the risk of changes in the species composition of forests.

САНКТ-ПЕТЕРБУРГСКИЙ
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# Comparative assessment of the ability to adapt in all key vulnerability factors for the Northwest Federal District subjects

| The subjects of the Northwest Federal District | Factors of vulnerability | | | | |
|---|---|---|---|---|---|
| | Fires | Pests | Diseases | Extreme weather events | Changes in the species composition of forests |
| Karelia Republic | + | + | + | + | + |
| Komi Republic | + | + | + | + | + |
| Arhangelsk region | + | ~ | + | + | + |
| Vologda Region | + | + | + | − | + |
| Kaliningrad region | + | − | − | + | + |
| Leningrad region | + | + | + | + | + |
| Murmansk region | + | + | + | + | + |
| Novgorod region | + | + | + | + | + |
| Pskov region | + | + | + | + | + |

Climatic parameters change and their standard deviations in relation to the current climate in the beginning (2011-2030), middle (2041-2060) and the end (2080-2099) of the XXI century on the territory of the European part of Russia

| Climatic parameters | 2011–2030 | | | 2041–2060 | | | 2080–2099 | | |
|---|---|---|---|---|---|---|---|---|---|
| | $B_1$ | $A_1B$ | $A_2$ | $B_1$ | $A_1B$ | $A_2$ | $B_1$ | $A_1B$ | $A_2$ |
| The average surface air temperature change and the corresponding standard deviation (° C) | $1.2_{\pm0.4}$ | $1.2_{\pm0.7}$ | $1.0_{\pm0.5}$ | $2.2_{\pm0.7}$ | $2.8_{\pm0.8}$ | $2.5_{\pm0.7}$ | $3.0_{\pm1.1}$ | $4.4_{\pm1.2}$ | $5.1_{\pm1.2}$ |
| The change of total annual precipitation and their standard deviations (% in relation to the current climate) | $4.9_{\pm3.2}$* | $3.3_{\pm3.0}$* | $3.5_{\pm2.3}$* | $5.8_{\pm2.7}$* | $8.0_{\pm3.5}$* | $6.4_{\pm2.9}$* | $9.1_{\pm2.3}$* | $11.7_{\pm4.6}$* | $12.4_{\pm4.5}$* |
| Notes $B_1$, $A_1B$, $A_2$ – climate change scenarios *mean changes in precipitation exceeding standard deviations | | | | | | | | | |

# Classification features of the complex adaptation measures in the forest sector in the conditions of global climate change

| Classification feature | Types of adaptation measures | Priority in the implementation of adaptation measures in relation to Russian forest sector |
|---|---|---|
| Time | Anticipatory | High |
| | Incidental | Medium |
| | Reactive | Low |
| Duration | Tactical | Low |
| | Strategic | High |
| Scale | Localized | High |
| | Disseminated | Medium |
| Acting persons | Public sector | High |
| | Private sector | Low |

# Environmental services as adaptation options

| Climate risk | Impact | Environmental service | Adaptation option (examples) |
|---|---|---|---|
| Changes in rainfall regime | Droughts, floods | Water system regulation | Watershed management: plantations of species with high regulation capacity, agroforestry, etc. |
| Extreme events (e.g. torrential rains, hurricanes) | Damage to infrastructure, floods | | |
| Changes in rainfall regime | Droughts and floods | Micro-climate regulation | Restoration and rehabilitation: forest enrichment, research in forestry. |
| Average temperature changes | Change in ecosystems structure. Habitat loss for some species . | | |
| Extreme events (e.g. torrential rains, hurricanes, fires) | GHG emissions | Carbon fixation and storage | Mitigation projects in LULUCF. Fire control. |
| Changes in rainfall regime | Change in ecosystem. Habitat loss for some species. Loss of species (fauna and flora). Loss of genetic pool. Epidemics. | Conservation of biological diversity (including pollination, seed distribution, habitat and natural pest control) | Bioprospecting studies. Sustainable management of forests: conservation, restoration and rehabilitation; sustainable plantation management. |
| Extreme events (e.g. torrential rains, hurricanes) | | | |
| Temperature changes | | | |
| Changes in rainfall regime | Erosion | Soil protection | Restoration and rehabilitation: forest enrichment. Plantations with soil protecting species in highly degraded areas. |
| Extreme events (e.g. torrential rains, hurricanes) | Landslides | | |

# Adaptation scenarios
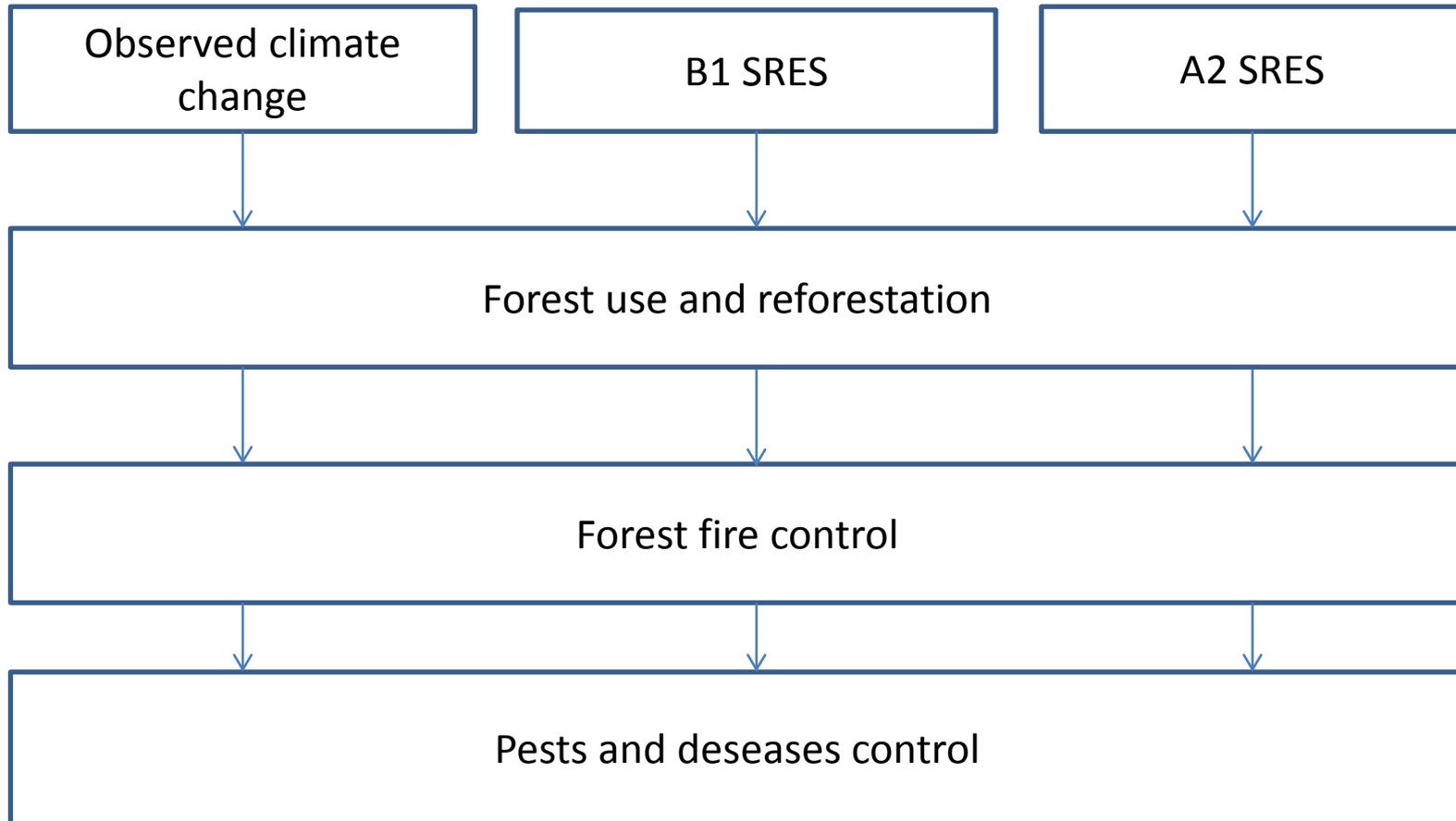
Thank you for your attention!

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