

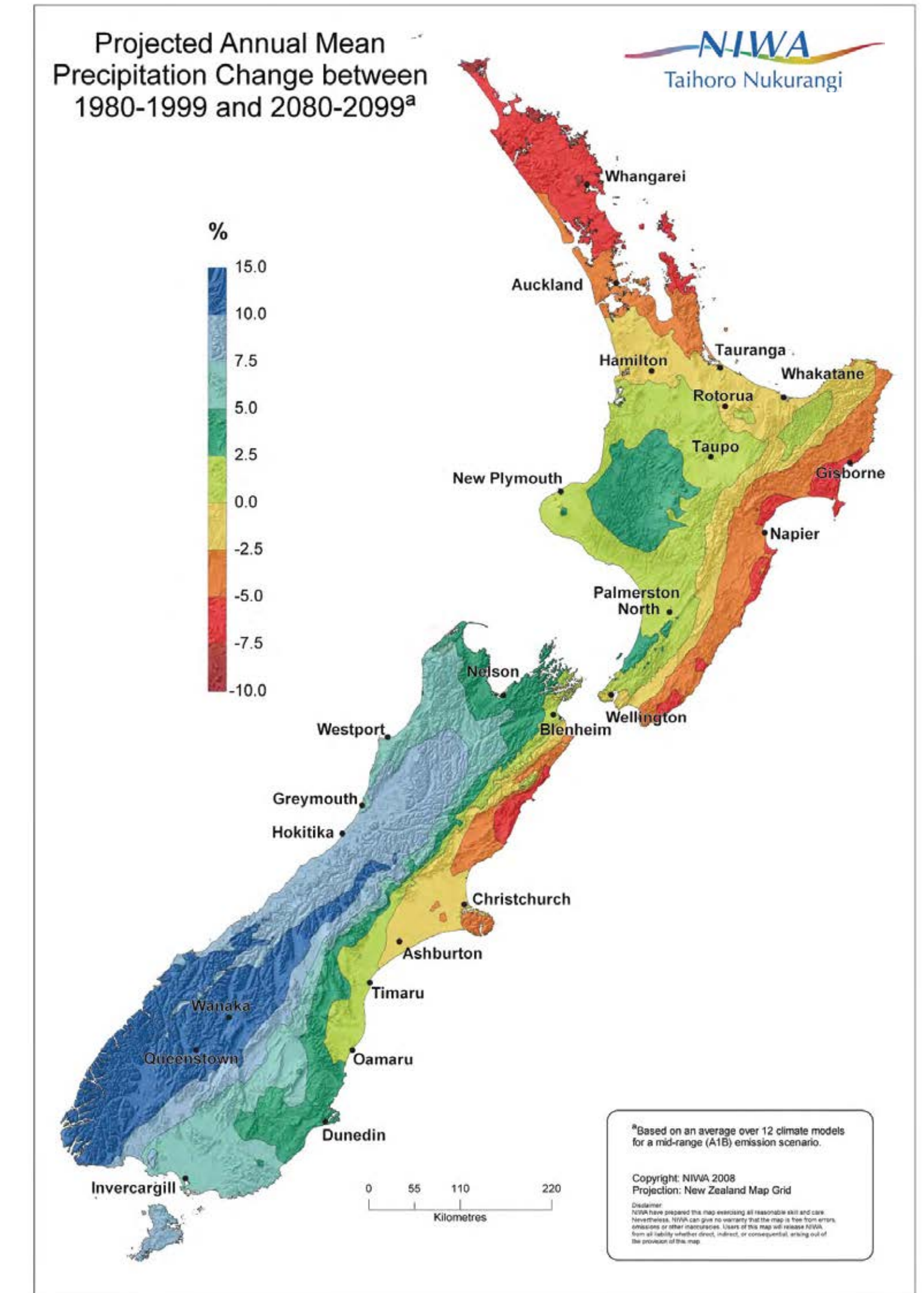
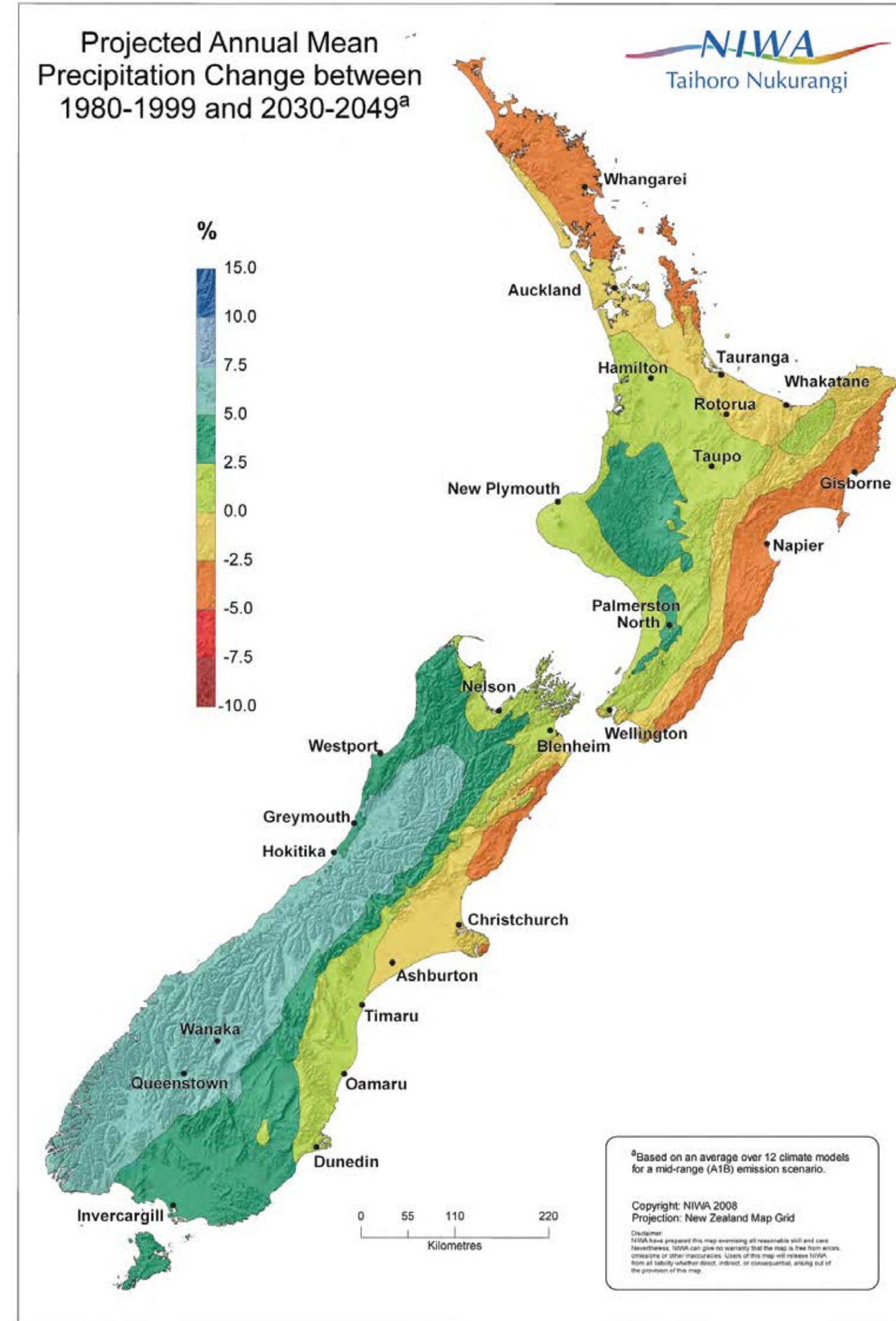
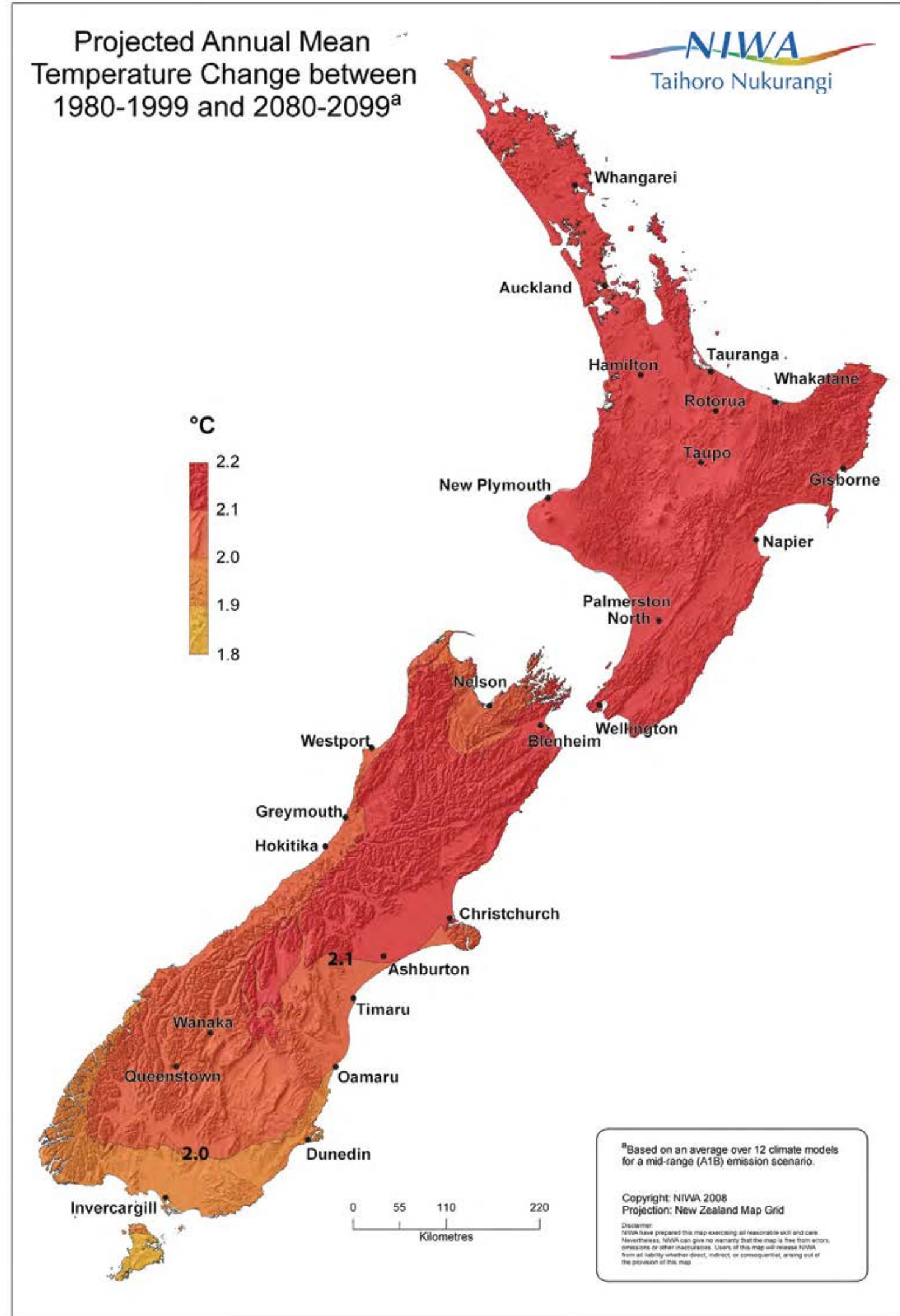
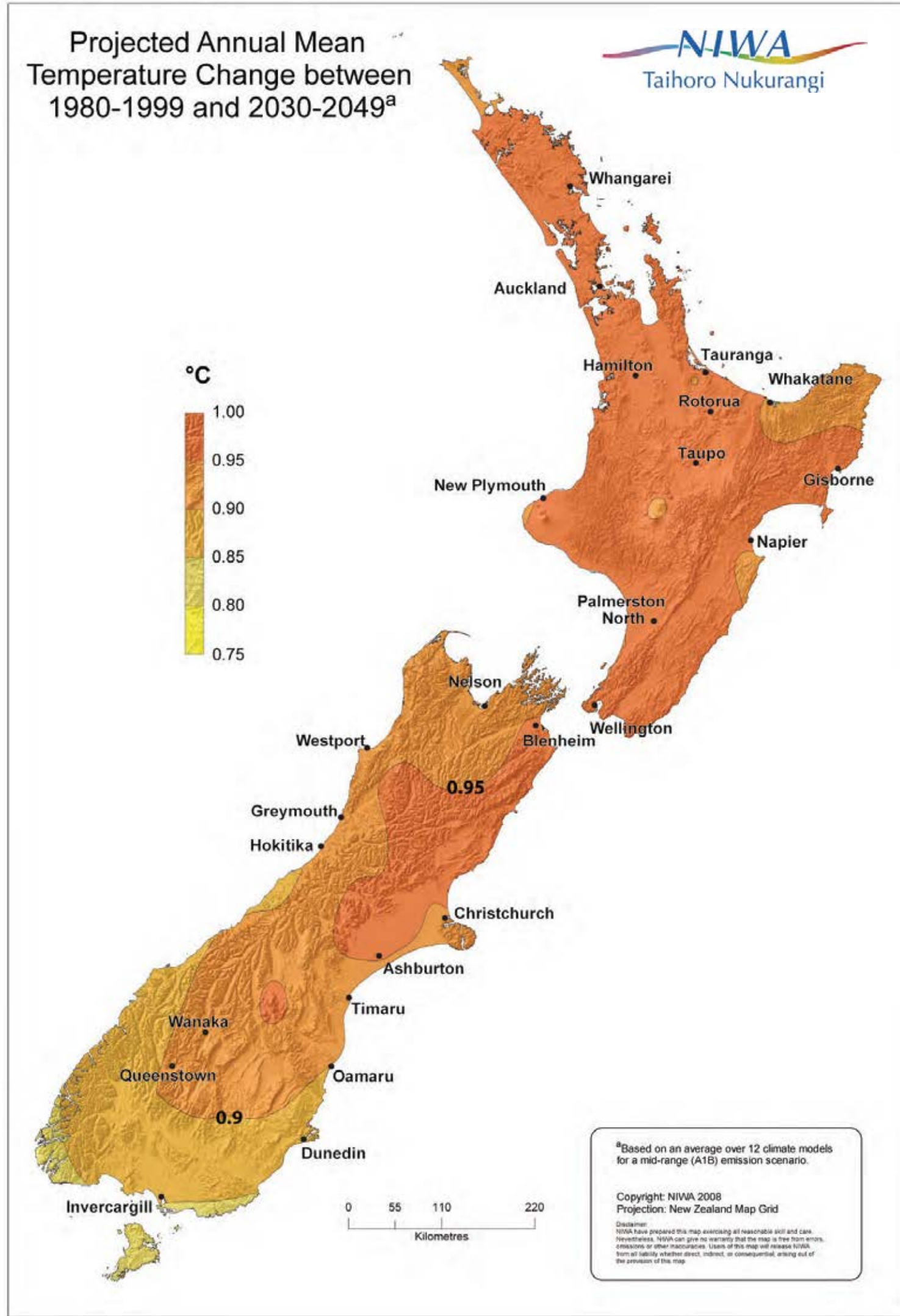
# Climate change will affect planted forests in New Zealand

## Projections of how climate will change:

Over the next two or three forestry rotations, NIWA projects the following likely trends in New Zealand's future climate:

- **Warmer by about 2.0°C\***
- **Wetter in the west and drier in the east**
- **More extreme weather events.**

- ✓ Some of these changes will create opportunities.
- ⚠ Others will require higher levels of risk management.

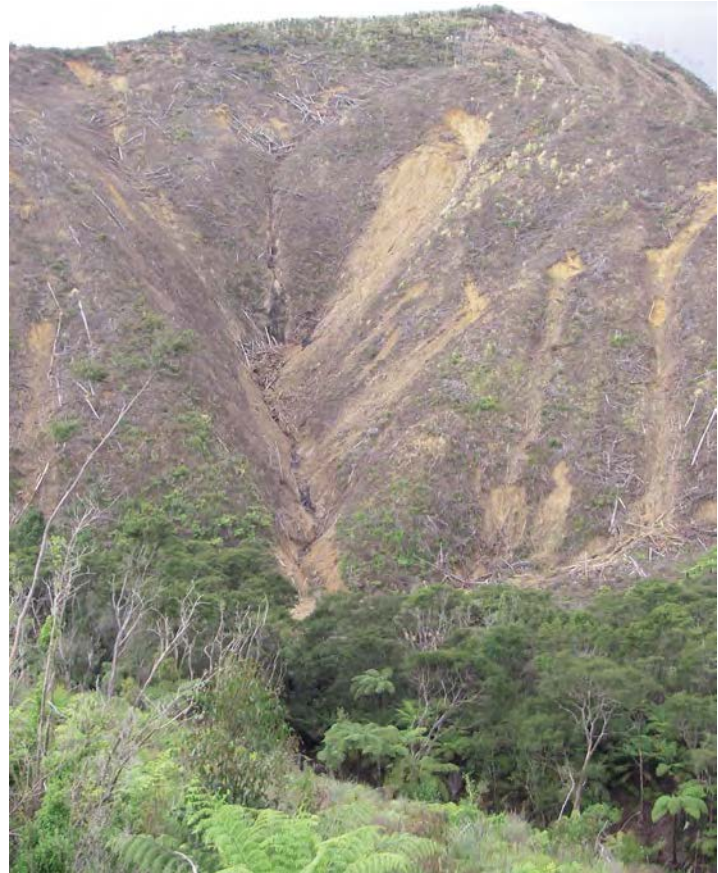


\* Mid-range projection

## Extreme weather events - higher variability and uncertainty

The effects of extreme weather events are already being felt. Intense storms are difficult to predict and their impact on forests can be huge.

### More high intensity rain



Higher temperatures mean more rain and severe storms

For forest growers, heavier rain means:

- ⚠ Higher risk of erosion and downstream impacts from sediment and debris flows.

### Higher winds



Winds may increase by up to 10%

For forest growers, higher winds mean:

- ⚠ More risk of toppling and breakage.

### Warmer temperatures, less frost



Fewer frost days in lower North and South Island

For forest growers, higher temperatures will mean:

- ✓ Higher growth rates. Reduced risk of crop damage or loss from frost damage.

### Increased drought



Severe droughts (1 in 20 years) may double or quadruple

For forest growers, more droughts will mean:

- ✓ Less fungal diseases.
- ⚠ Slower growth rates. Increased fire danger.

## Impacts on forestry

### Forest productivity



- ✓ More rainfall and higher temperatures mean higher growth rates.
- ✓ Elevated CO<sub>2</sub> typically makes trees grow faster.
- ⚠ Wood density decreases with temperature change.
- ⚠ Increased risk of diseases, pests, weeds, wind and fire.

Forest productivity is expected to increase

### Pests and diseases



- ✓ Less fungal disease in dry areas.
- ⚠ Increased risk of new species from warm-temperate or subtropical regions.
- ⚠ Warmer temperatures mean more insects (due to better survival over winter).
- ⚠ Increased risk of Swiss needle cast in Douglas-fir.

Species composition may change in response to pest and disease trends

### Weeds



- ⚠ Weeds adapt to change more quickly than trees. Faster growing trees mean even faster growing weeds.
- ⚠ Increased weed competition for water in dry regions.
- ⚠ Species composition and distribution will change. Risks of new weeds will increase.

Growth rates of weeds are expected to increase in most regions

### Fire



- ⚠ Higher temperatures and more wind mean a longer fire season and bigger fires.
- ⚠ Highly stocked stands have higher risk profile and insurance rates.

Fire risk is likely to increase in many regions

## Summary

- ✓ Tree growth responds directly to changes in temperature, water availability and CO<sub>2</sub> concentration. In many regions, this could mean higher productivity and opportunities to establish faster-growing forests.
- ✓ Climate change issues are driving policy to offset CO<sub>2</sub> emissions.
  - Carbon forestry offers increased revenue streams for growers
  - Demand for sustainable wood products is expected to increase
- ✓ Climate change has highlighted the potential for using forests to protect soil and decrease risks of flooding.
- ⚠ The impact of pests and diseases, weeds, fire, intense rainfall and high wind cause significant economic losses in planted forests. These risks are expected to increase with climate change.