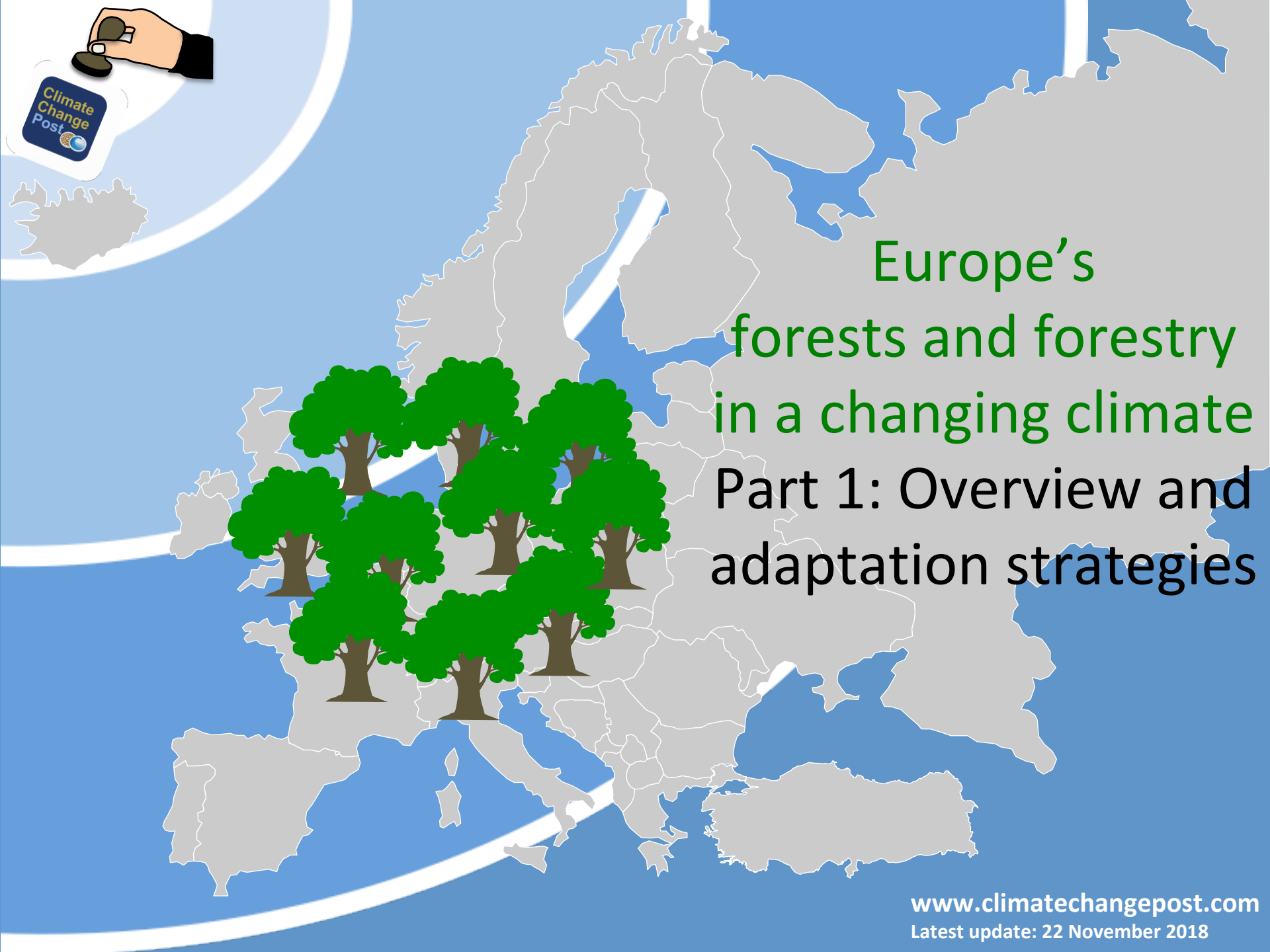


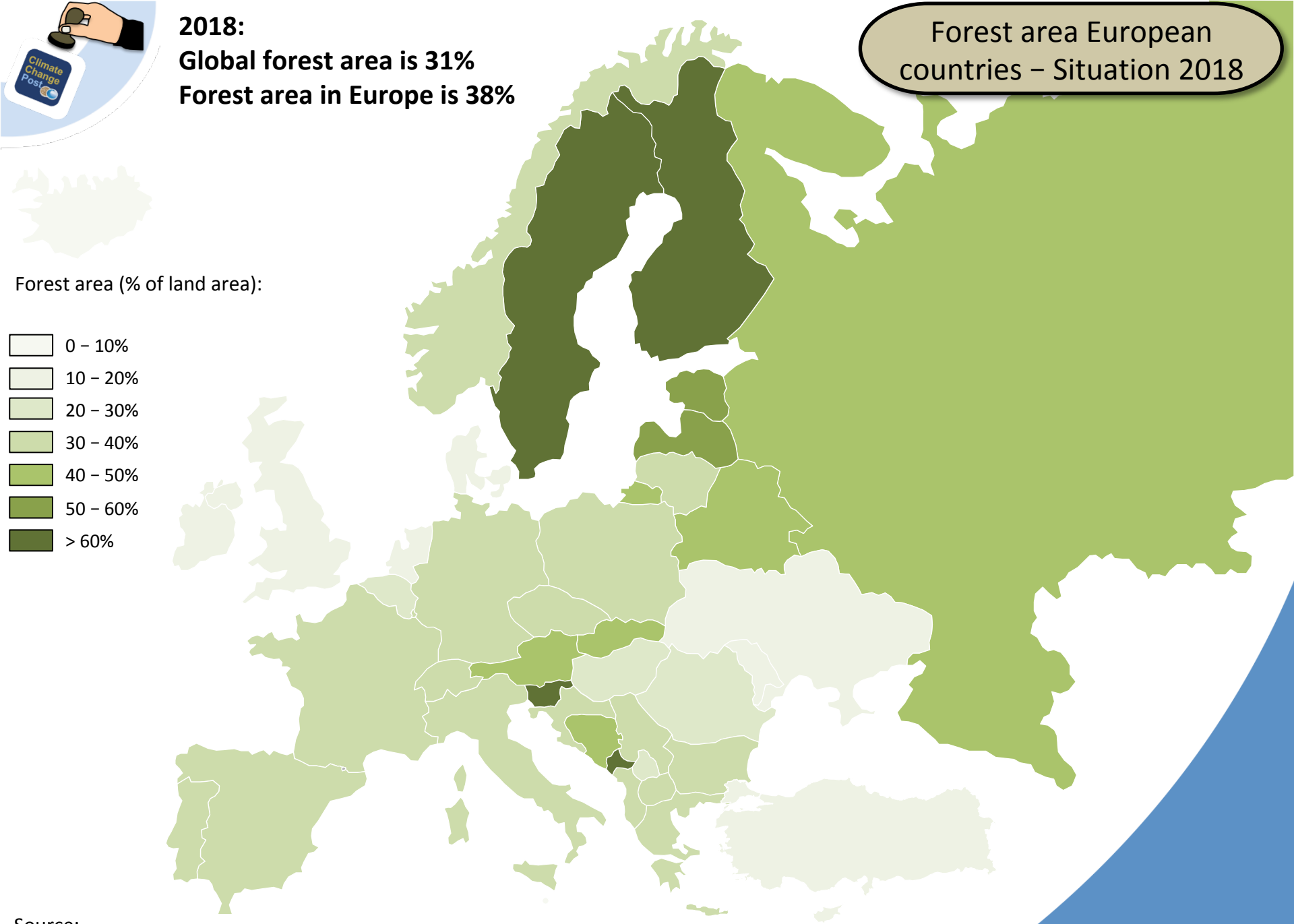
Europe's forests and forestry in a changing climate

Part 1: Overview and adaptation strategies

www.climatechangepost.com
Latest update: 22 November 2018

Forest area European countries – Situation 2018

2018:
Global forest area is 31%
Forest area in Europe is 38%



Source:
FAO (last update 18-10-2018)

Forest types

Tree growth hindered by low temperatures and short growing seasons

Coniferous trees (fir, pine) are the dominant trees

Forest type:

- Mediterranean
- Temperate grasslands
- Temperate forests
- Boreal forests
- Tundra

Large and tall trees with wide leaves. The main trees are the great redwood, oak, ash, maple, birch, beech, poplar, elm and pine

Grassland plains without trees apart from those near rivers and lakes

Broad-leaved evergreen shrubs, bushes and small trees

The increased vulnerability of forests (and people) with respect to climate change refers to several impacts:

Vulnerabilities

Ecosystem services

Benefits
Changes in socio-economic resilience; changes in availability of specific forest products (timber, non-timber wood products and fuel wood, wild foods, medicines, and other non-wood forest products); changes in the cultural, religious and spiritual values associated with particular forests.

Regulation of water flows
Changes in the seasonality and intensity of precipitation, altering the flow regimes of streams; changes in the salinity of coastal forest ecosystems; increased probability of severe droughts; increased terrain instability and soil erosion due to increased precipitation and melting of permafrost; more/earlier snow melt resulting in changes in the timing of peak flow and volume in streams. The capacity of the forest ecosystem to purify water is an important service, obviating the cost of expensive filtration plants.

Biomass and carbon stocks

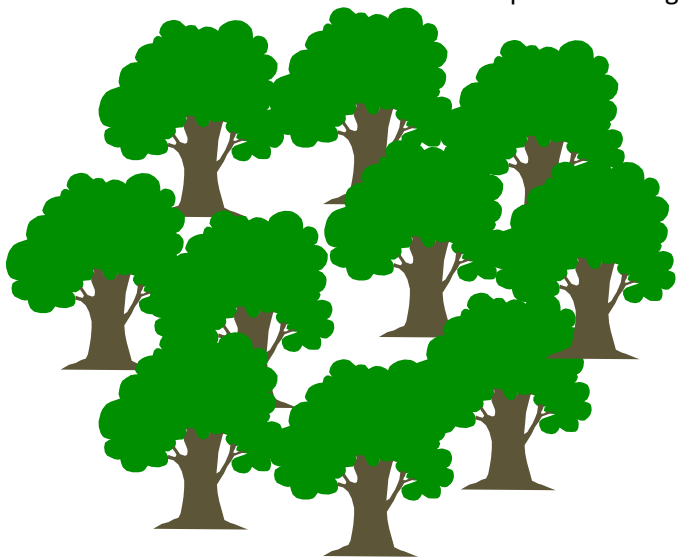
Productivity
Changes in forest growth and ecosystem biomass; changes in species/site relations; changes in ecosystem nitrogen dynamics.

Carbon cycles
Alteration of forest sinks and increased CO_2 emissions from forested ecosystems due to changes in forest growth and productivity. The more carbon is accumulated in the trees of a forest, the more this forest contributes to the mitigation of climate change.

Forest cover
Conversion of forests to non-woody energy plantations; accelerated deforestation and forest degradation; increased use of wood for domestic energy; effects of storms (wind throws), wildfires and droughts.

Biodiversity

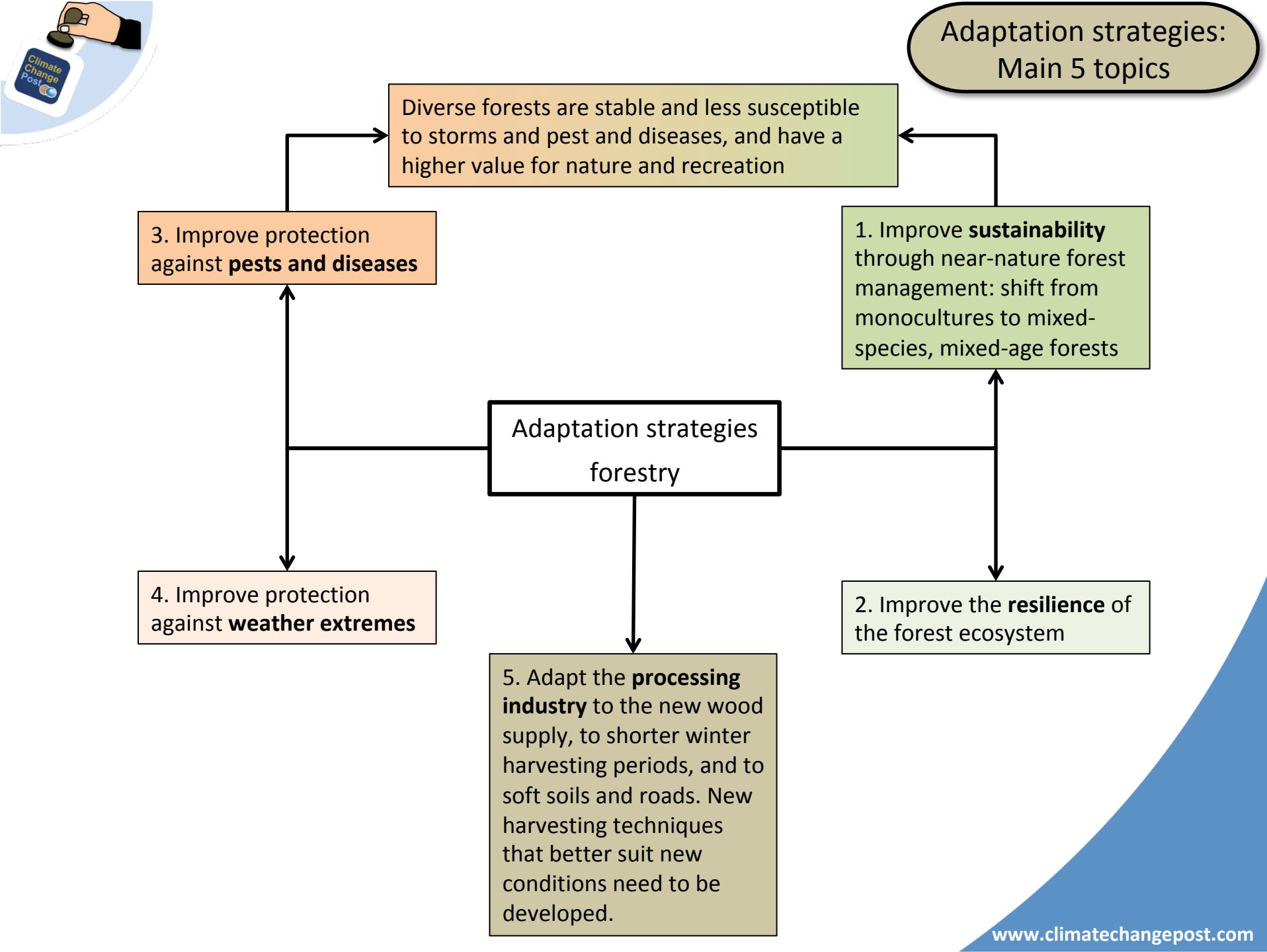
Alteration of plant and animal distributions; loss of biodiversity; habitat invasions by non-native species; alteration of pollination systems; changes in plant dispersal and regeneration.



Forest health

Increased mortality due to climate stresses; decreased health and vitality of forest ecosystems due to the cumulative impacts of multiple stressors; deteriorating health of forest-dependent peoples.

Adaptation strategies: Main 5 topics



Adaptation strategies: Sustainability

1. Improve **sustainability** through near-nature forest management: shift from monocultures to mixed-species, mixed-age forests

Adapt species composition to those species that are expected to perform better under a changed climate (30 years from now)

A shorter rotation of forest and regular forest management will improve adaptation by accelerating the spreading of new, genetically better adapted populations and reducing the risk of pest damage

Rejuvenation of stands on the one hand leads to an increased adaptability of (young) individual trees, and on the other hand promotes natural selection toward climate-adapted populations

Natural regeneration creates opportunities for utilising the natural genetic potential of the tree species for adaptation to climate change

Selection of the origin of **artificial** regeneration material and the use of improved material will allow a more efficient response to climate change

Adaptation strategies: Sustainability

1. Improve **sustainability** through near-nature forest management: shift from monocultures to mixed-species, mixed-age forests

Transform coniferous ecosystems in mixed forest or broadleaved ecosystems

More natural and better adapted forests require acceptance of a dynamic species composition and acceptance of associated costs with changed commercial value of production wood, as new timber species may not fit the demands of the timber processing industry.

The establishment of migration corridors between forest reserves may aid in the autonomous colonization and migration of species in response to climate change

Replace spruce, one of the major commercial tree species in Europe, and Scots pine by other species better adapted to droughts, and to mild and rainy winters, e.g. Douglas fir and broad-leaved trees

Adaptation strategies: Sustainability

Northern Europe is projected to show the highest production increases under climate change and can also adapt its species distribution faster. The forest in Northern Europe is generally distributed rather equally over the age classes, and lowering the rotation length makes a considerable additional amount of area available for harvesting, resulting in fast adaptation. Besides, in Northern Europe only a few species show a lower suitability due to climate change.

1. Improve **sustainability** through near-nature forest management: shift from monocultures to mixed-species, mixed-age forests

New species for a given region might not necessarily imply the introduction of alien species, but rather replacing existing species with others already growing in the warmest and driest areas of the country. Species from southern Portugal, for instance, can gradually replace existing species in north-western Portugal.

Southwest Europe is expected to face the greatest challenge by a combination of a predicted loss of production and a slow rate of management alteration under climate change. In Southwest Europe, the age class distribution is less favourable for adaptation with a large share of relatively young stands, and the suitability due to climate changes affects almost all (nine out of 10) species.

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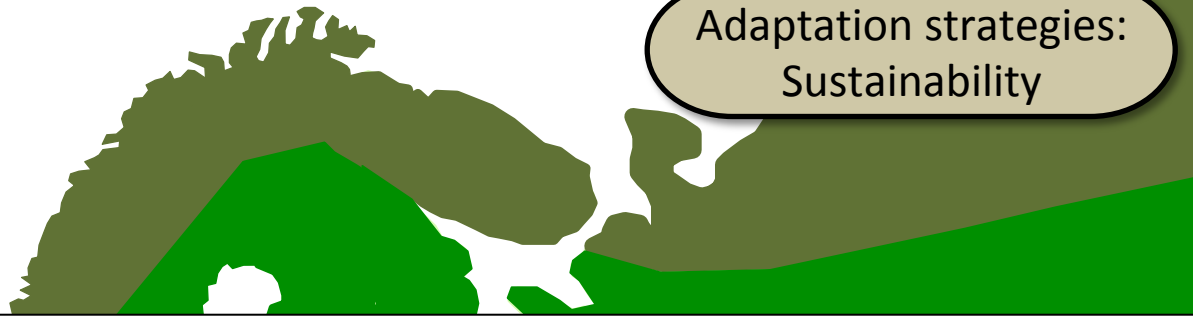

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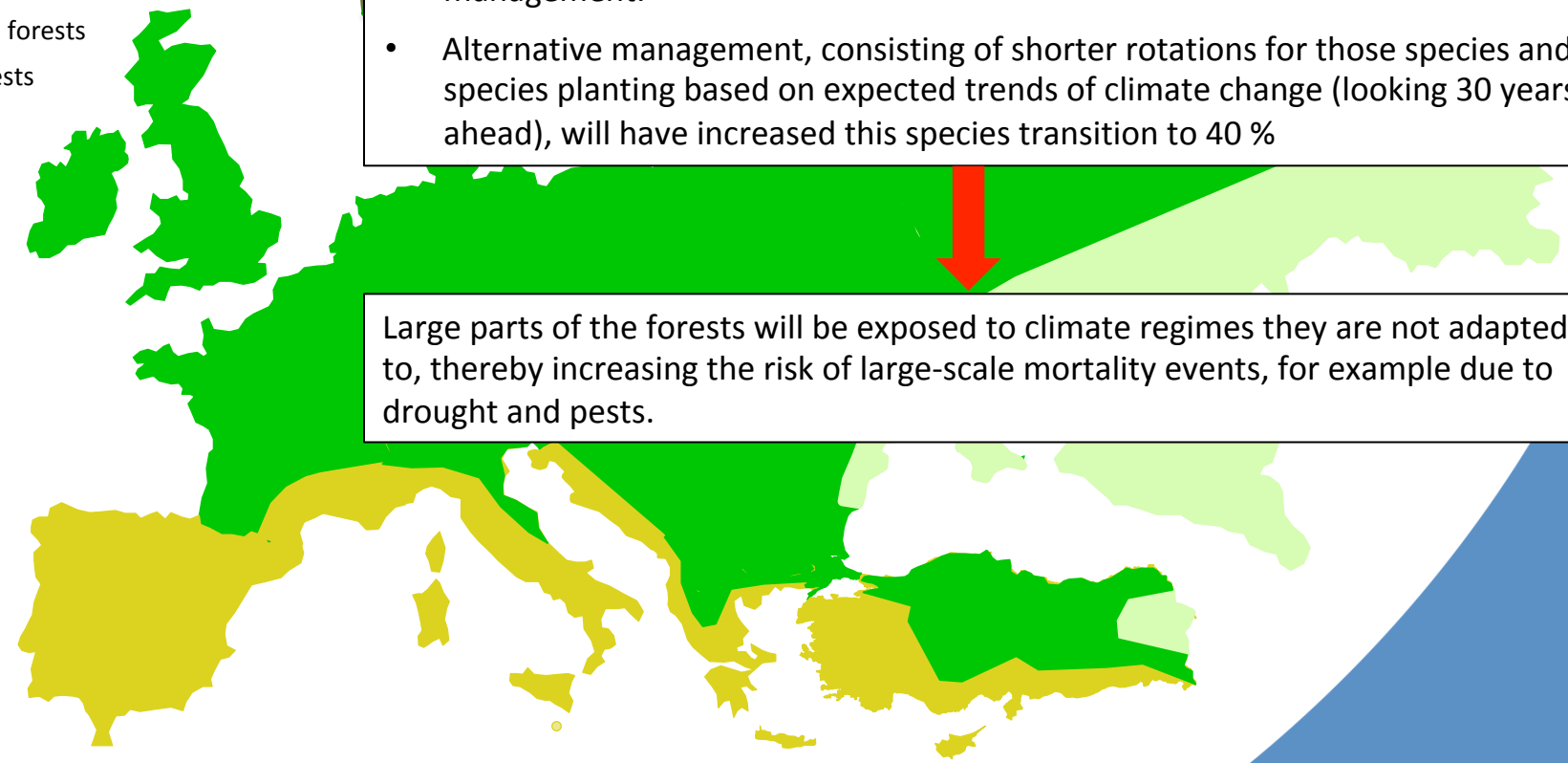
European forests are very inert. It takes a long time to influence the species distribution by replacing species after final felling:

- By 2070, on average about 36 % of the area expected to have decreased species suitability will have changed species following business as usual management.
- Alternative management, consisting of shorter rotations for those species and species planting based on expected trends of climate change (looking 30 years ahead), will have increased this species transition to 40 %



Large parts of the forests will be exposed to climate regimes they are not adapted to, thereby increasing the risk of large-scale mortality events, for example due to drought and pests.

Adaptation strategies: Resilience

Reduce degradation of soil fertility and increase the amount of carbon bound in the soil

Encourage complex forest structures and increase the forest area through ecologically advantageous afforestation of agricultural land

2. Improve the **resilience** of the forest ecosystem

Optimize management of water resources: enhance soil and groundwater recharge by maintaining good soil structure and limiting the water consumption of the ecosystem through choice of species and forestry practices; re-wet floodplain forests; deactivate drainage systems; improve retention of winter precipitation in forests to relieve drought stress during dry summers.

Monitor density of game populations and eliminate pressure from game

Relation with **sustainability**:

By avoiding monoculture systems with low biodiversity, forests can become more resilient to climate and climate-induced disturbances such as wildfire, being thus possible to enhance ecosystem services and economic growth.

Adaptation strategies: Pests and diseases

The older the stand, the higher the risk is of fungal, insect, or wind damage. Accordingly, the adaptability of the commercial forest as a set of stands can be increased by avoiding the over-maturing of stands.

3. Improve protection against **pests and diseases**

Adaptation to invasive species: Recognition of potential invaders and their major pathways helps to prevent or reduce introductions, since not all of the imported exotic insects are invasive, nor do they manage to establish themselves in novel environments. The risk of establishment is most severe where the main host species for the potential invader occurs naturally or is widely cultivated.

Prevent pests and diseases: Through stricter quarantine and sanitary management, the impact of insects and diseases can be minimized. The northbound spread of pests and diseases from southern regions can be slowed by restricting import of fresh timber from areas with pests.

Adaptation strategies: Weather extremes

Relation with **sustainability**:

A conversion to mixed forests, which usually exhibit a moister forest internal climate, decreases the risk of forest fires.

A shift from mature needle-leaved to mature broad-leaved forest can reduce the fire risk between three to five times for many boreal forest regions.

Because of the higher year-round albedos of deciduous broad-leaved forests compared to evergreen needle-leaved forests, the earth would absorb less solar energy, thus having a cooling effect throughout the boreal zone.

A lower risk of wildfires in boreal biomes through increased broad-leaved tree composition is a means to reduce greenhouse gas emissions.

Wildfires: Development of fire prevention barriers, building roads, undertaking preventive fires, creation of fire control system, introduction of technical devices for fire detection, a better integration of planning levels (forest owners, communities, regional authorities, forestry departments, fire brigades, road constructions).

4. Improve protection against **weather extremes**

Wind damage: Reductions in rotation length decrease the time the timber crop is at risk, limit the top height reached, reducing wind throw risk.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