HET HANGT IN DE LUCHT

OP ZOEK NAAR KLIMAATBESTENDIGE BOOMSOORTEN VOOR URBAAN VLAANDEREN

ADDENDUM ENGELSTALIG

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KU LEUVEN

FACULTEIT BIO-INGENIEURSWETENSCHAPPEN

Finding Climate Resilient Urban Tree Species for Flanders

Op zoek naar Klimaatbestendige Boomsoorten voor Urbaan Vlaanderen

ADDENDUM

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Masterproef voorgedragen
tot het behalen van het diploma van
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Landbeheer

Vito LEYSSENS

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Content

Introduction

This document is the addendum to the thesis “Finding Climate Resilient Urban Tree Species for Flanders (Leyssens, 2021)”. Here you can find the climatic suitability maps for all modelled species. The generated maps are the result of ensemble species distribution modelling. To gain more information about the method, you are directed to section 3 of the thesis itself.

These maps are meant to aid the evaluation of the climate resilience of urban tree species. However, the presented maps do *not* show the potential distribution maps. Instead, the maps show the climatic suitability for a certain species. This means: how well is the future climate adapted to the needs of the species? Two different climate scenarios were evaluated: a middle-of-the-road scenario (SSP2-4.5) and a worst case scenario (SSP5-8.5). Both scenarios were modelled for the year 2050 and the year 2100. This means there are for four distinct scenarios: i) middle-of-the-road scenario in 2050, ii) worst case scenario in 2050, iii) middle of the road scenario in 2100, and iv) worst case scenario in 2100. The results can thus be read as a vertical timeline, see “Example” (page 7).

The generated maps do *not* account for the Urban Heat Island effect, as it was not technically feasible within the scope of this thesis. This means that the generated results should be interpreted strictly. The actual climatic suitability is lower than is presented on the generated maps. These results also do *not* hold any information about soil suitability for a certain species. Only the climatic suitability of the predicted climate for Europe and Flanders are shown on the maps.

The resulting list of trees that are at least moderately climate resilient is not exclusive. A multitude of trees could not be modeled for technical reasons. The resulting list contains only 1 coniferous tree. This can lead to the idea that conifers are generally less climate resilient, which is untrue. The morphological characteristics of conifers suggest a high potential as a climate resilient tree, but only a few conifers could ultimately be tested. The results of this addendum should therefore not be used as an exclusive list for selecting urban tree species. Instead, it should be used as an instrument to test the climate resilience of a chosen selection, especially when the trees will be planted solitary or in a highly urbanized location.

The climate resilience of cultivars and subspecies within a species can vary widely. The provenance can also strongly determine the climate response of a tree individual. However, the results generated are at the level of a species. The results in this addendum thus form a

supporting role in the decision-making process and cannot provide certainty in the success of an urban plantation.

The maps on the extent of Europe can be used to visualize the poleward migration of the climatic suitability. This poleward migration is seen in all species. The maps on extent of Flanders can be used to evaluate if a species is climate resilient for the future climate of Flanders. If a species shows high climatic suitability (shown in green) for all scenarios, it can be seen as strongly climate resilient. If a species shows a high climatic suitability for all scenarios but the 4th one, it can be viewed as moderately climate resilient. If maps of scenario ii and iii show medium climatic suitability (shown in yellow), the species is less climate resilient. Low climatic suitability (shown in orange) for any of the first three scenarios indicates a low climatic resilience. Special attention should go to the amount of observations on which the predictions are based (n). Any prediction made with less than 1000 occurrences should be used with care and offers not more than a guiding role.

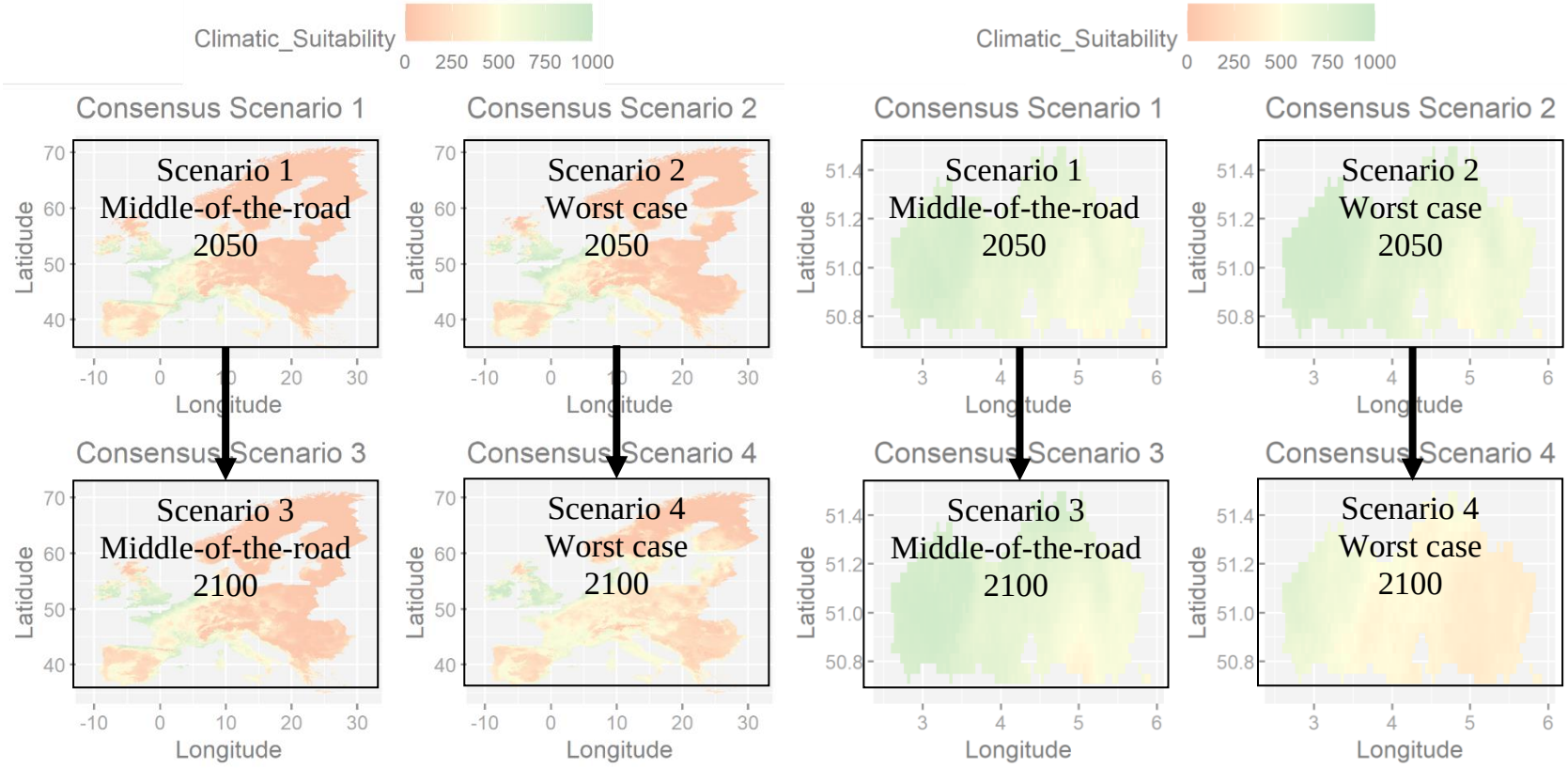
Climate resilient species

The table below lists all species that are viewed to be at least moderately climate resilient, based on the generated results. Species with less than 1000 occurrences were not included in this list.

Scientific name	**Amount of occurrences**
Broussonetia papyrifera (L.) Vent.	*2.931*
Celtis australis L.	*13.416*
Cercis siliquastrum L.	*7.921*
Cornus mas L.	*15.446*
Cotinus coggygria Scop.	*14.283*
Ficus carica L.	*29.021*
Fraxinus ornus L.	*2.969*
Mespilus germanica L.	*7.469*
Morus alba L.	*1.416*
Ostrya carpinifolia Scop.	*2.342*
Paulownia tomentosa (Thunb.) Steud.	*4.719*
Quercus cerris L.	*2.920*
Quercus ilex L.	*20.001*
Sorbus torminalis (L.) Crantz	*20.975*
Taxodium distichum (L.) Rich.	*2.726*
Ziziphus jujuba Mill.	*2.090*

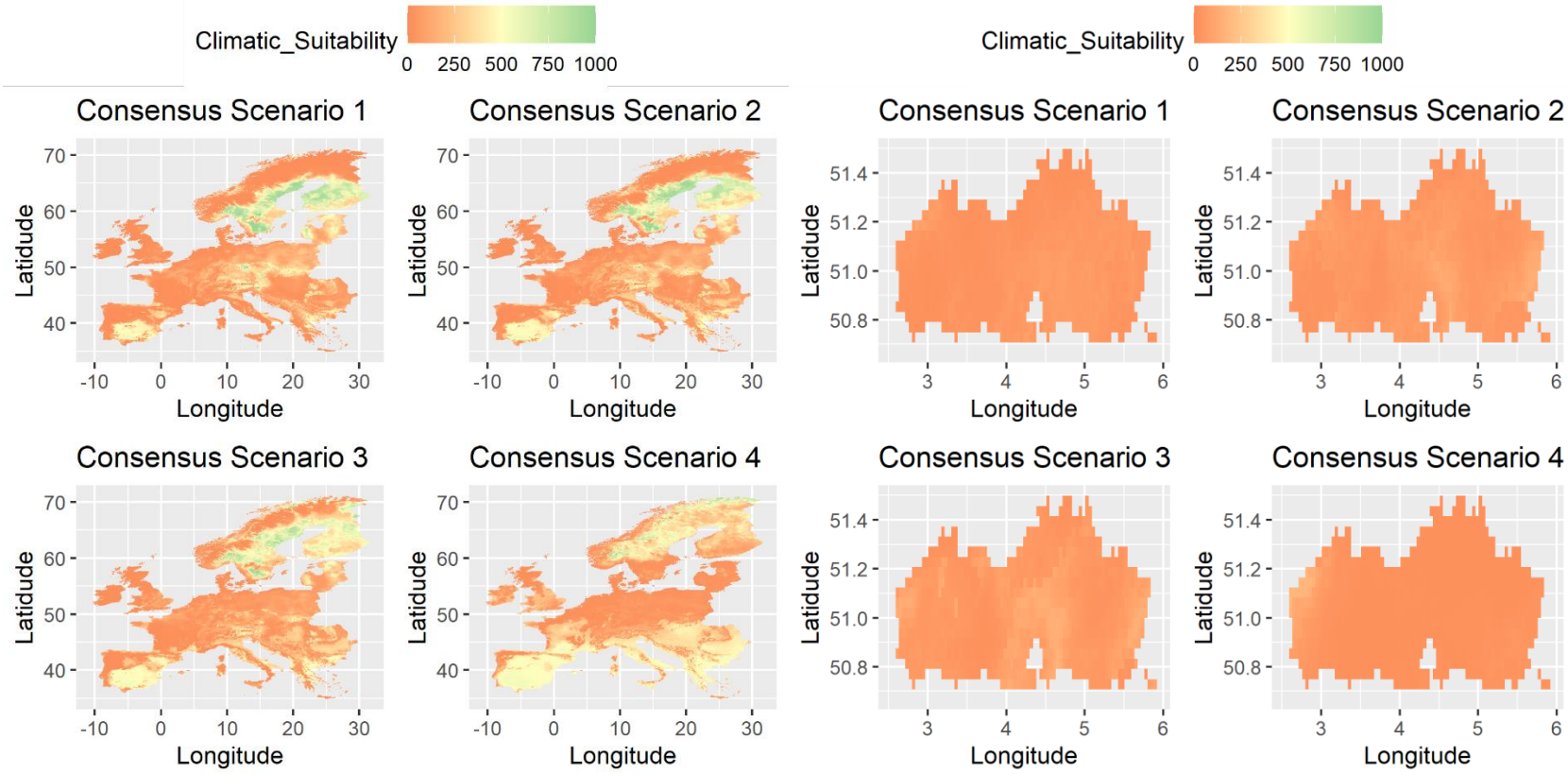
Example

n = the amount of observations



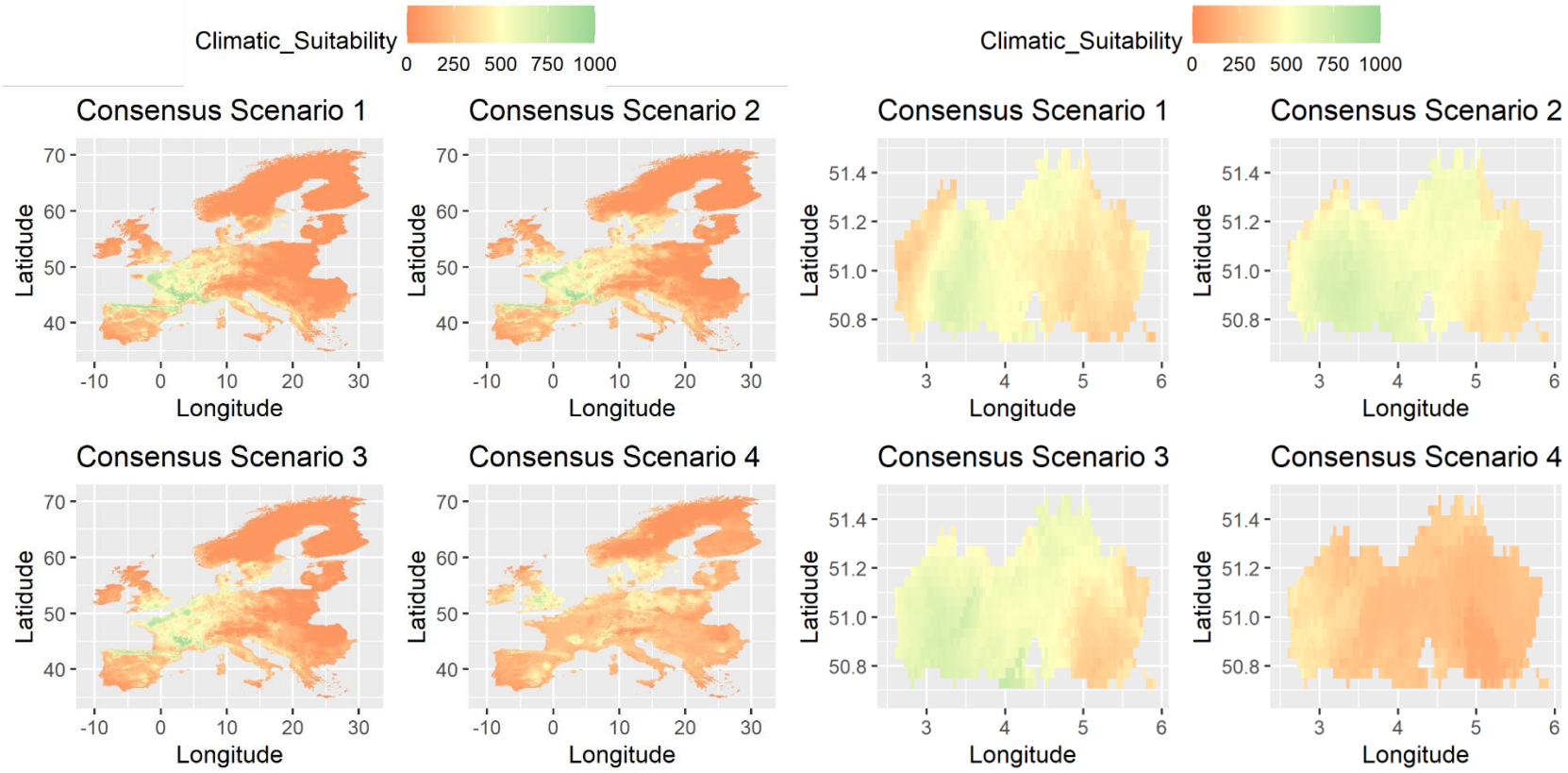
Acer ginnala Maxim.

n = 1.965



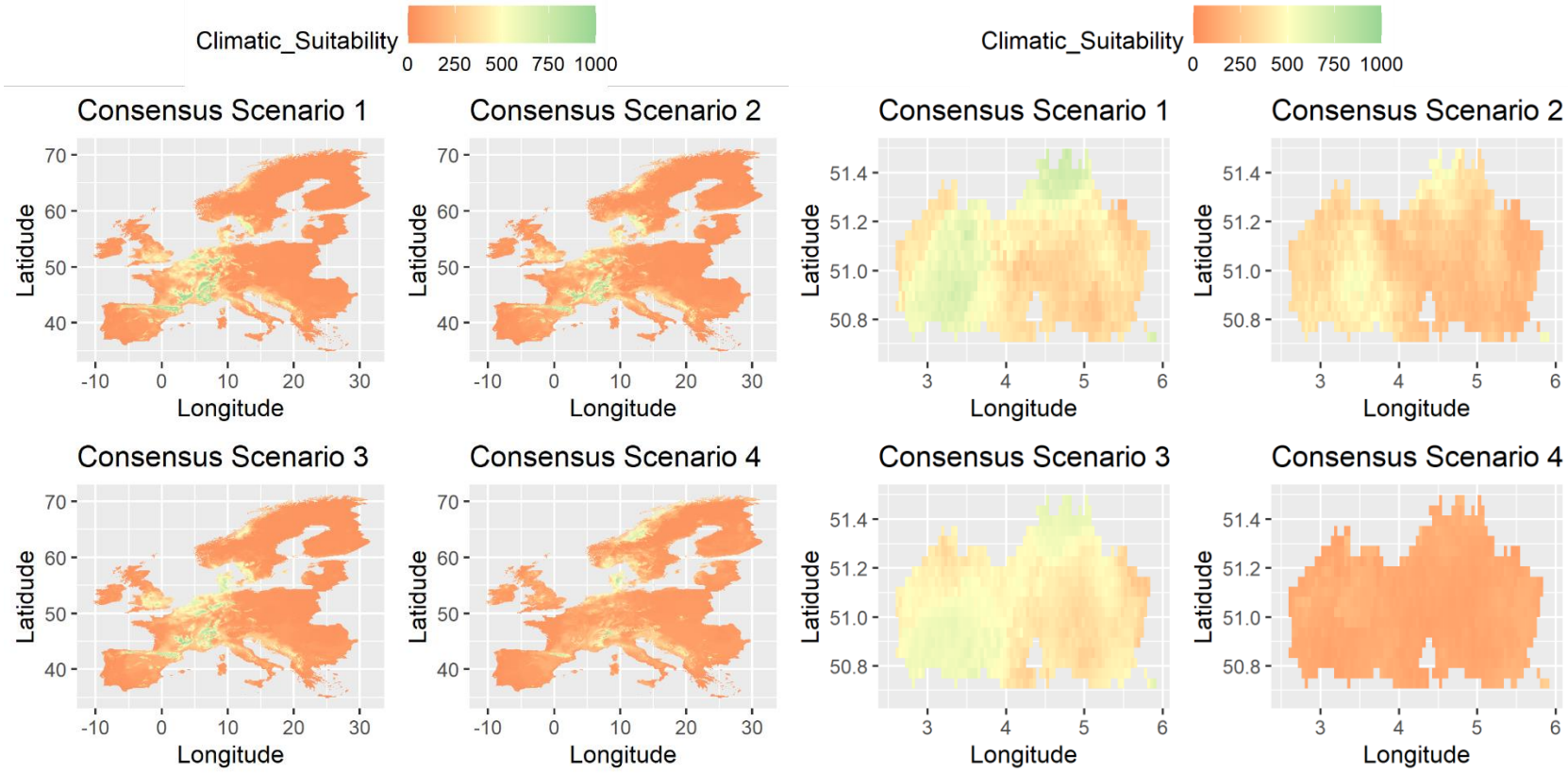
Acer monspessulanum L.

n = 7.439



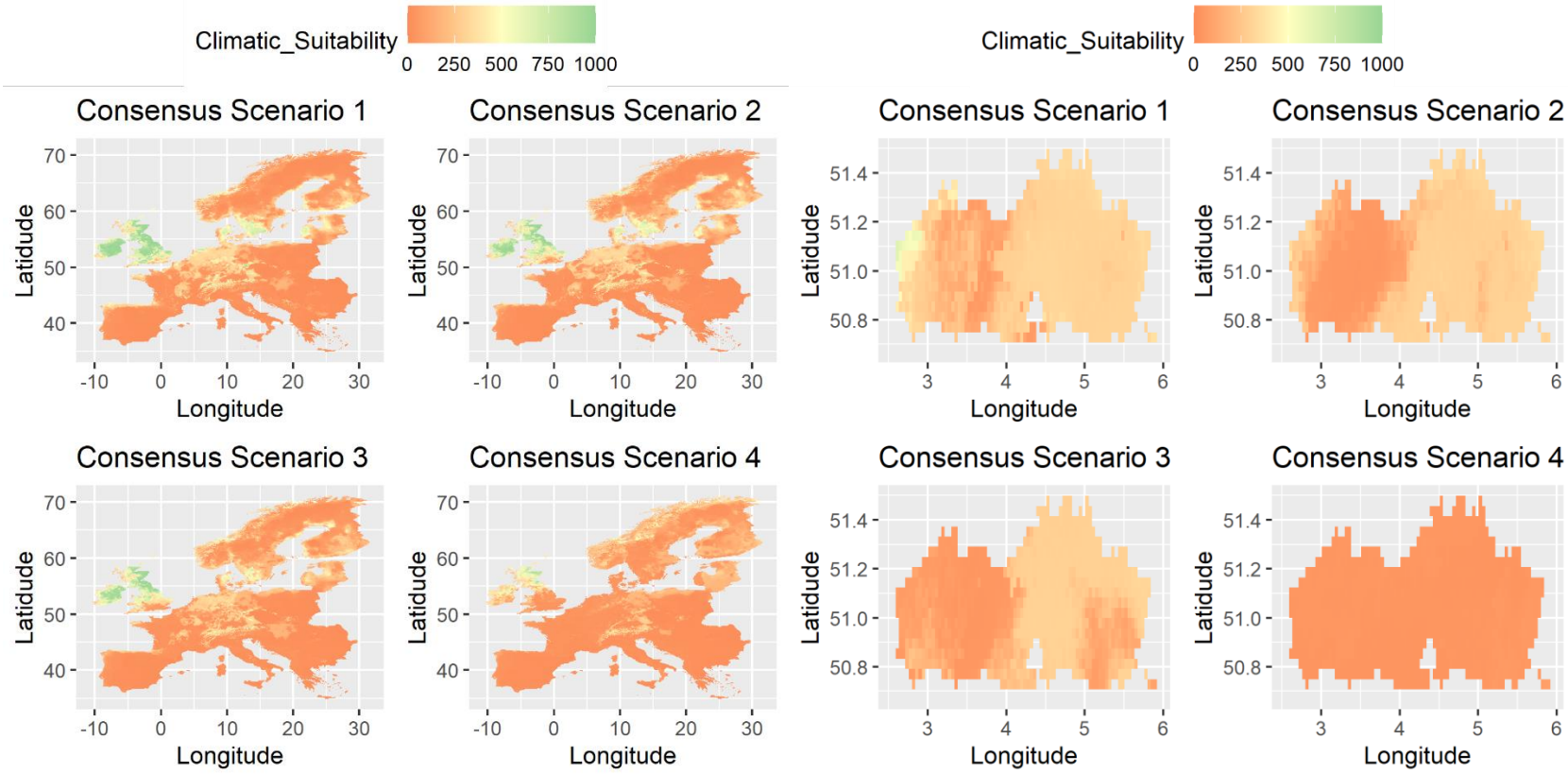
Acer opalus Mill.

n = 4.003



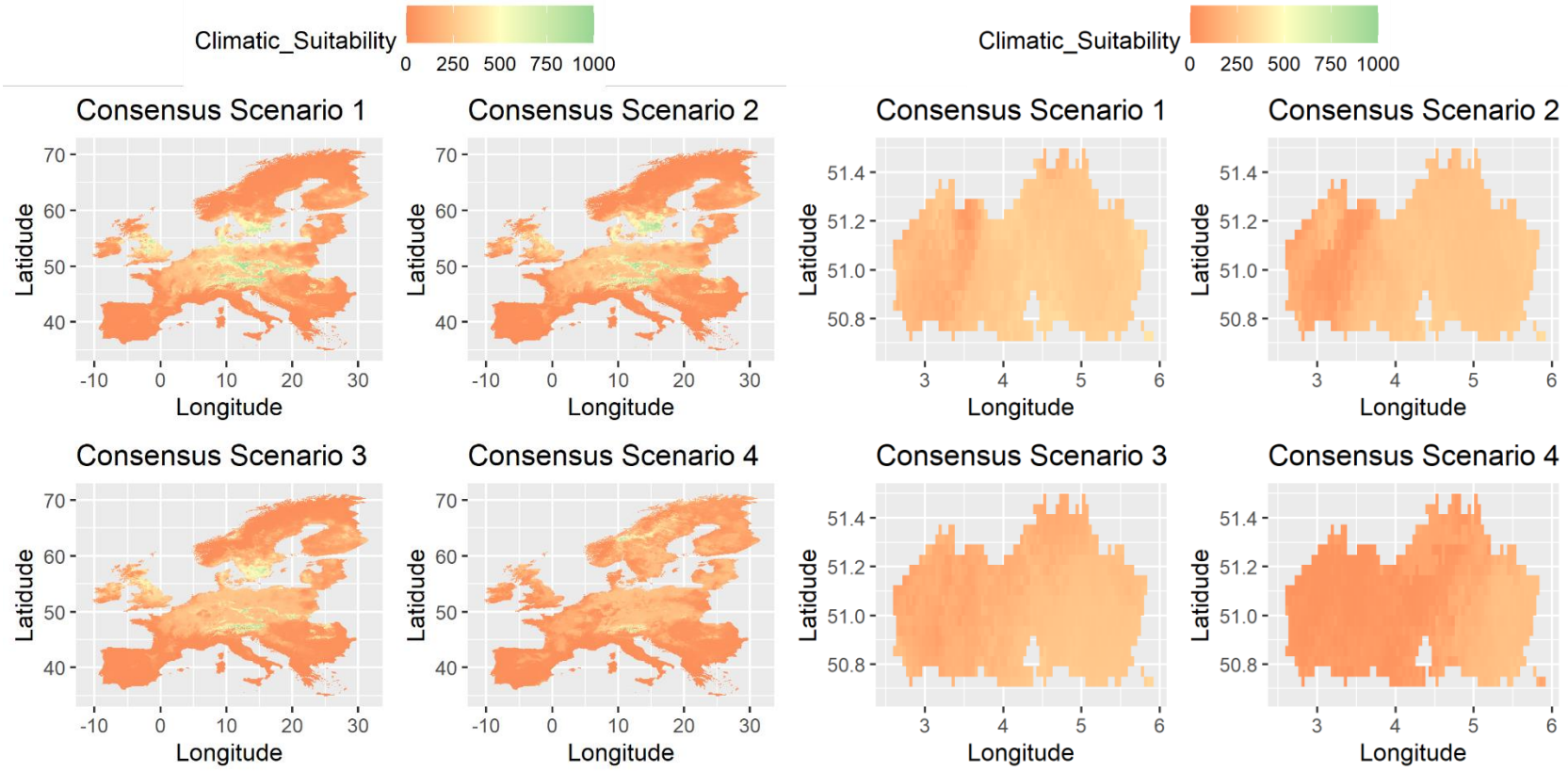
Acer rubrum L.

n = 109



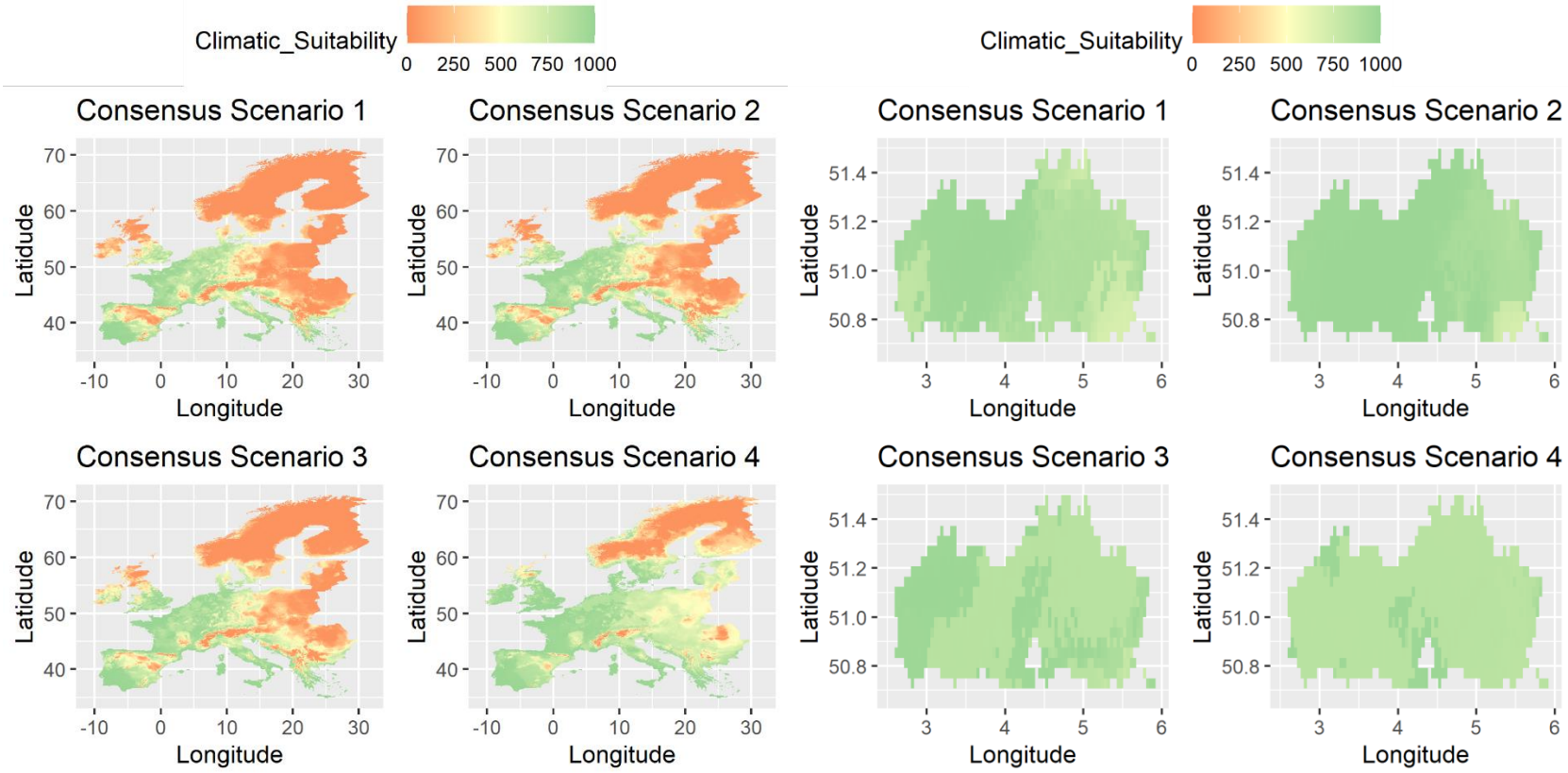
Acer saccharinum L.

n = 2.139



Albizia julibrissin Durazz.

n = 224



Broussonetia papyrifera (L.) Vent.

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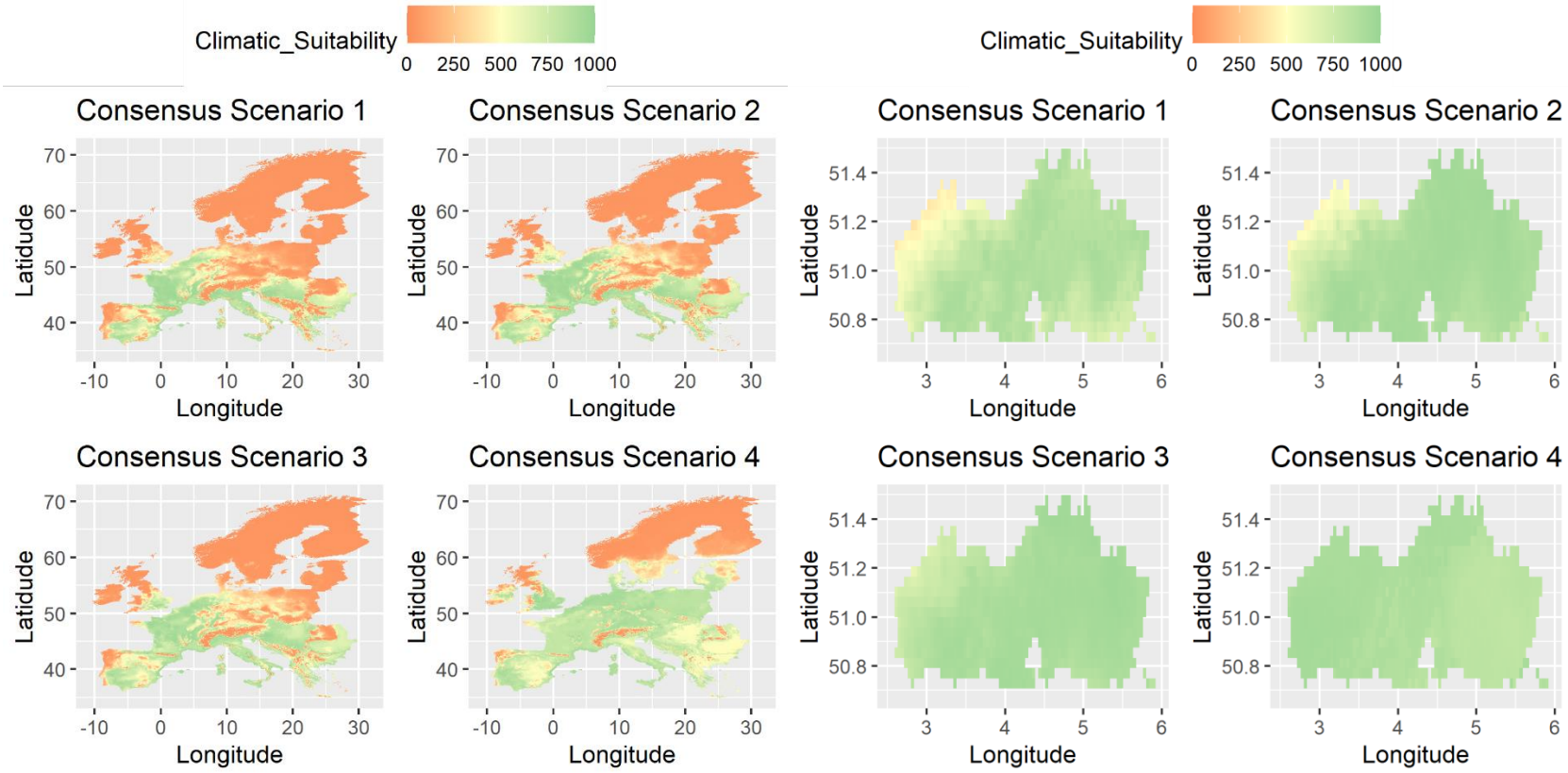
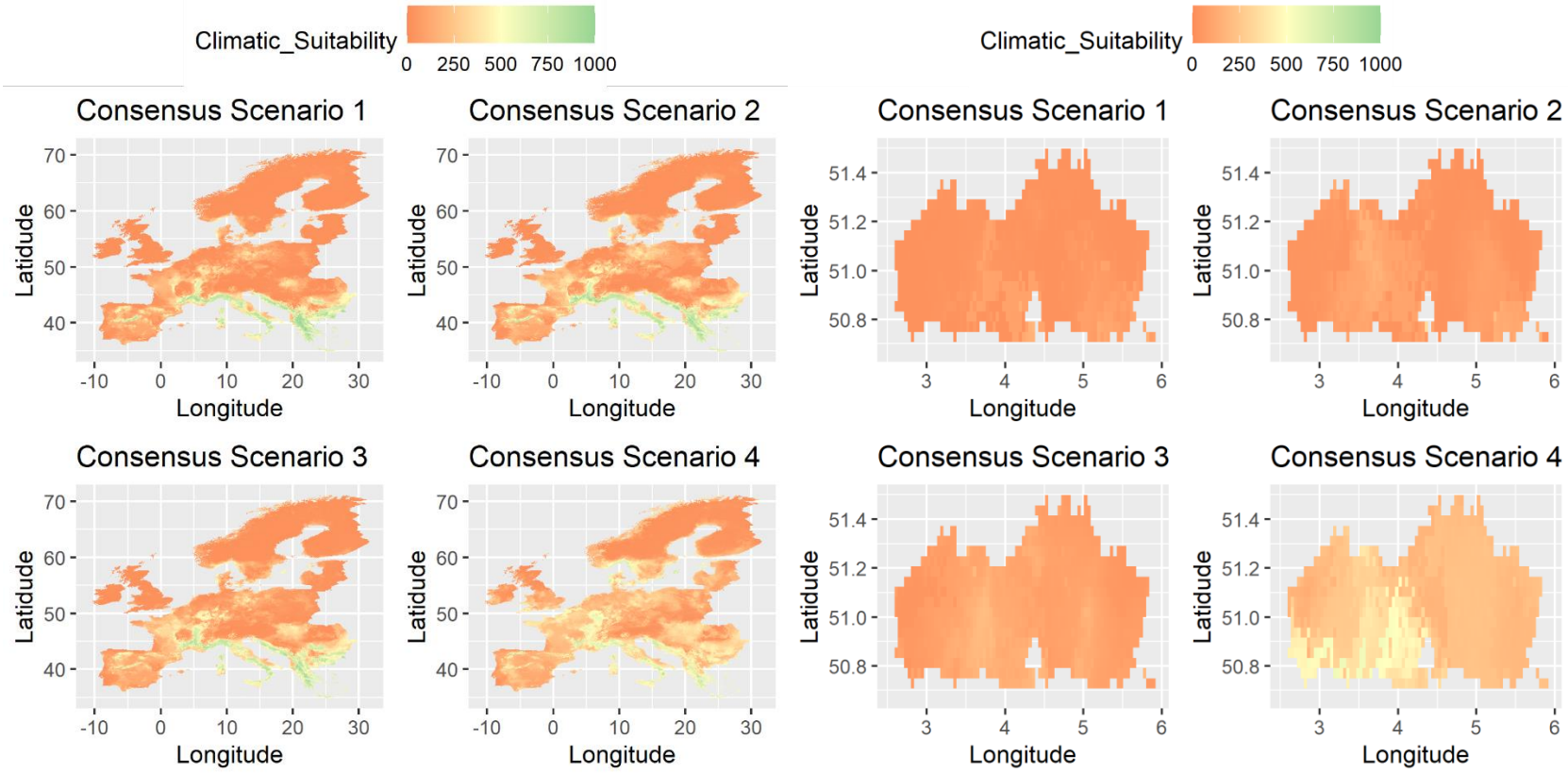


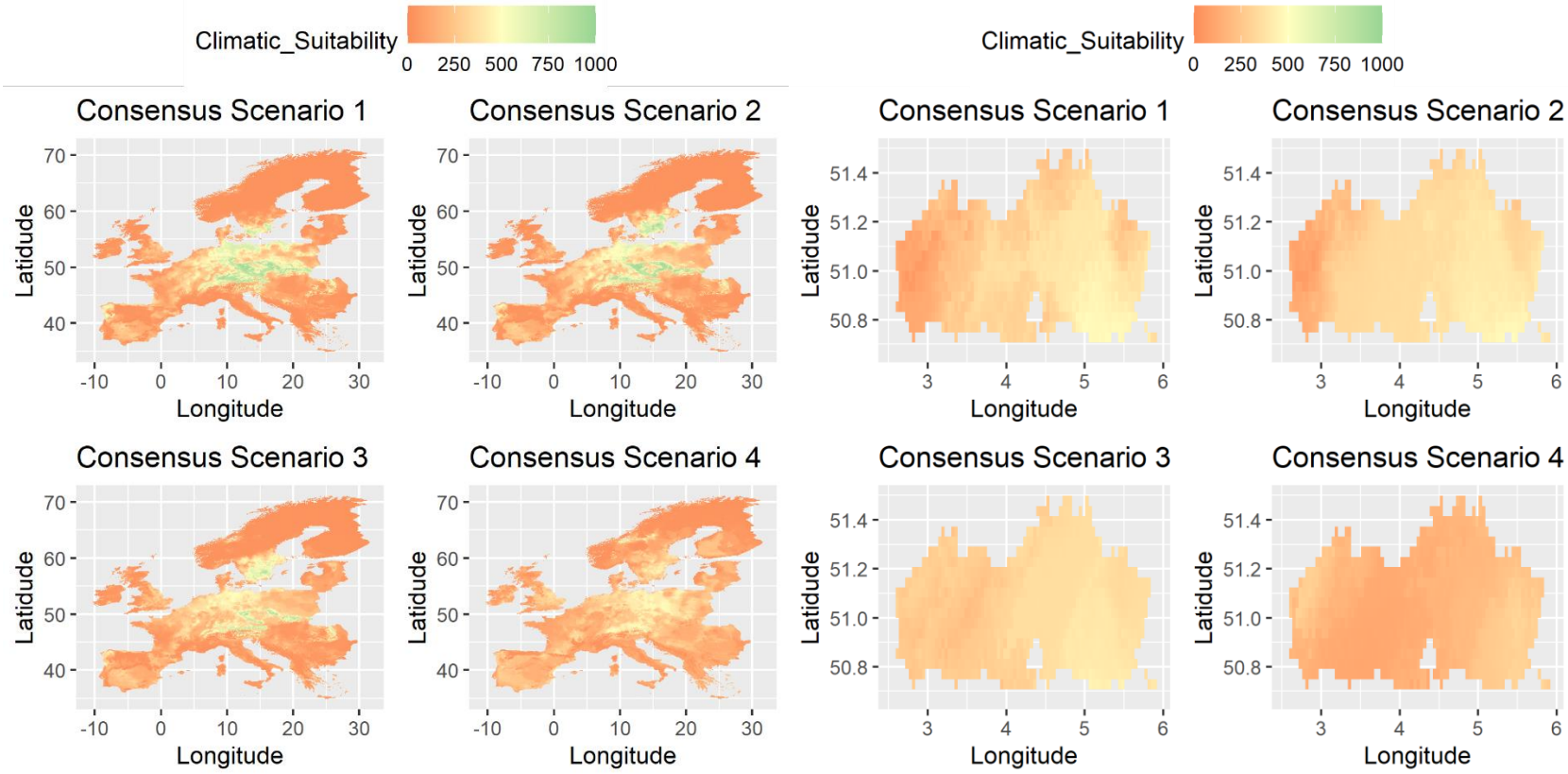
Carpinus orientalis Mill.

n = 195



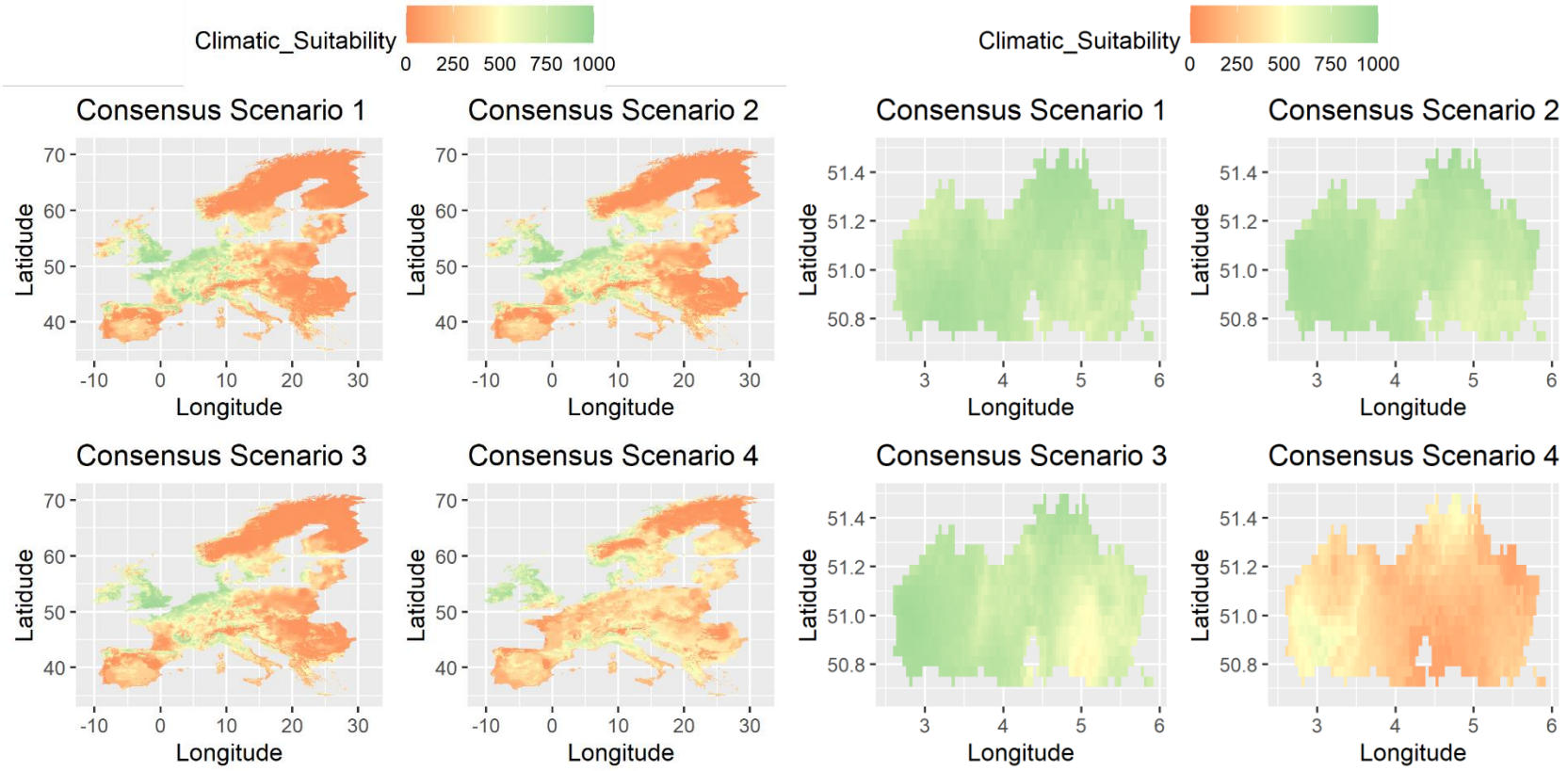
Catalpa bignonioides Walter

n = 3.885



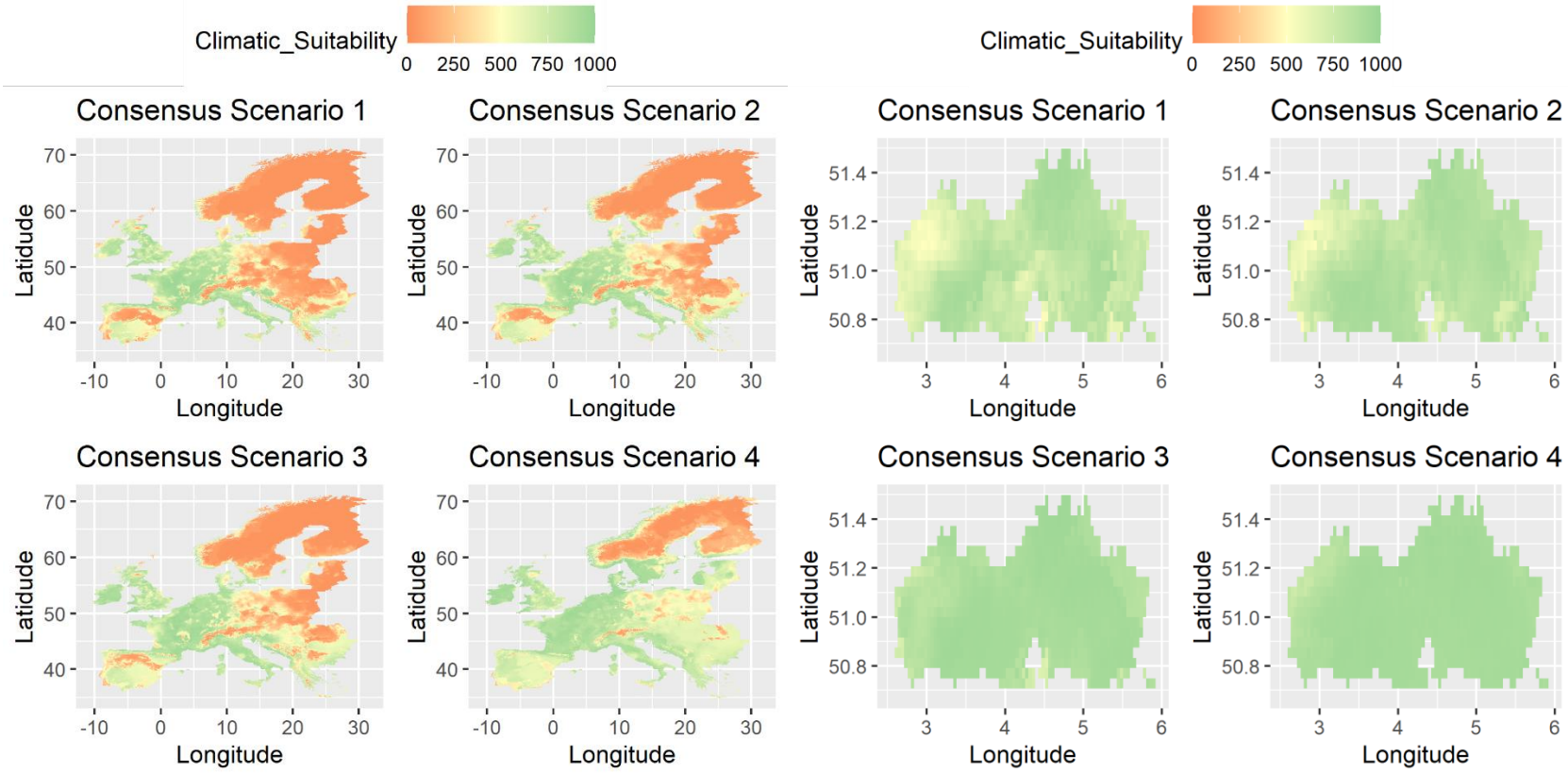
Cedrus atlantica (Endl.) Manetti ex Carriere

n = 999



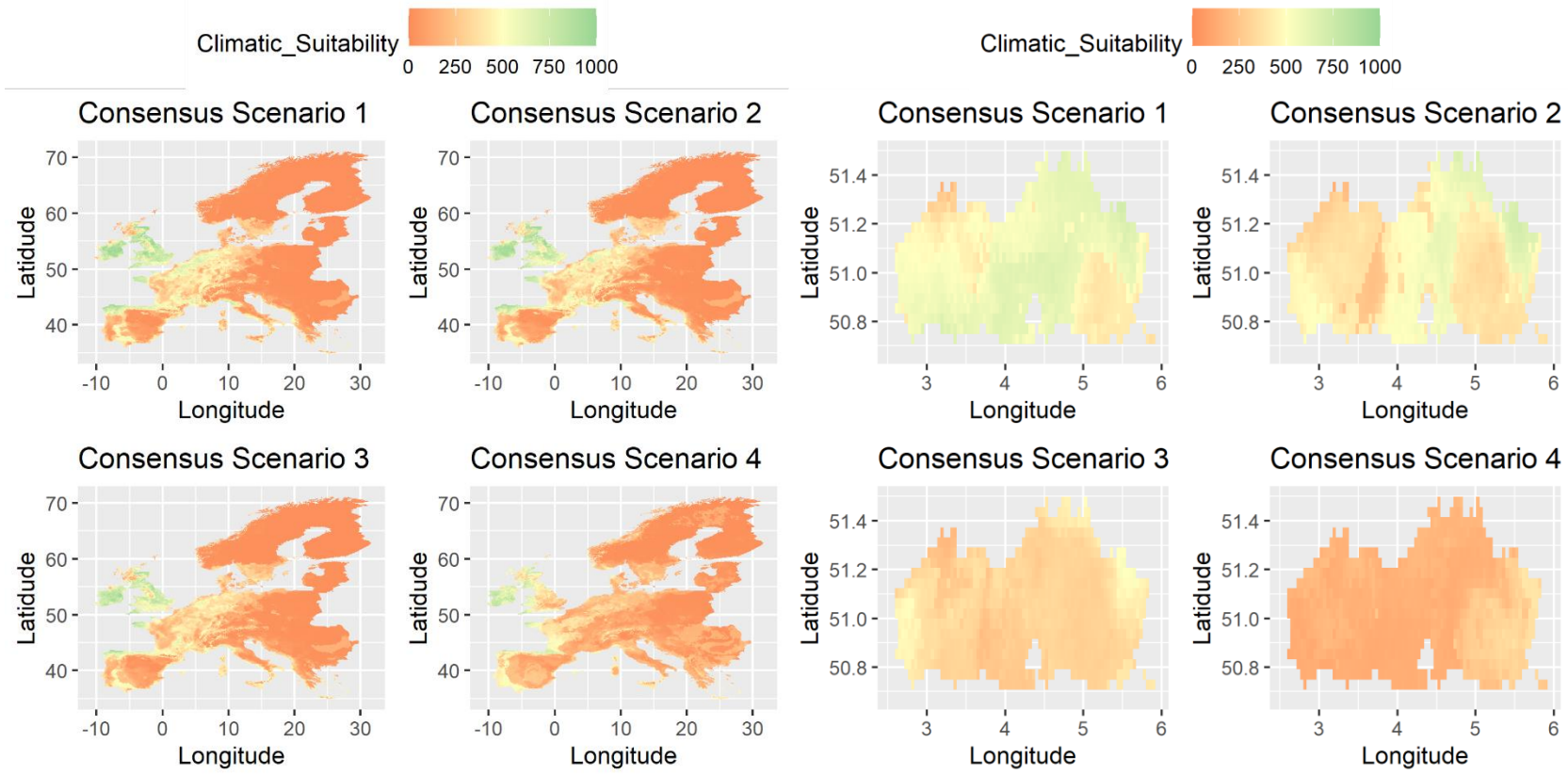
Cedrus deodara (Lamb.) G.Don

n = 362



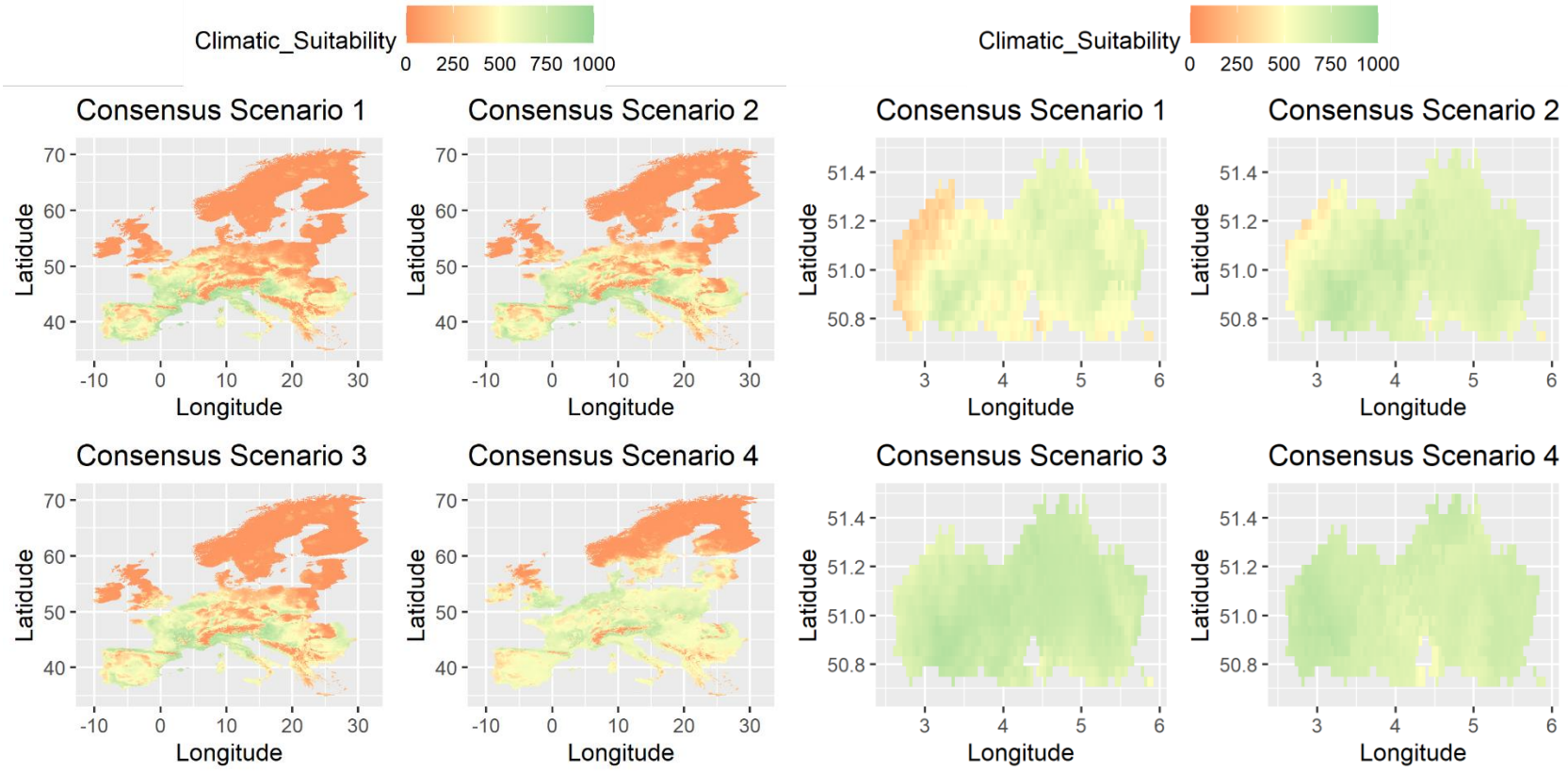
Cedrus libani A.Rich.

n = 347



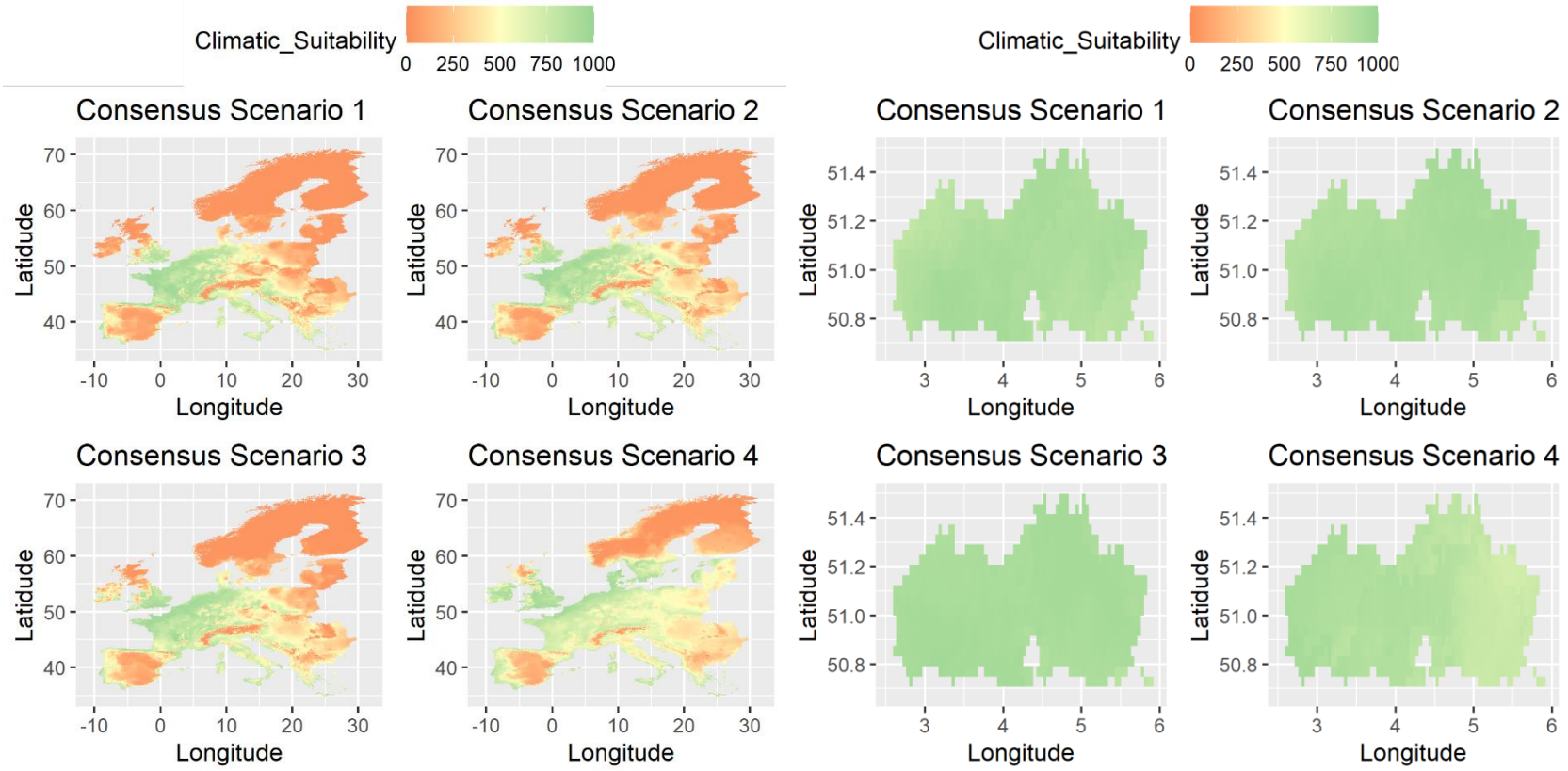
Celtis australis L.

n = 13.416



Cercis siliquastrum L.

n = 7.921



Cornus mas L.

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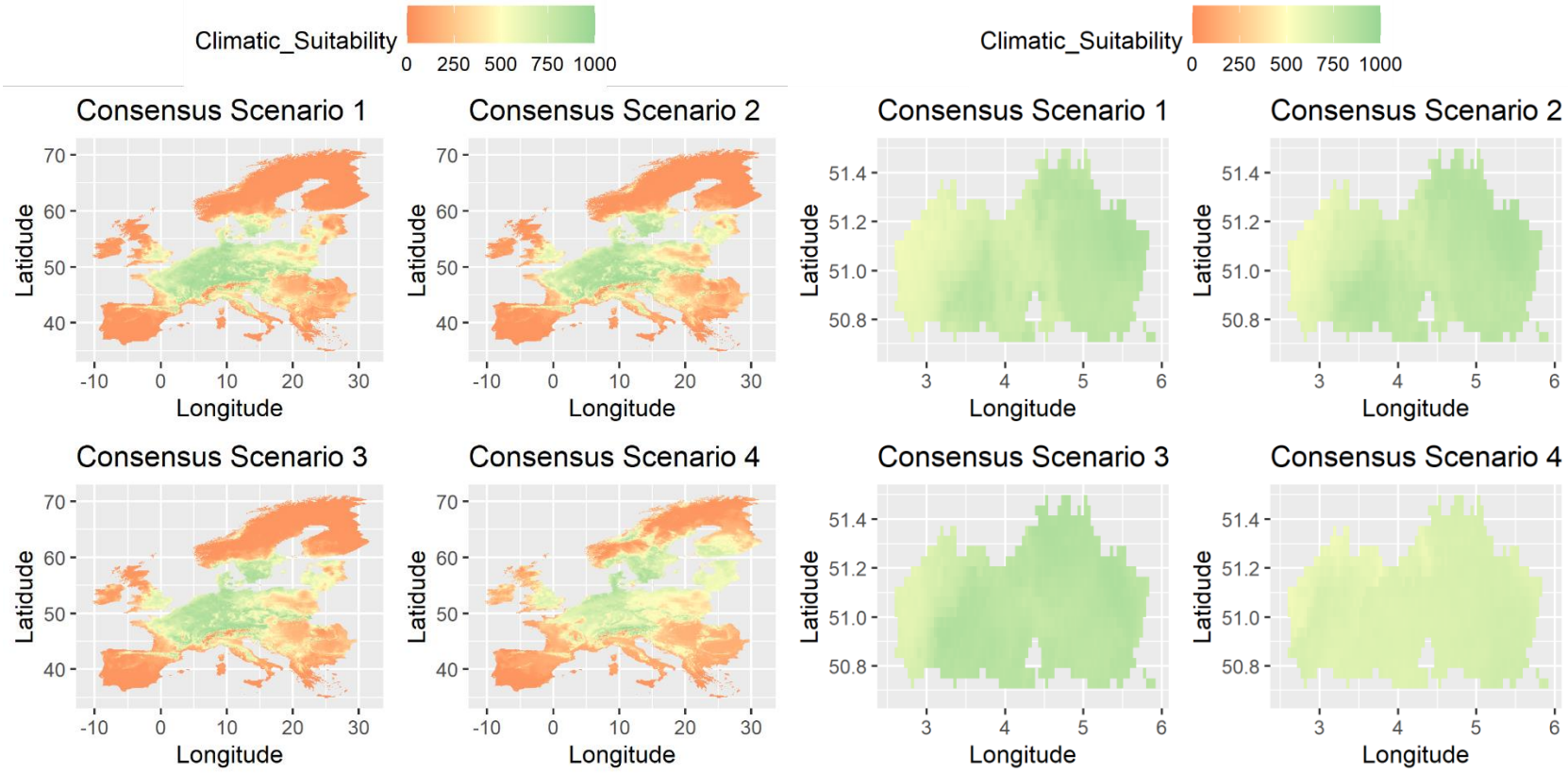
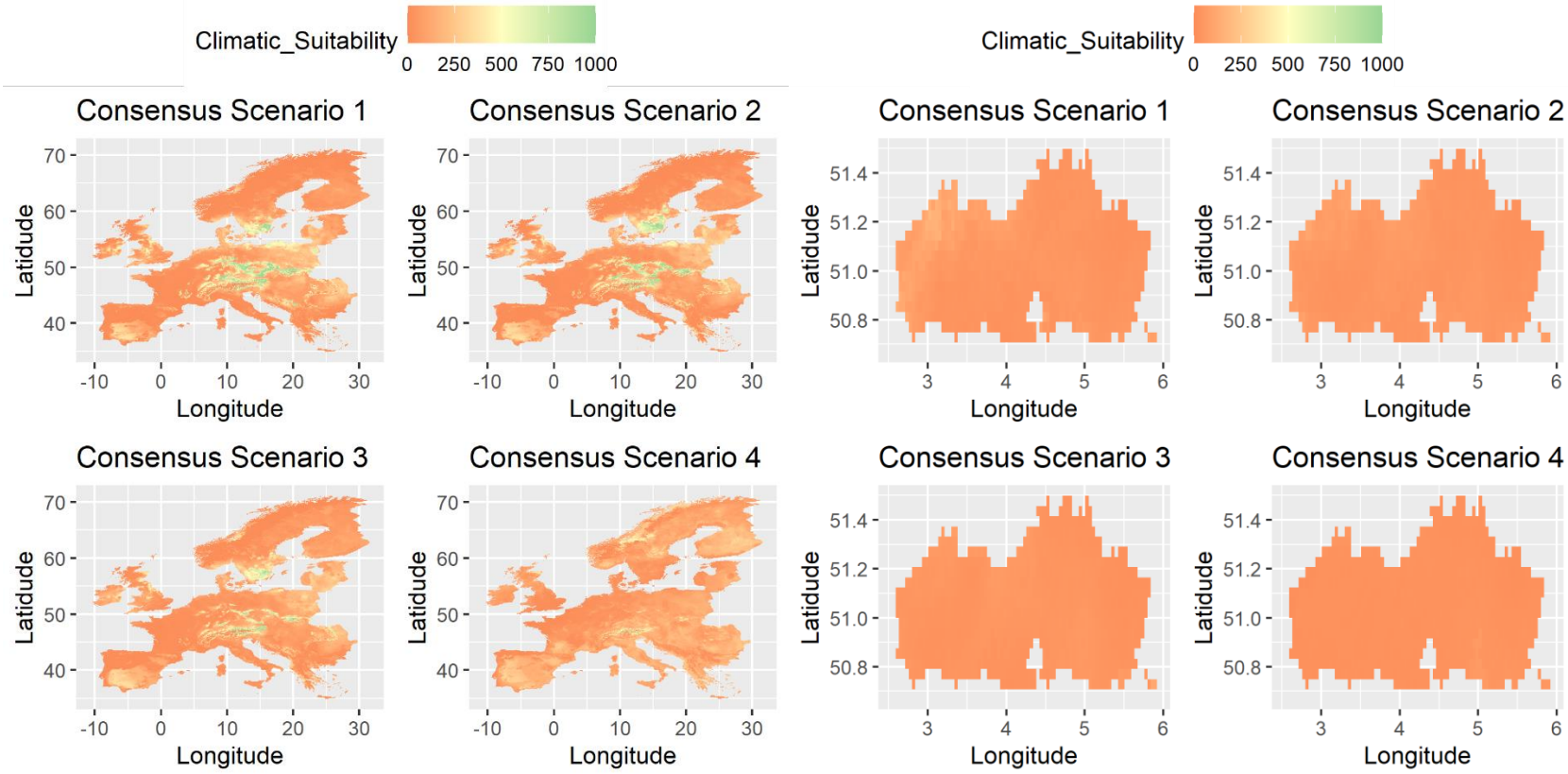


Corylus colurna L.

n = 416



Cotinus coggygria Scop.

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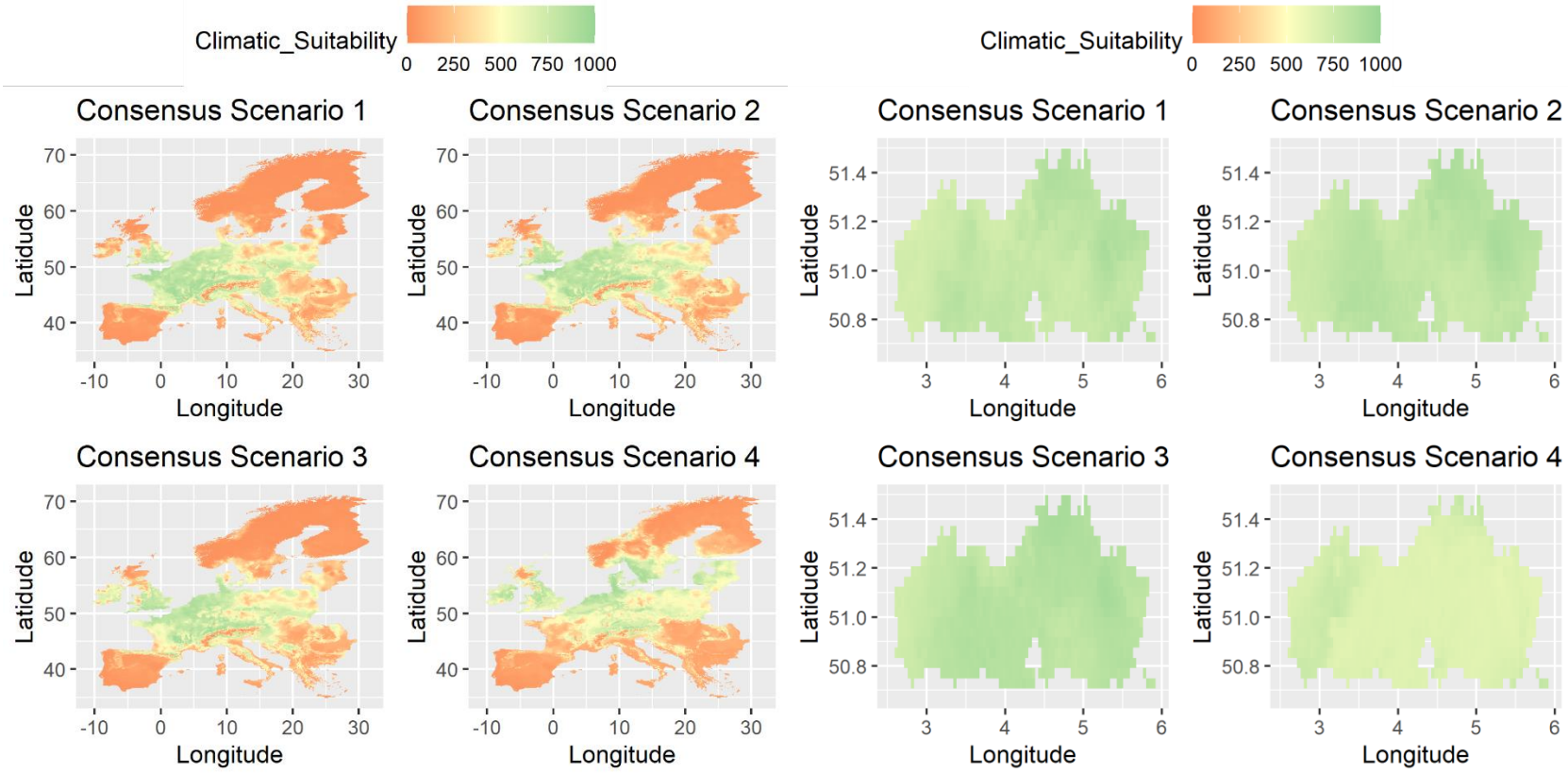

Elaeagnus angustifolia L.

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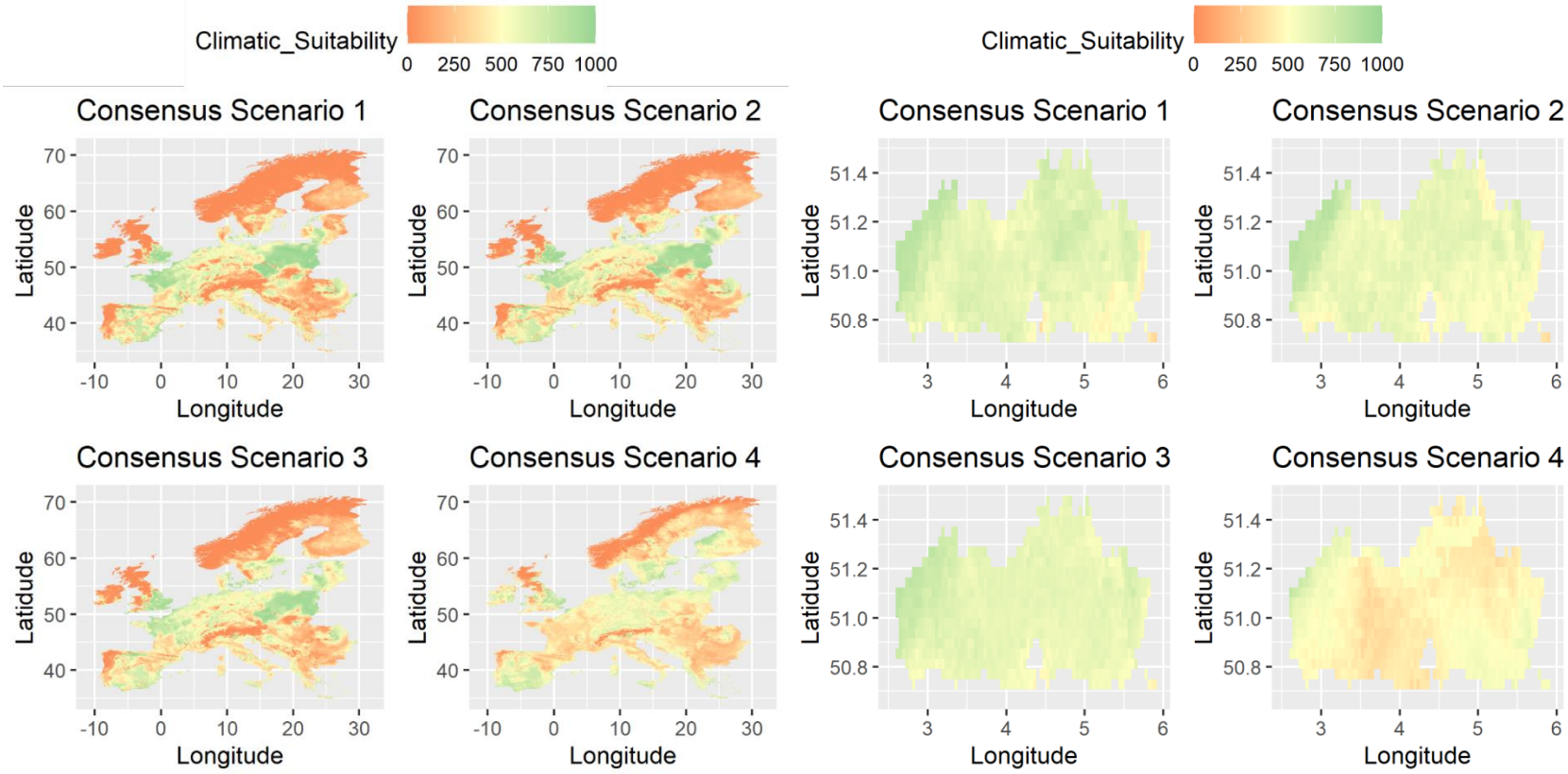

Ficus carica L.

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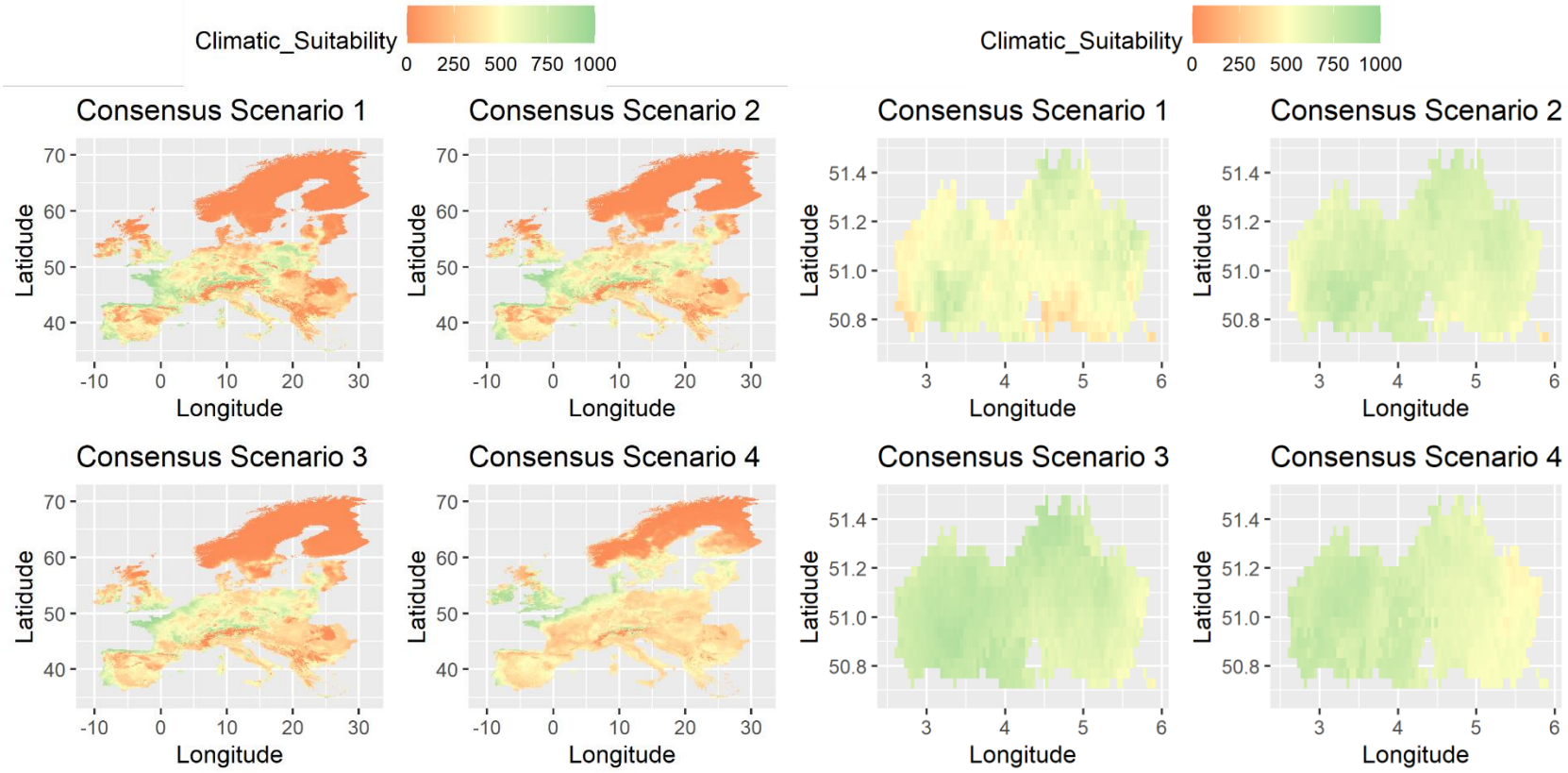

Fraxinus angustifolia Vahl

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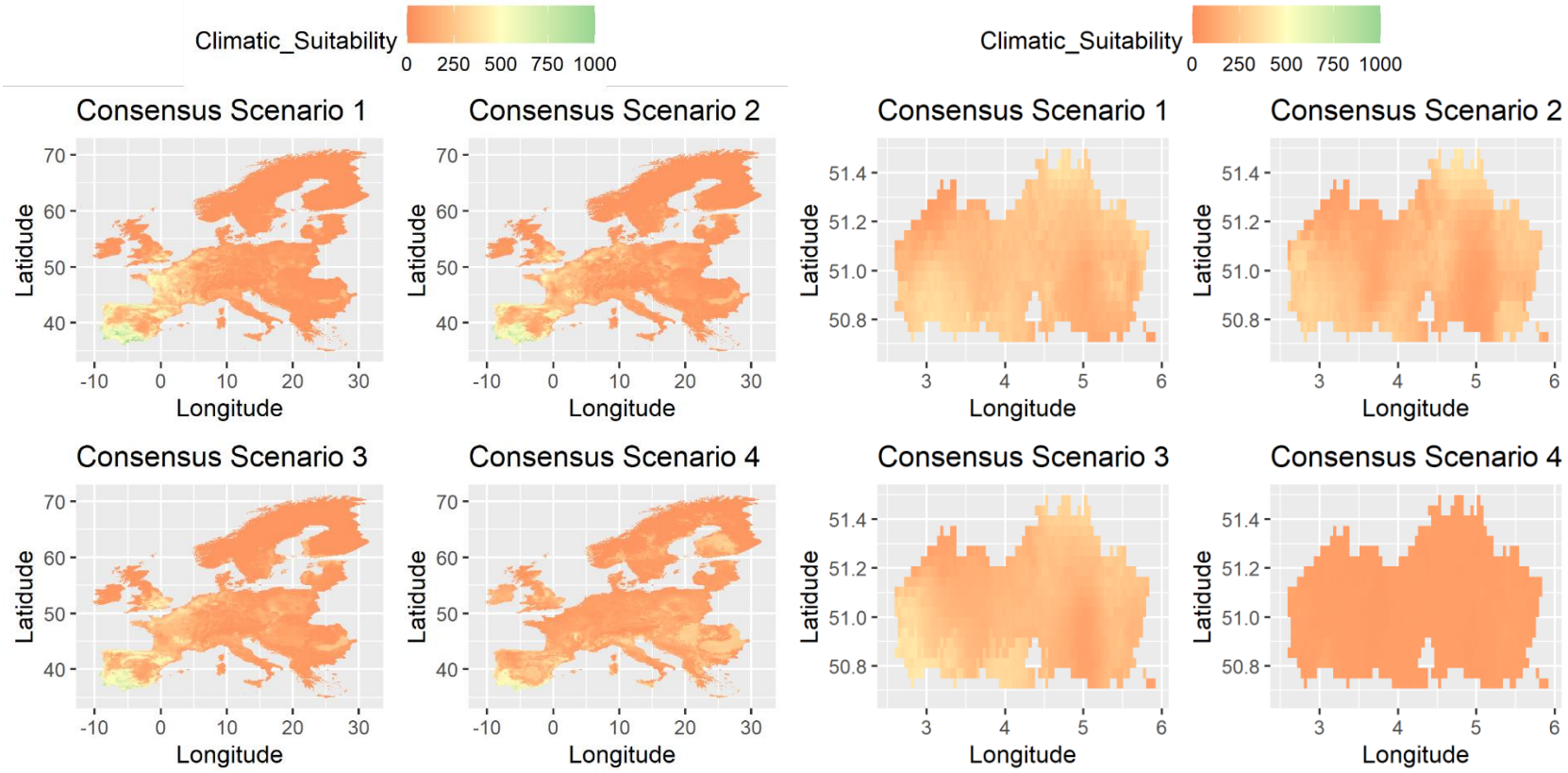

Fraxinus ornus L.

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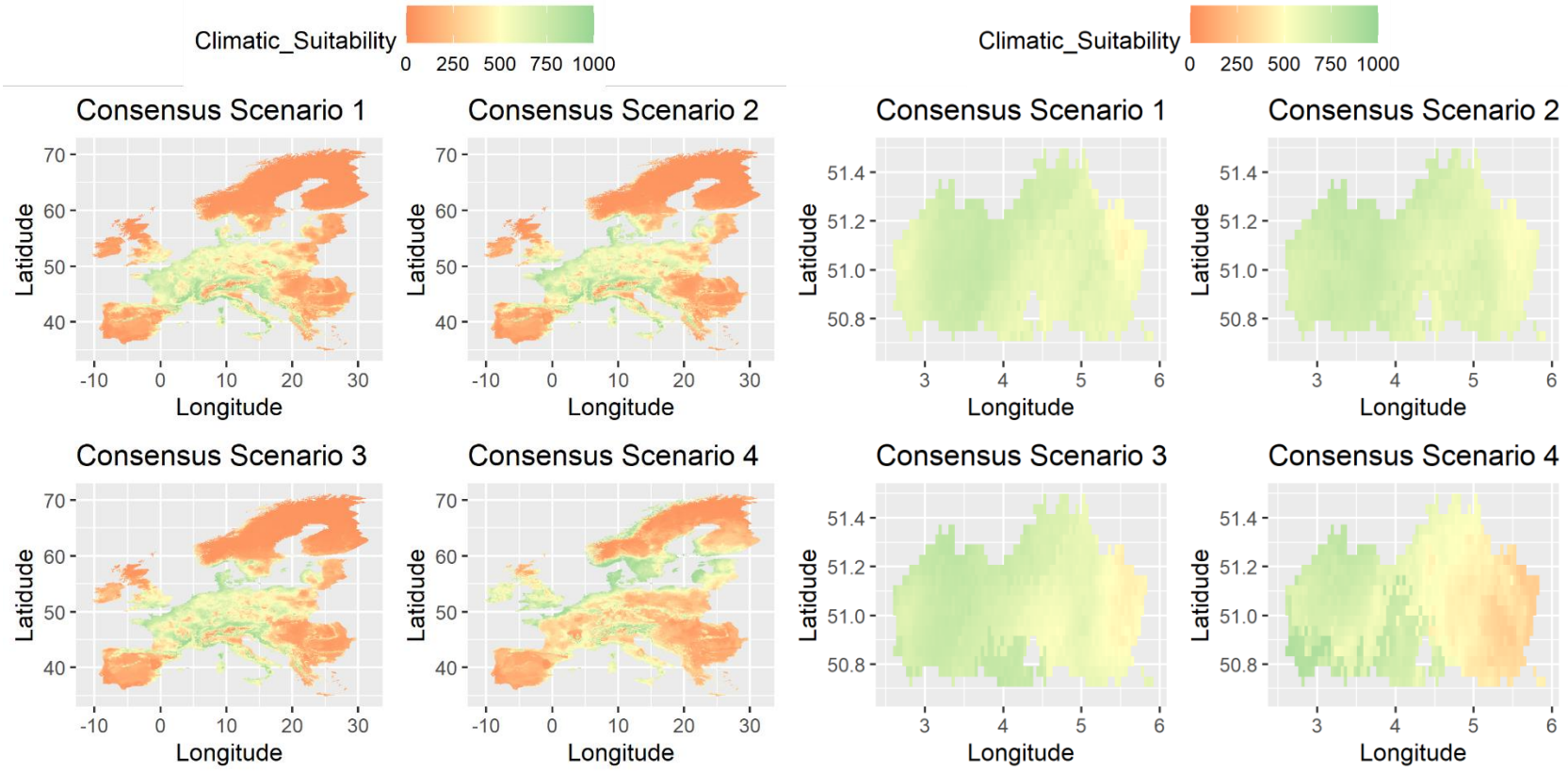
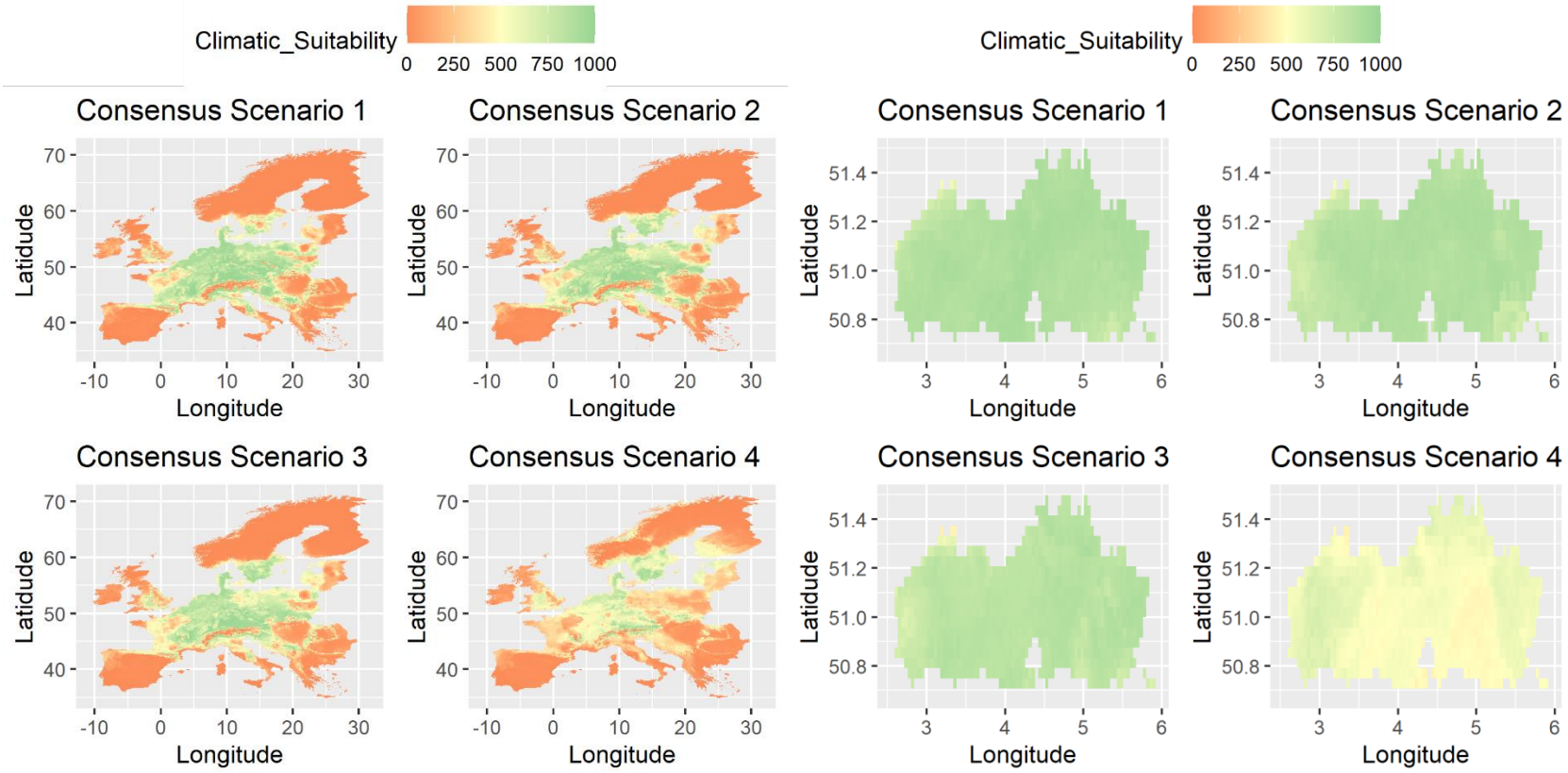


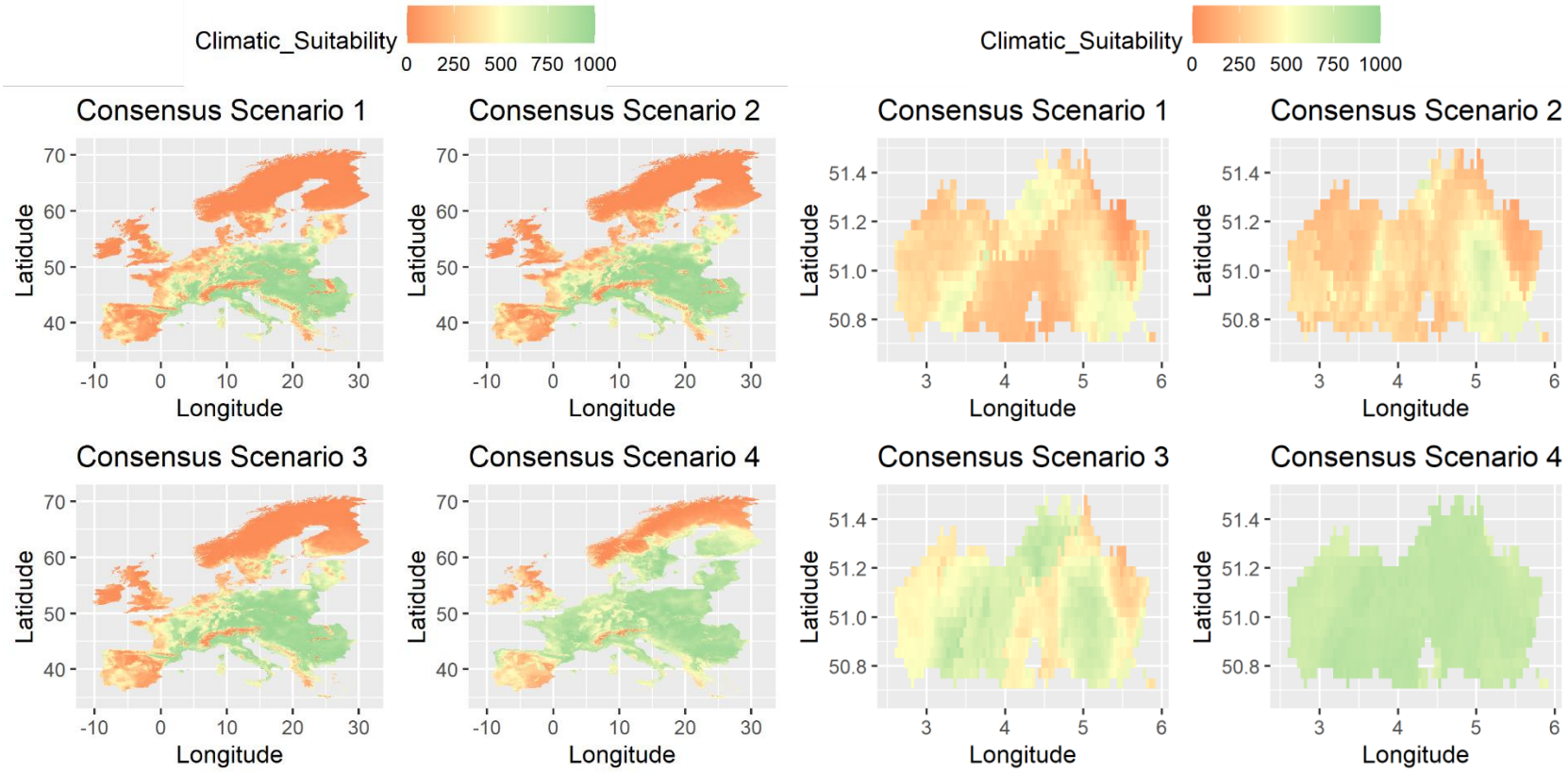
Juglans nigra L.

n = 839



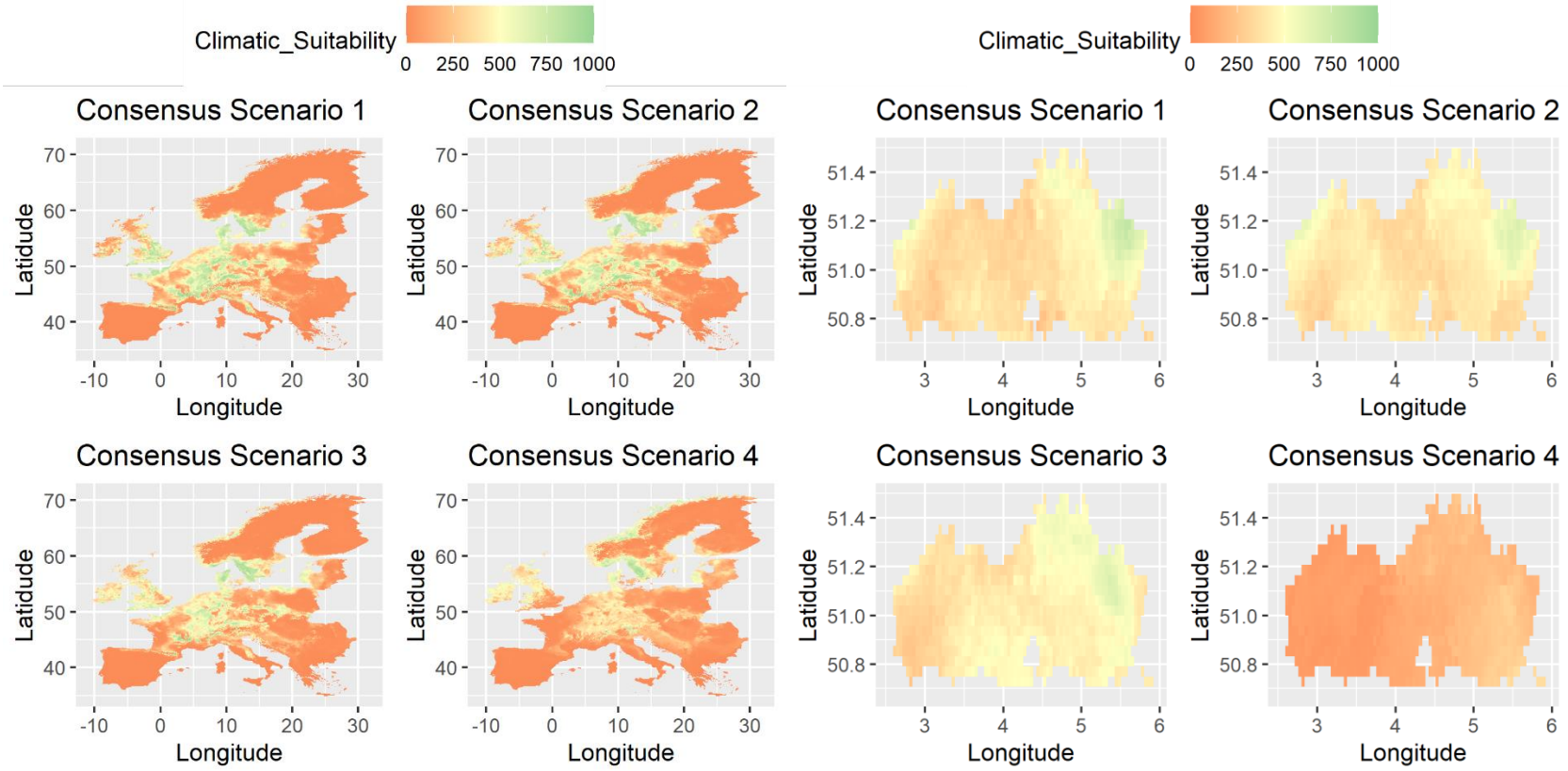
Koelreuteria paniculata Laxm.

n = 501



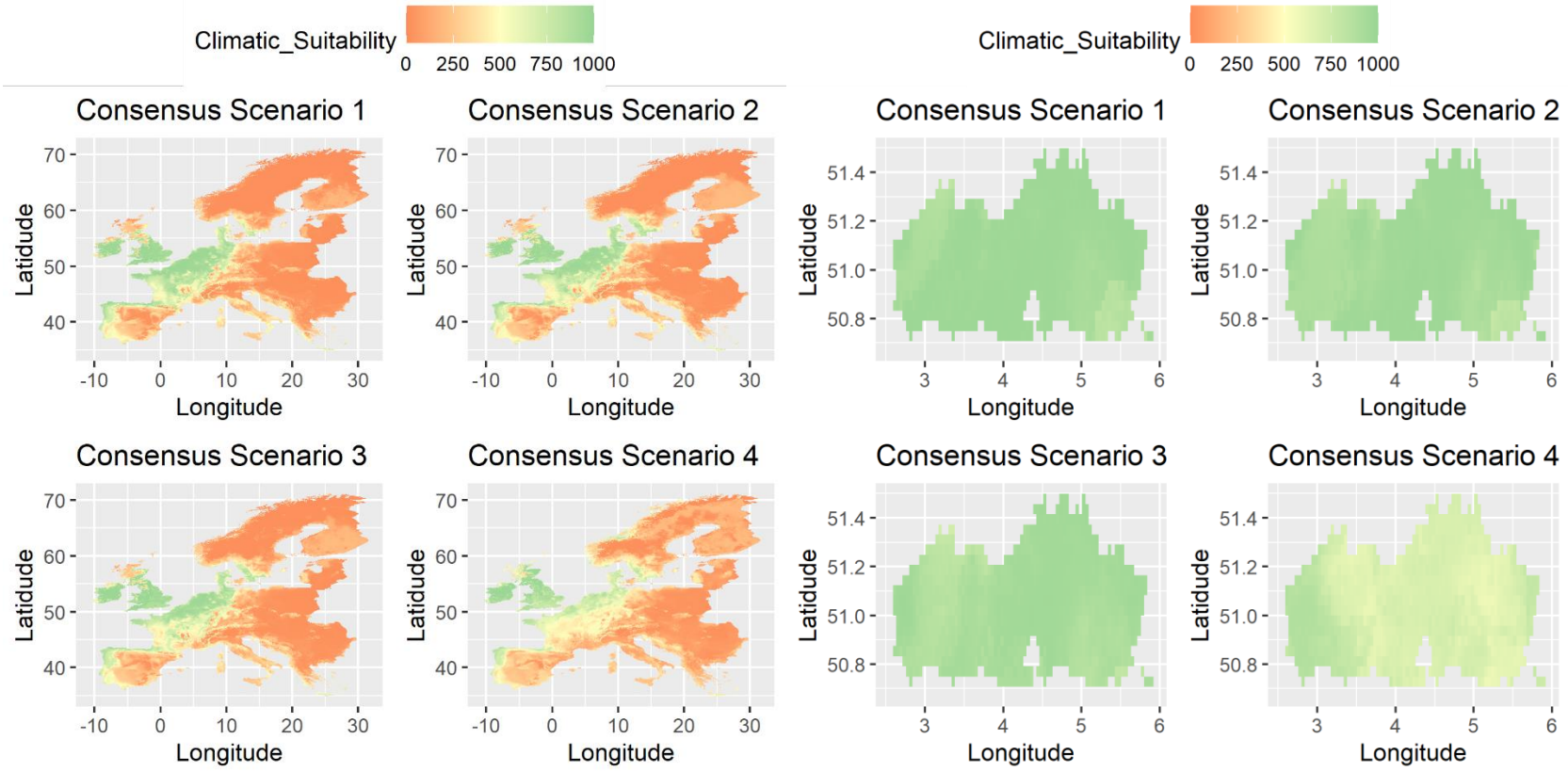
Laburnum anagyroides Medik.

n = 9.705



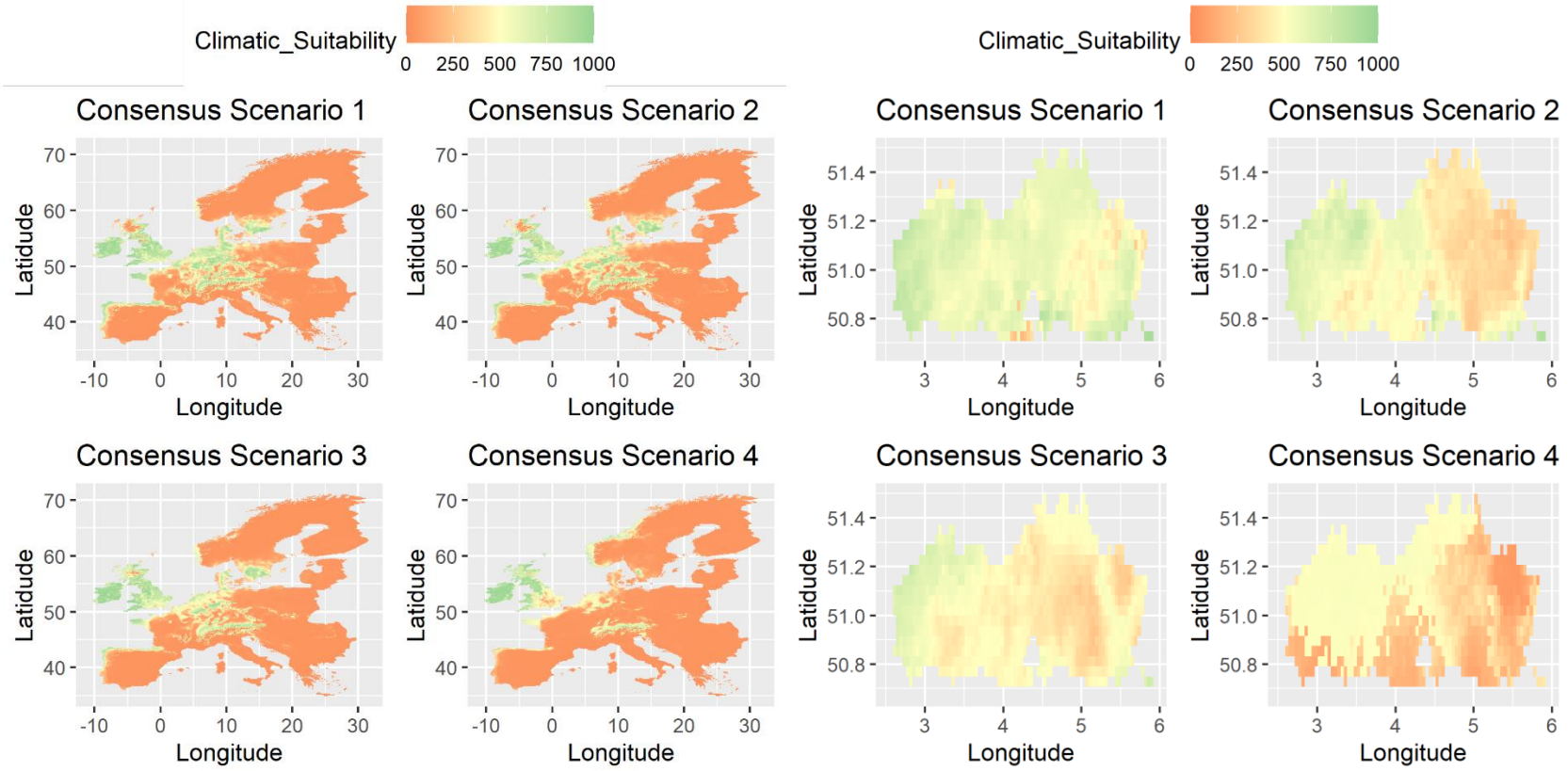
Liquidambar styraciflua L.

n = 148



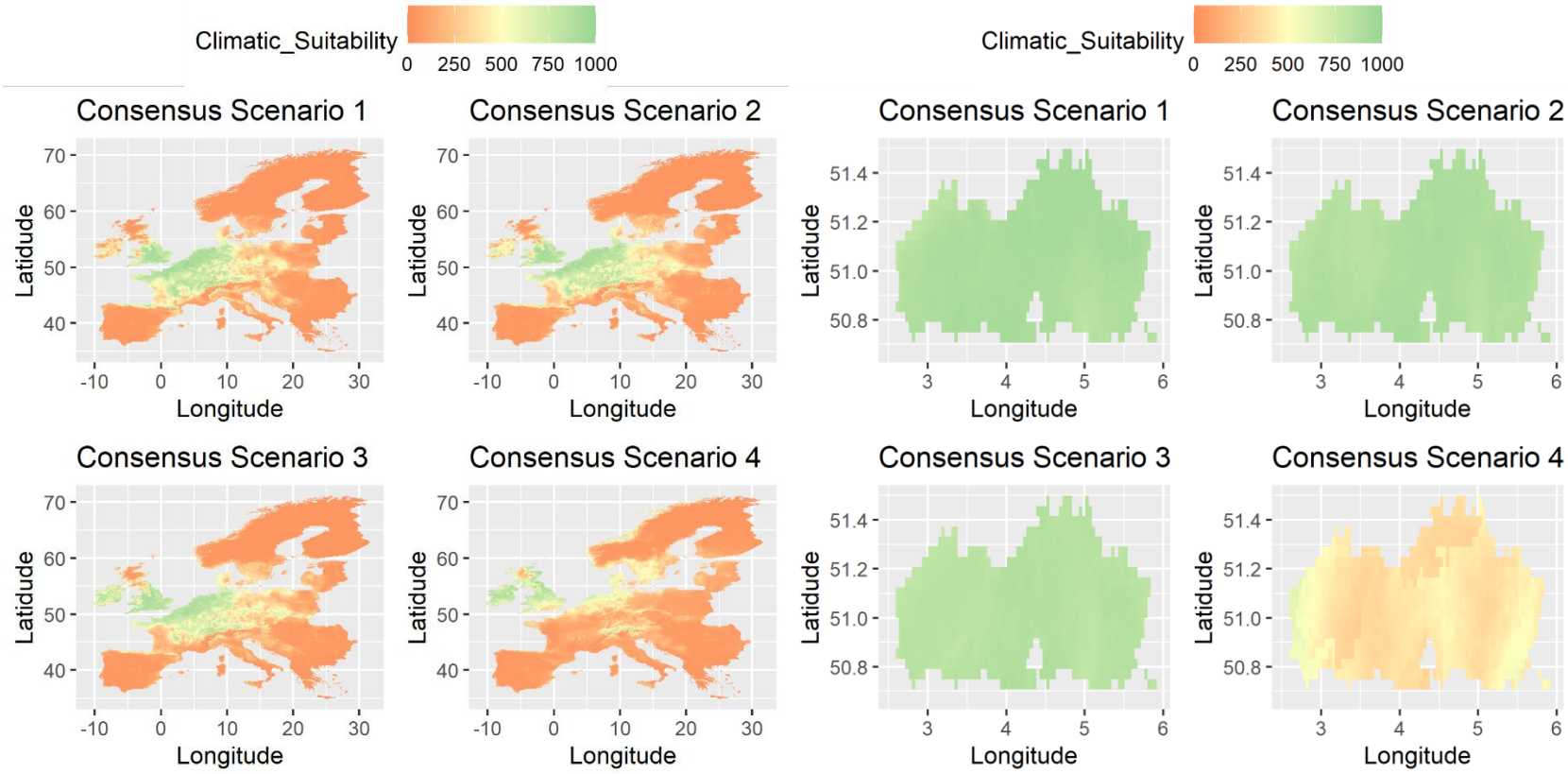
Liriodendron tulipifera L.

n = 389



Mespilus germanica L.

n = 7.469



Morus alba L.

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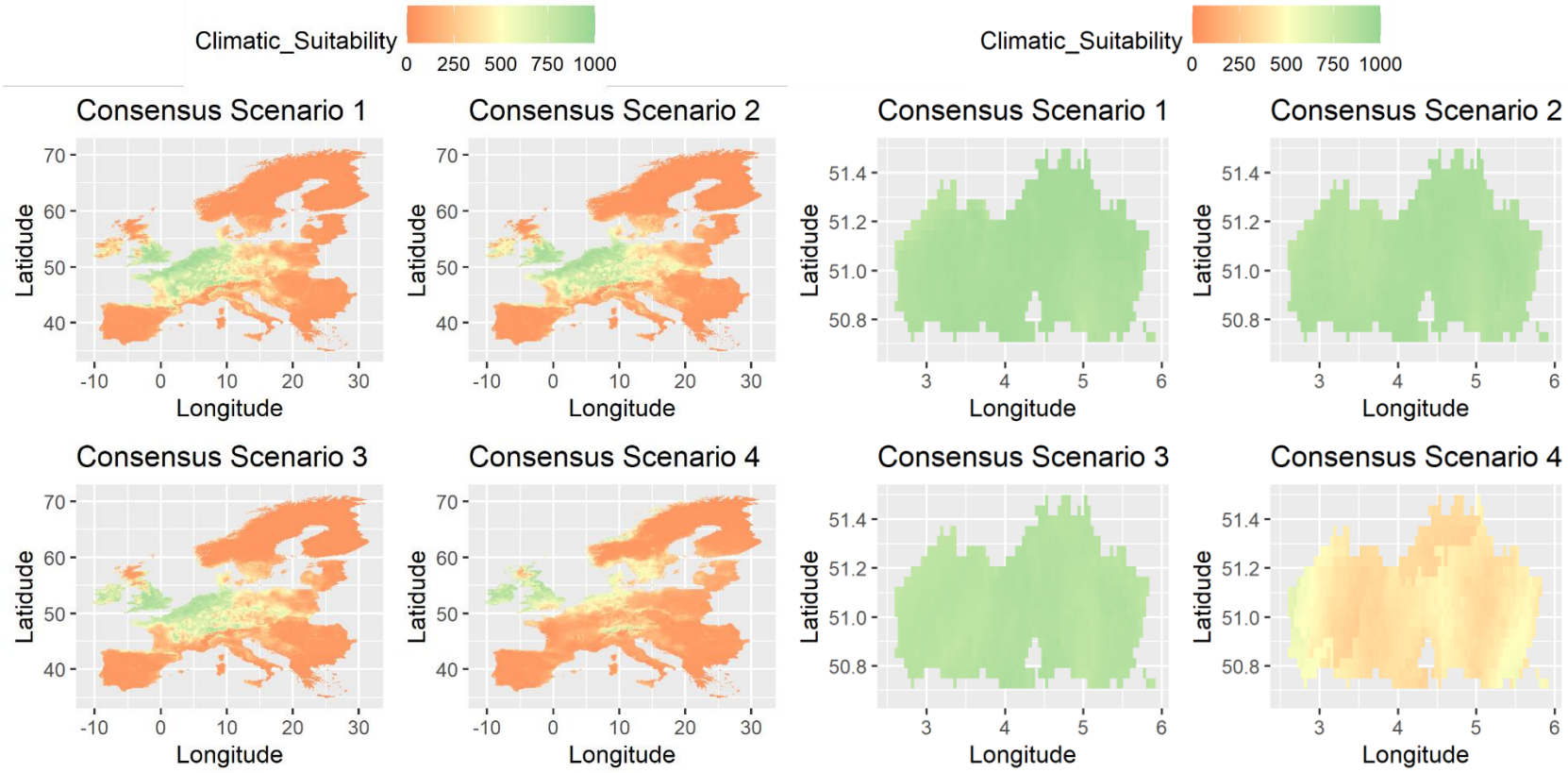

Ostrya carpinifolia Scop.

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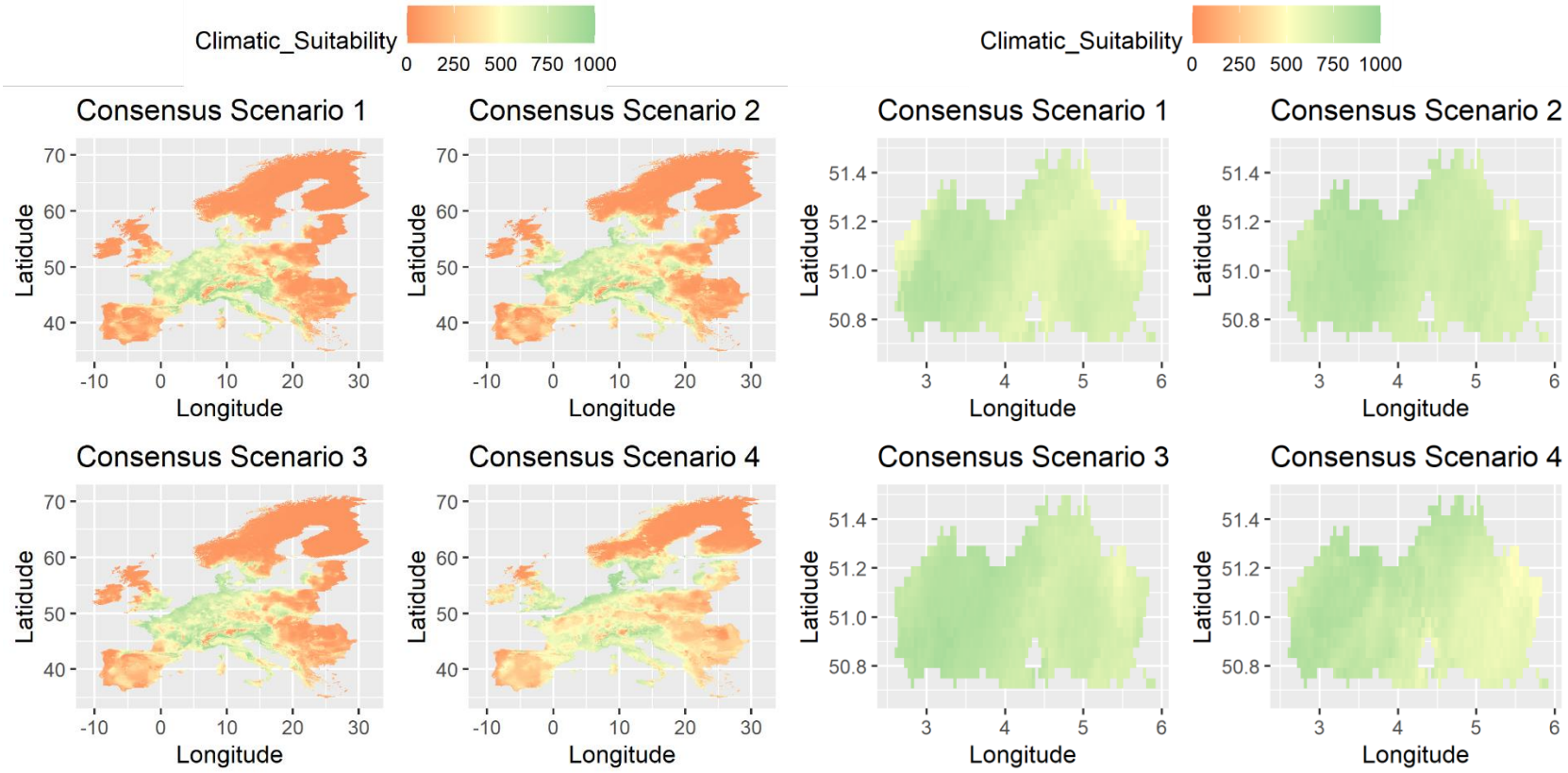
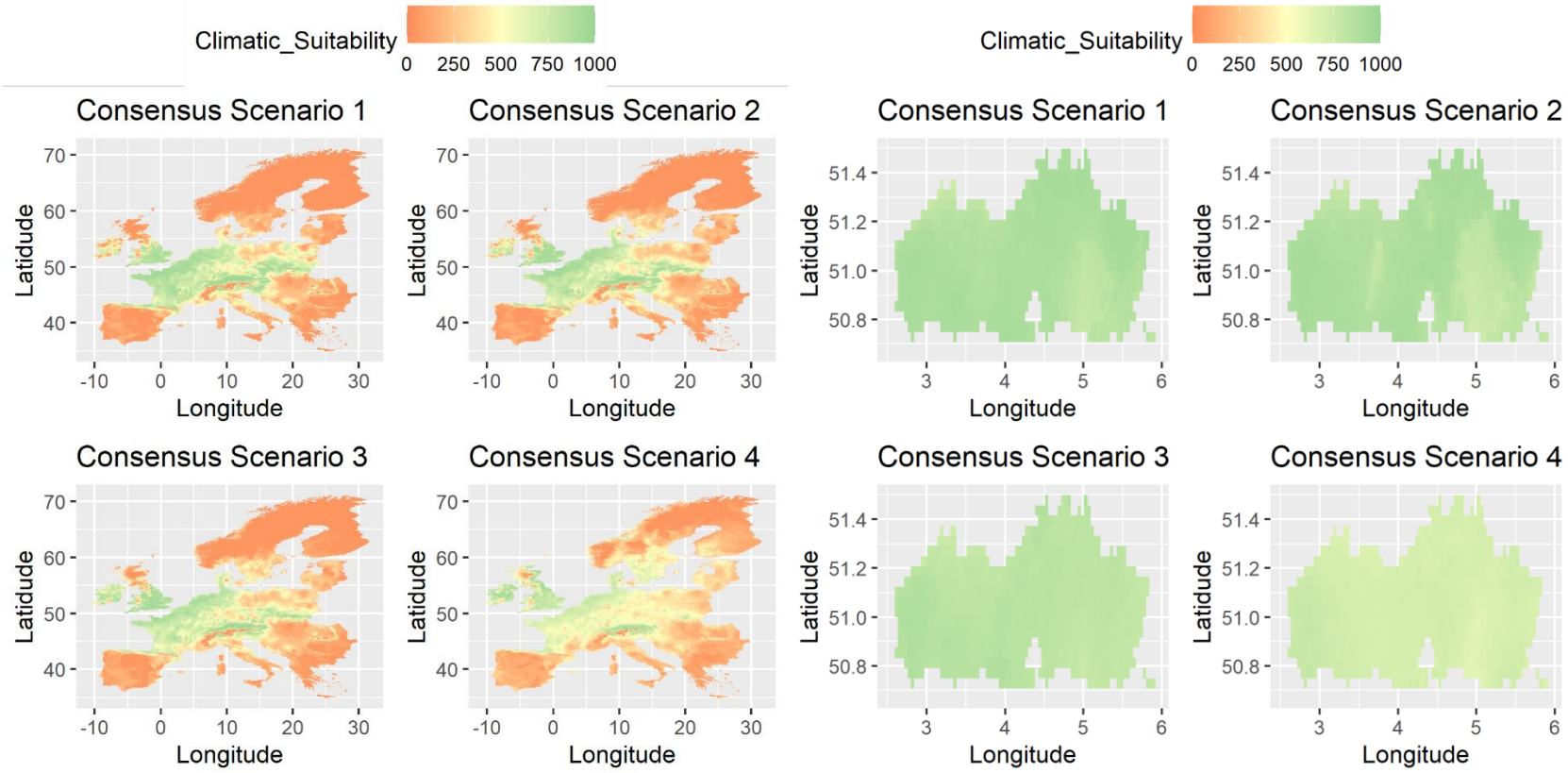


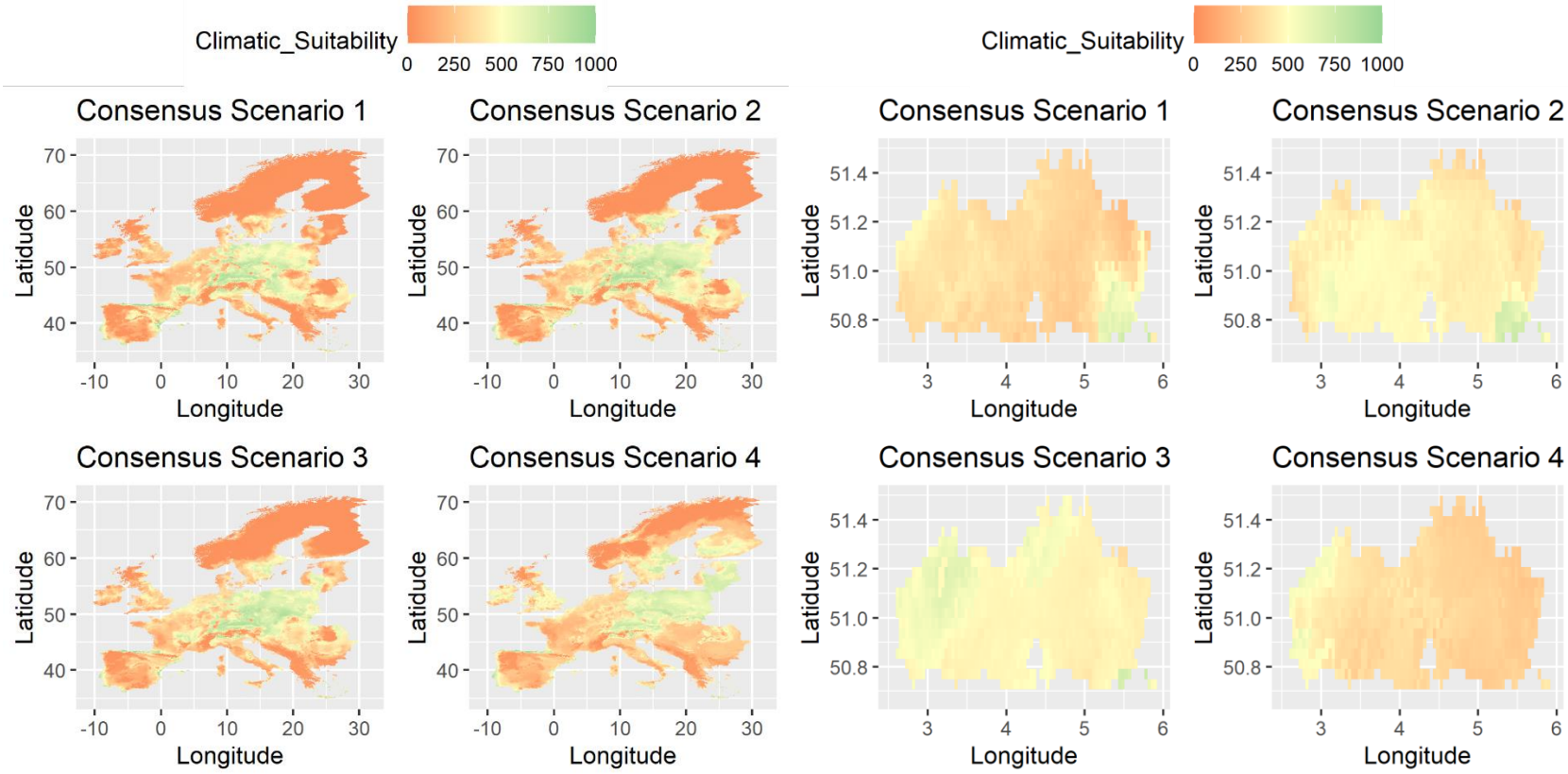
Paulownia tomentosa (Thunb.) Steud.

n = 4.719



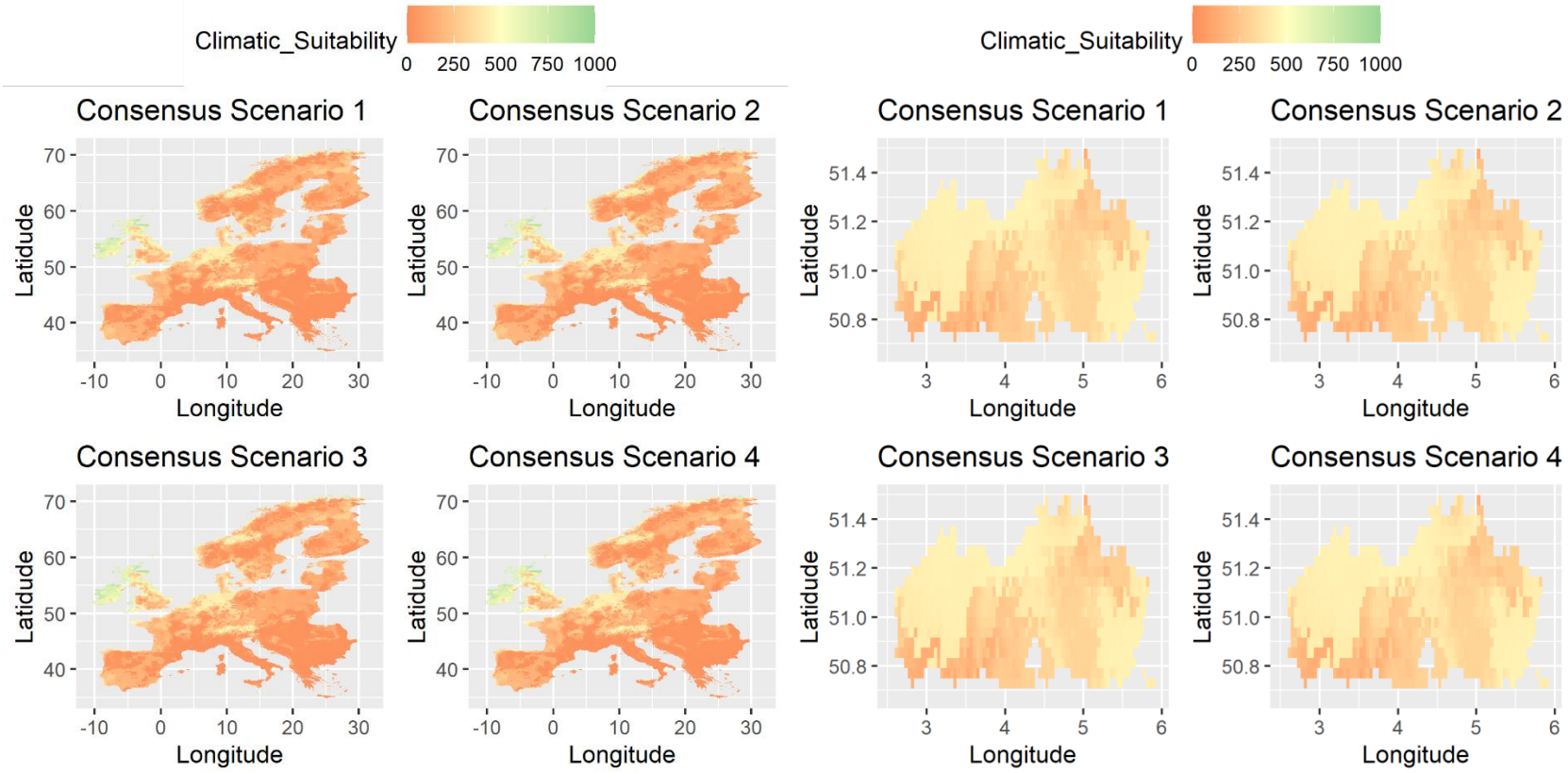
Platanus hispanica Ten.

n = 783



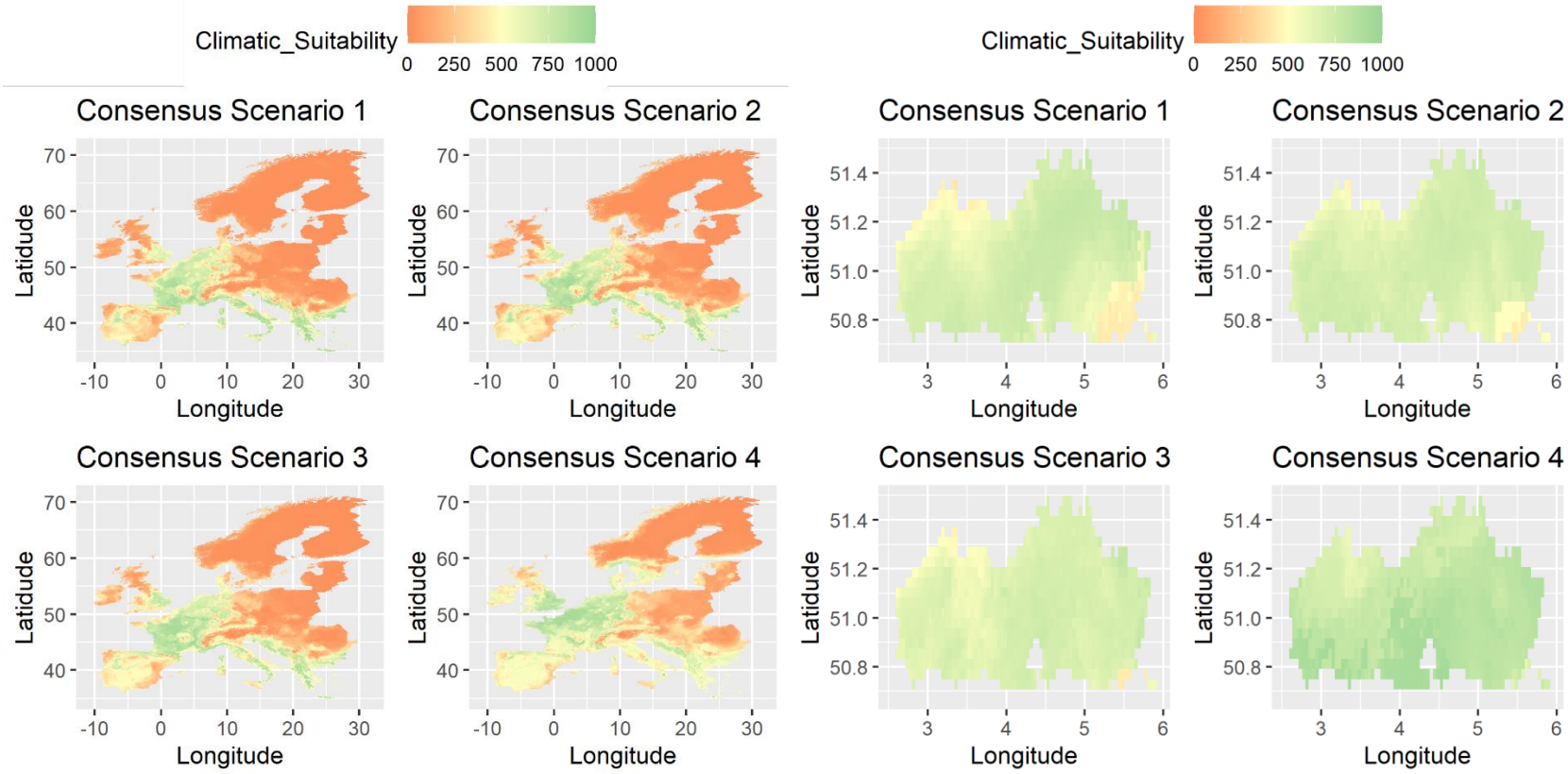
Platanus occidentalis L.

n = 16



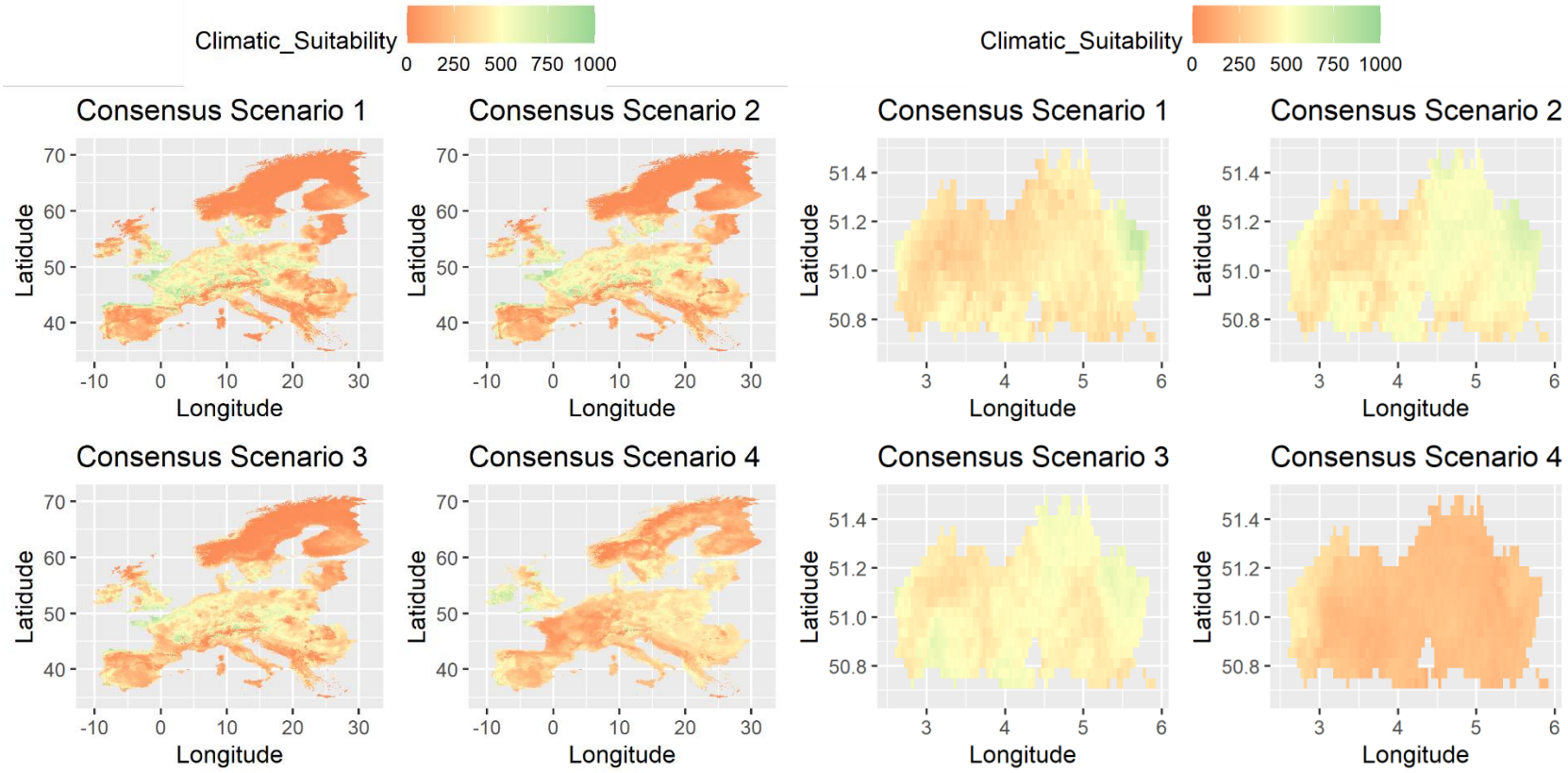
Platanus orientalis L.

n = 442



Prunus cerasifera Ehrh.

n = 28.402



Prunus domestica subsp. domestica

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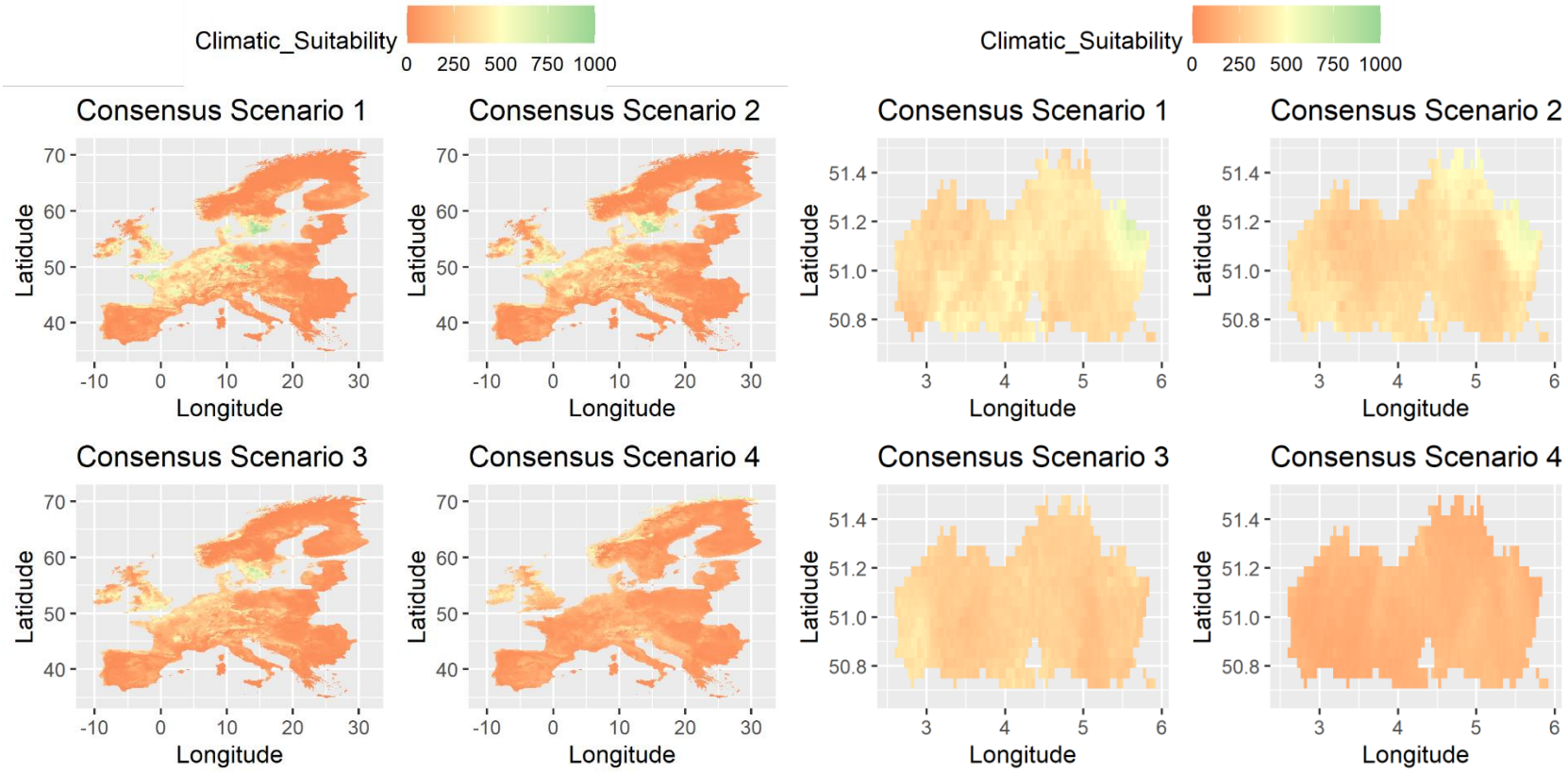
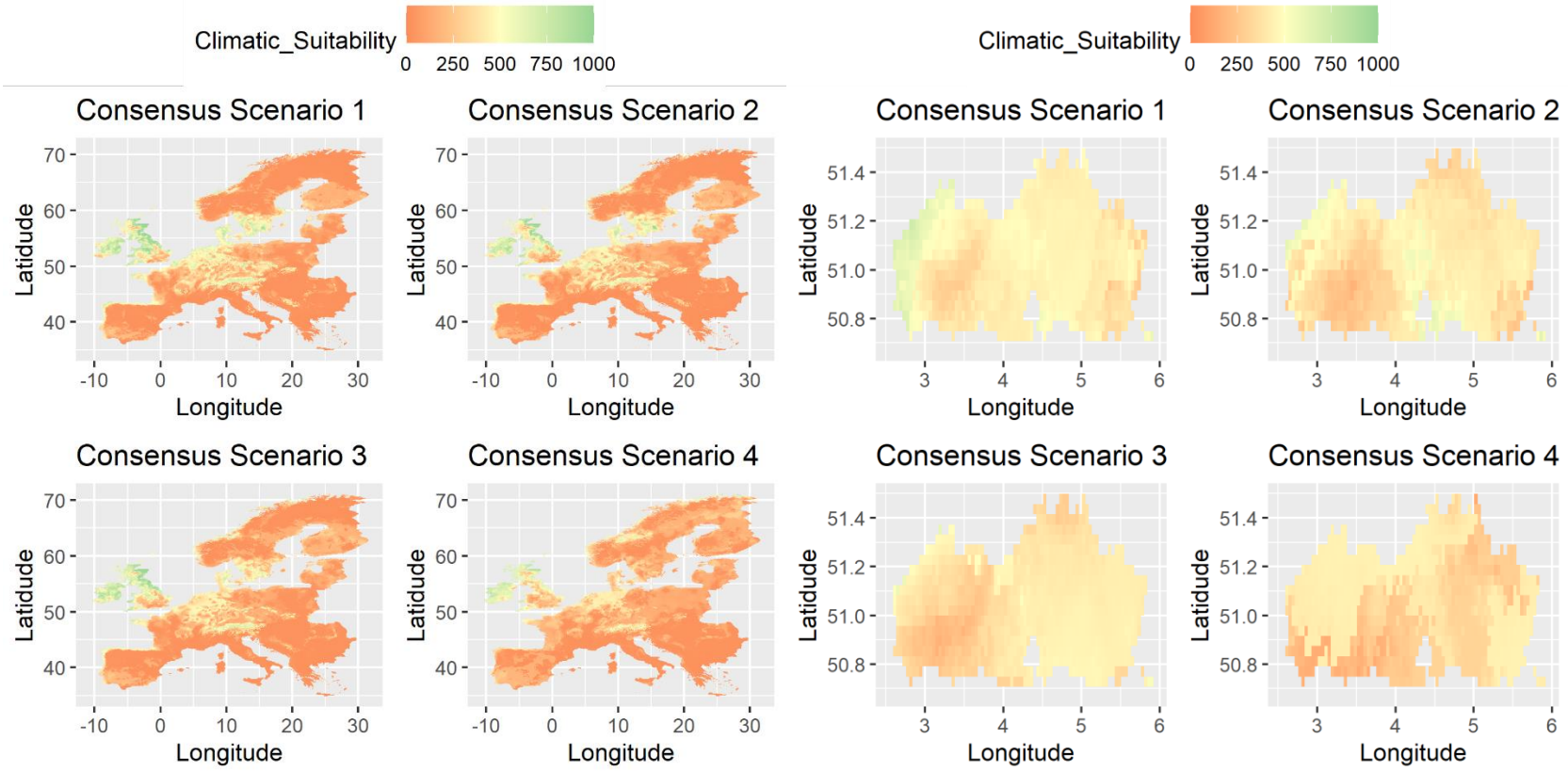


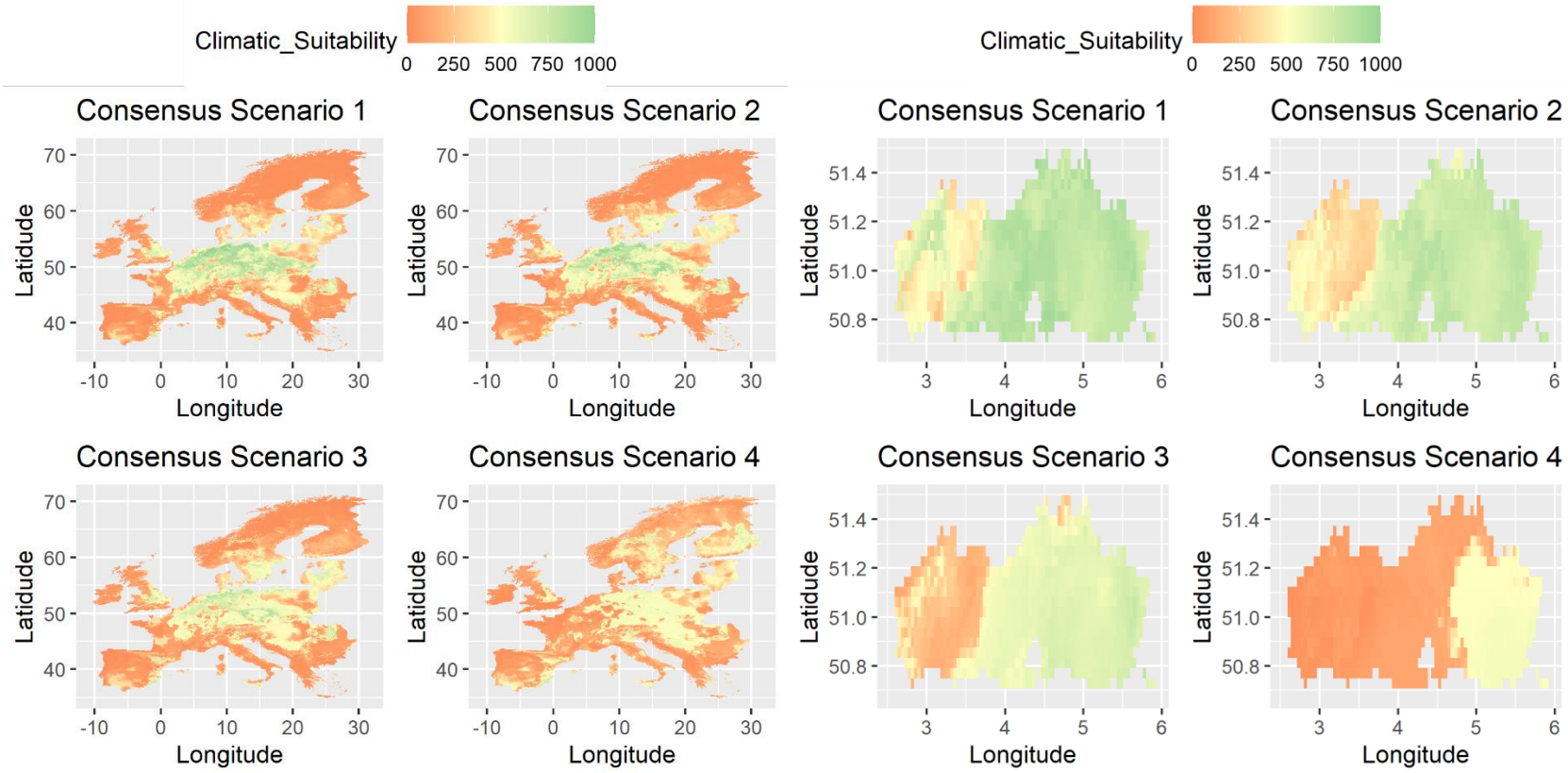
Prunus serrulata Lindl

n = 220



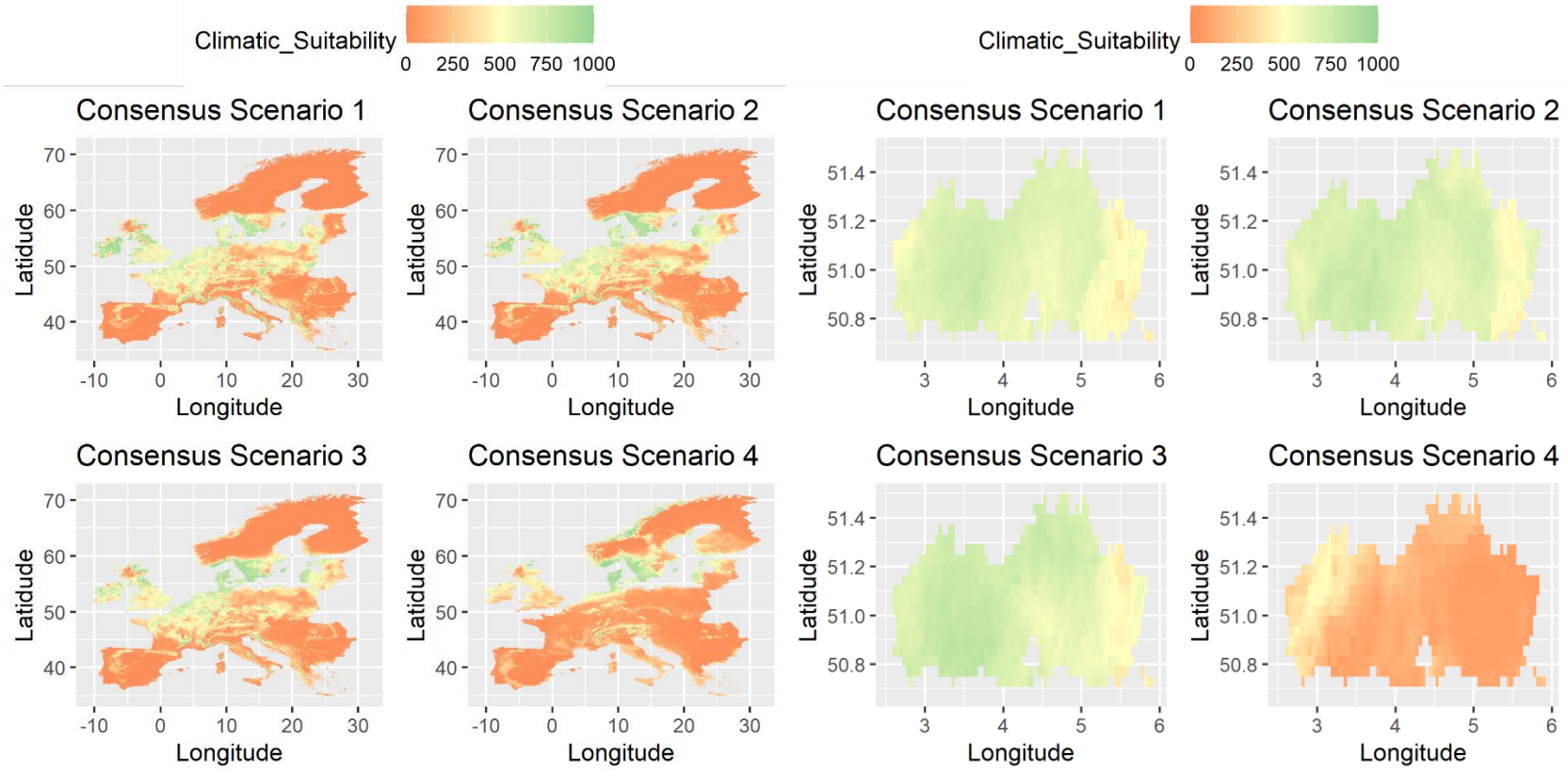
Ptelea trifoliata L.

n = 200



Quercus cerris L.

n = 2.920



Quercus frainetto Ten.

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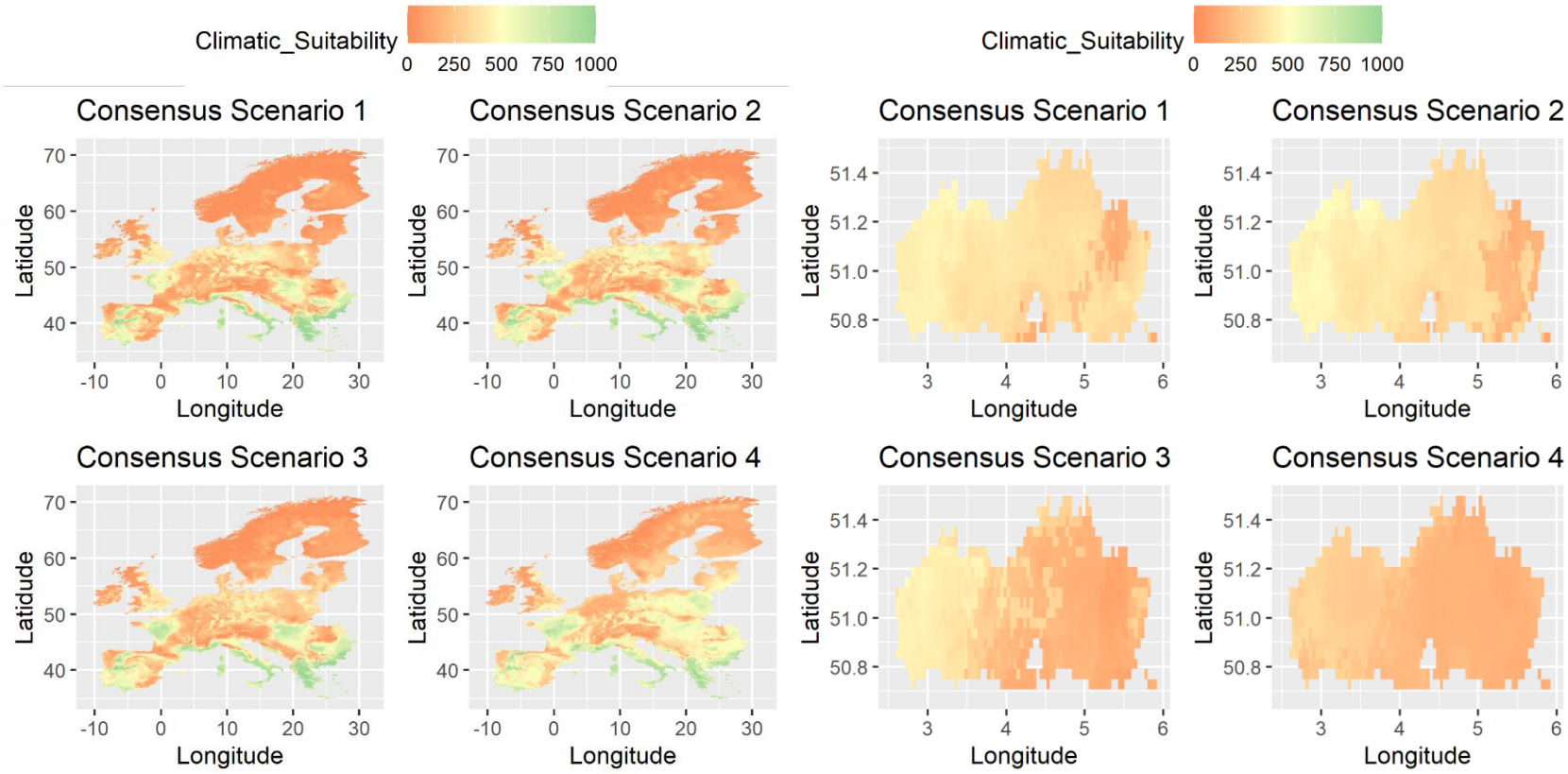

Quercus ilex L.

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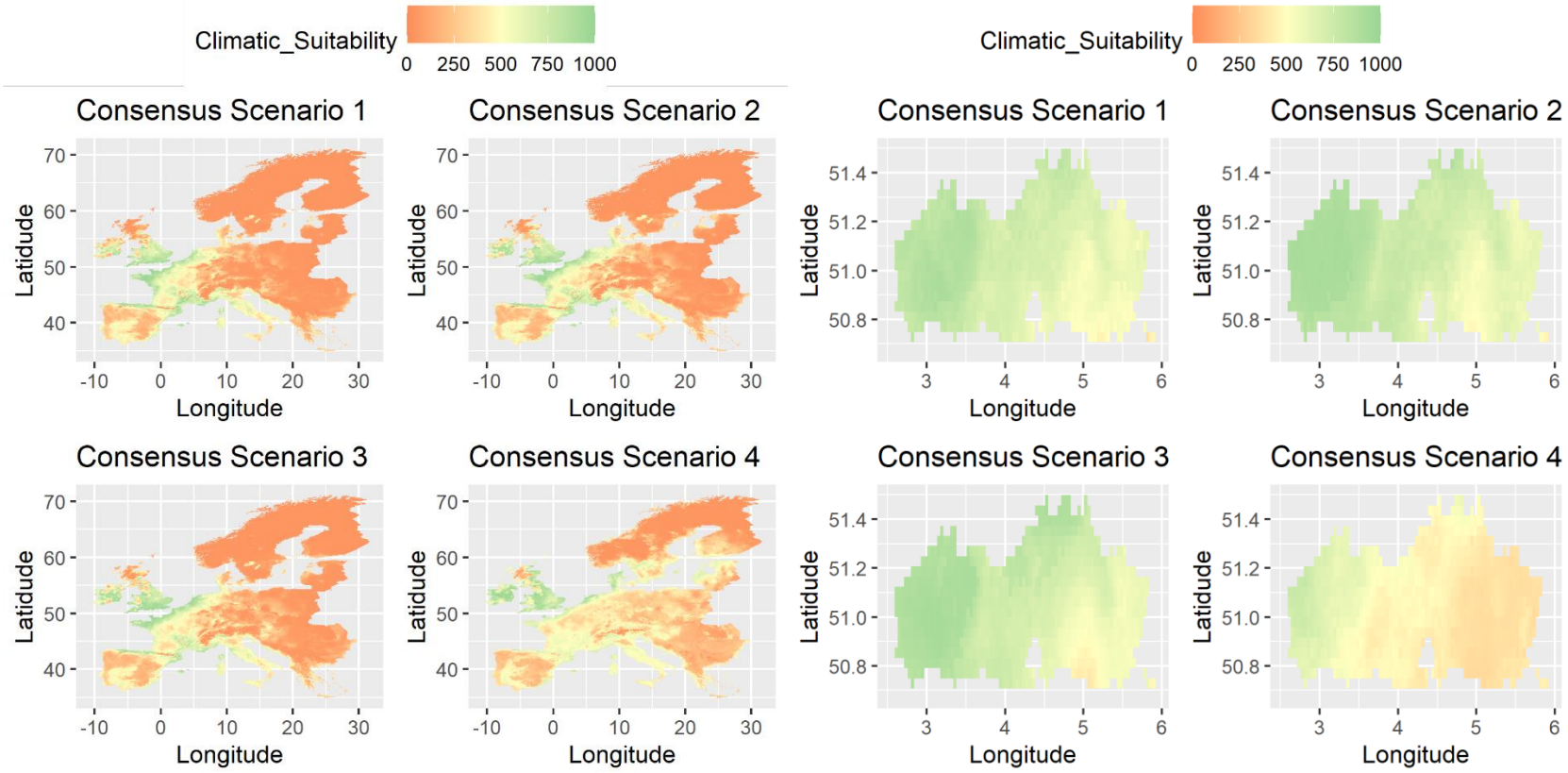

Quercus pyrenaica Willd.

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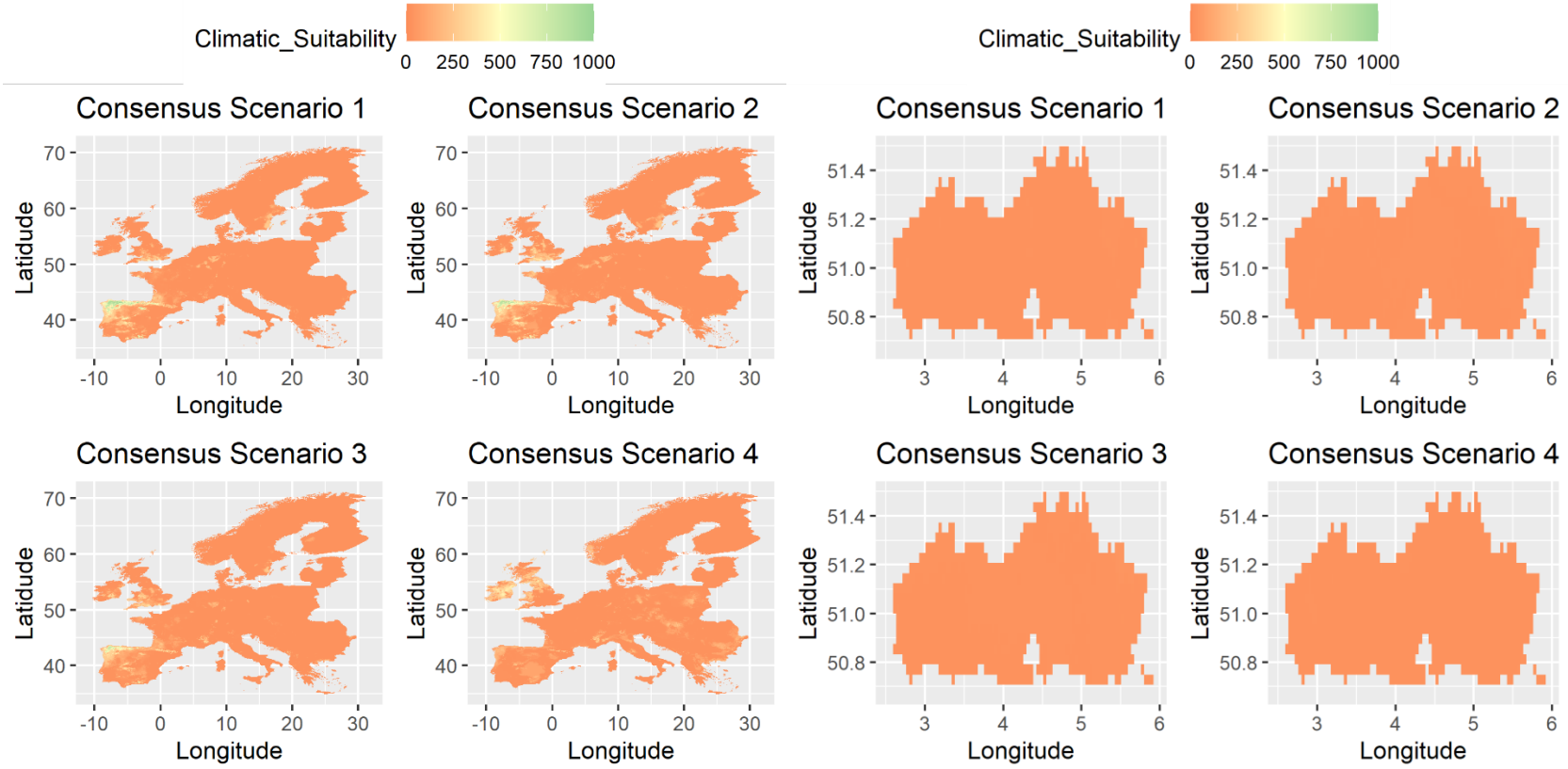

Salix pentandra L.

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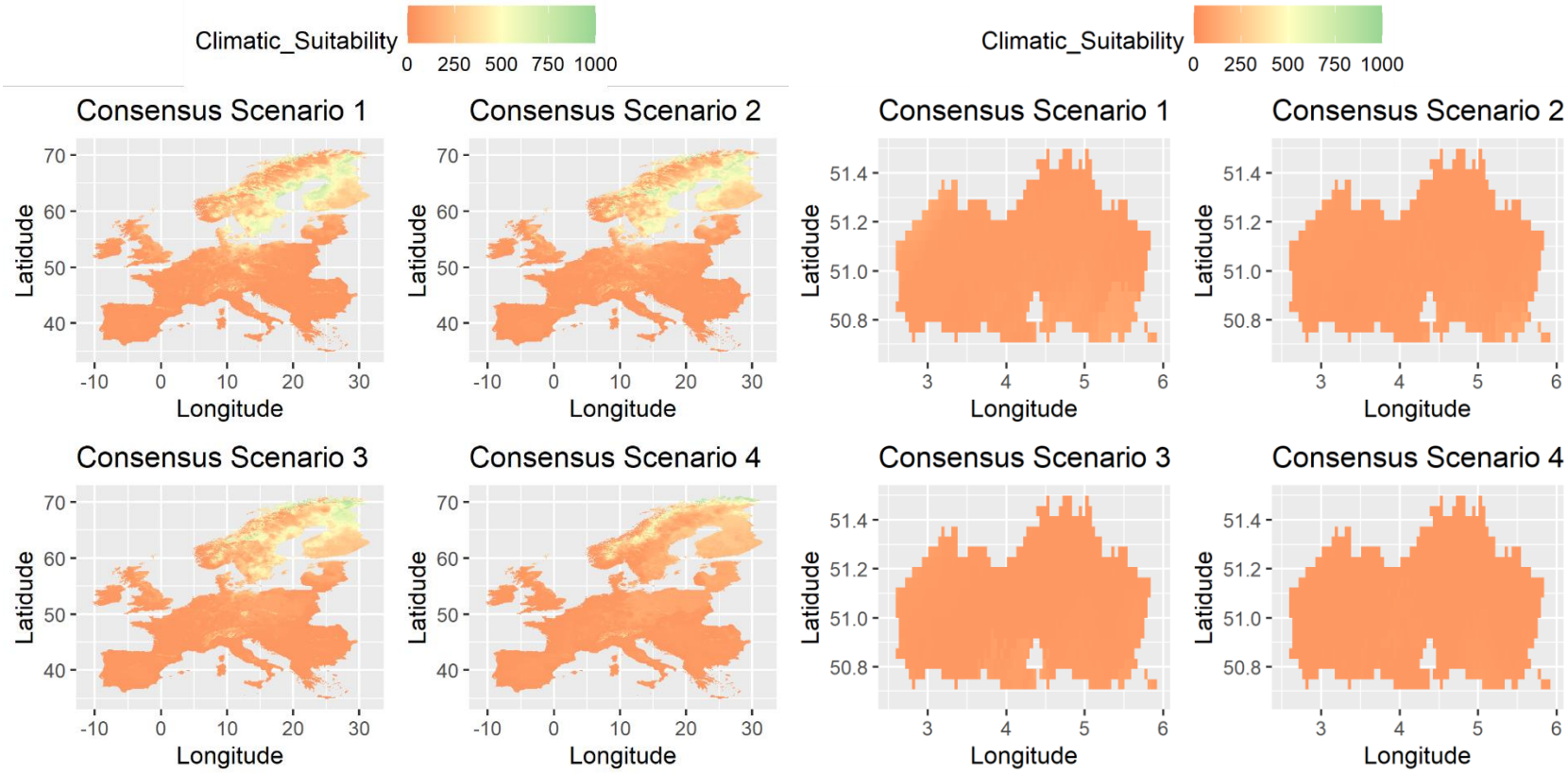
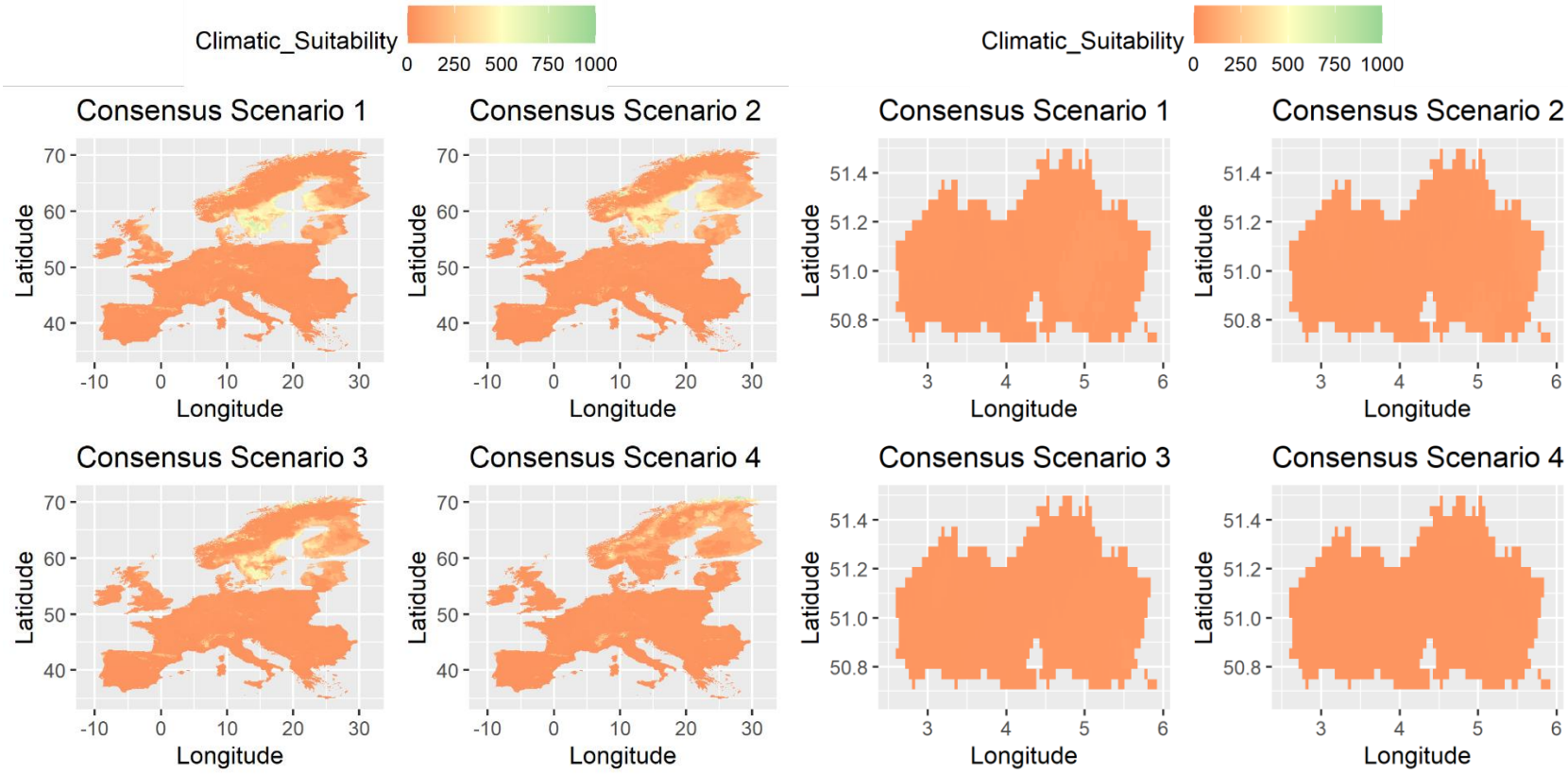


Sorbus intermedia (Ehrh.) Pers.

n = 33.879



Sorbus latifolia (Lam.) Pers.

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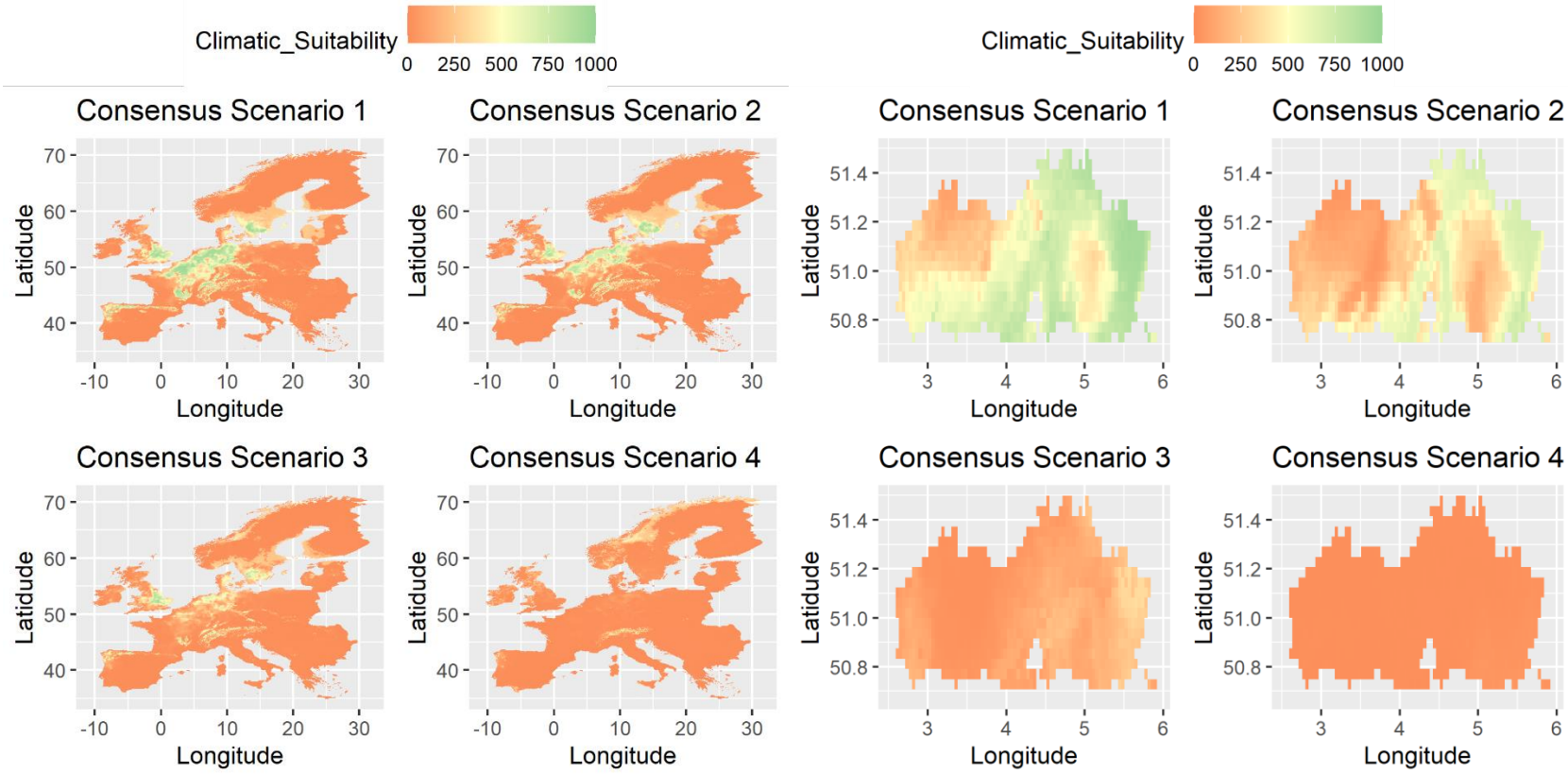
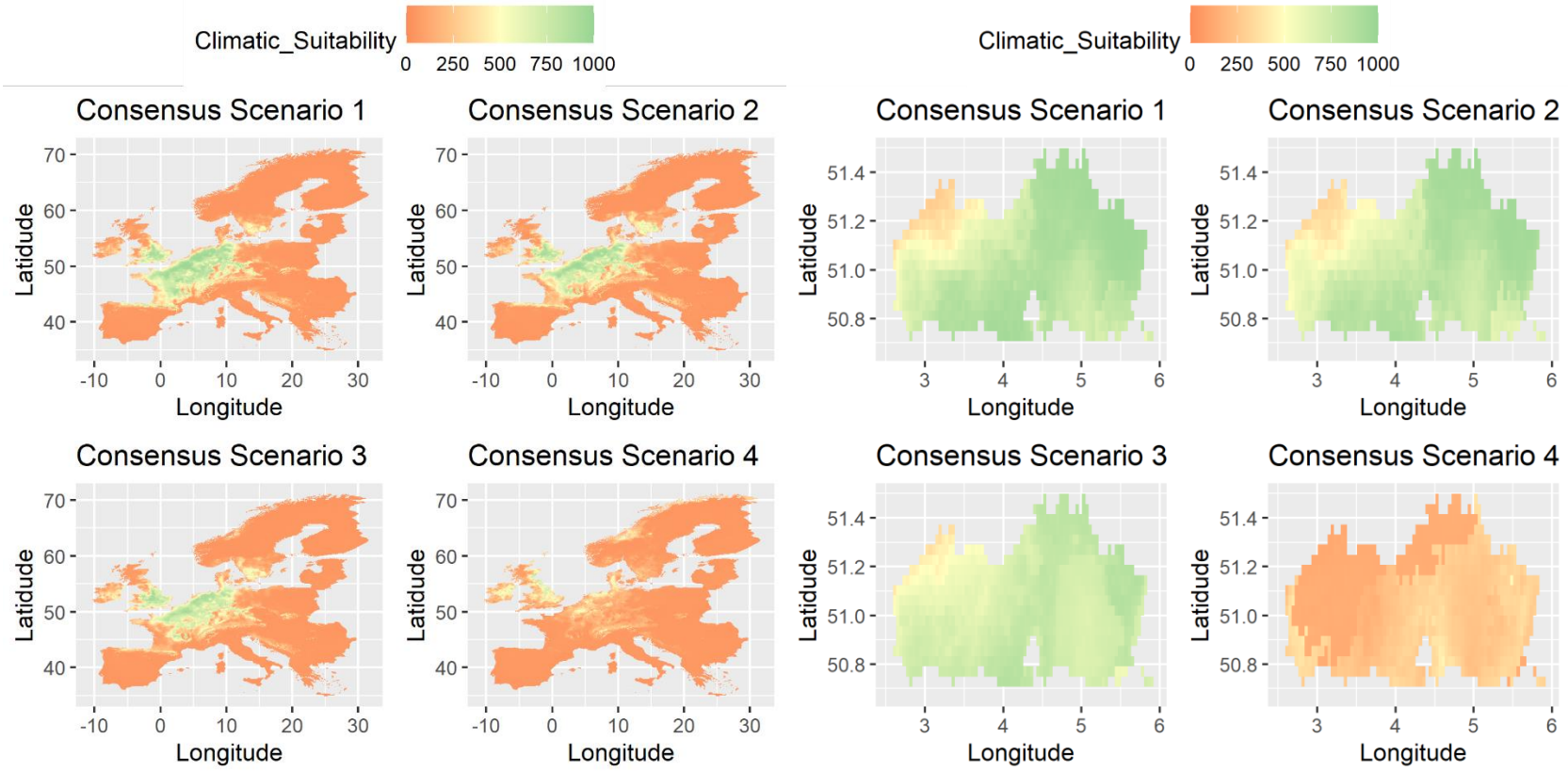


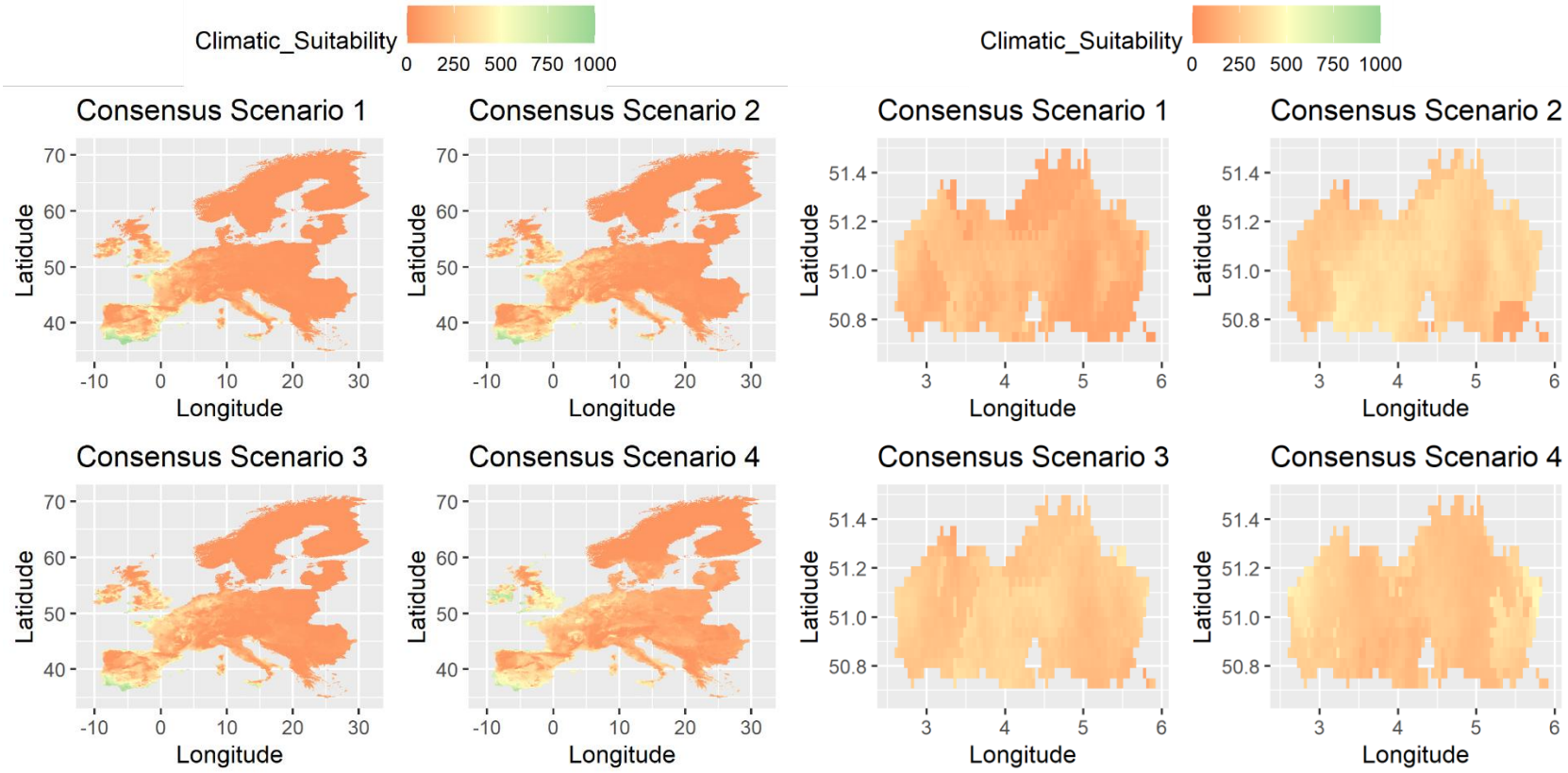
Sorbus torminalis (L.) Crantz

n = 20.975



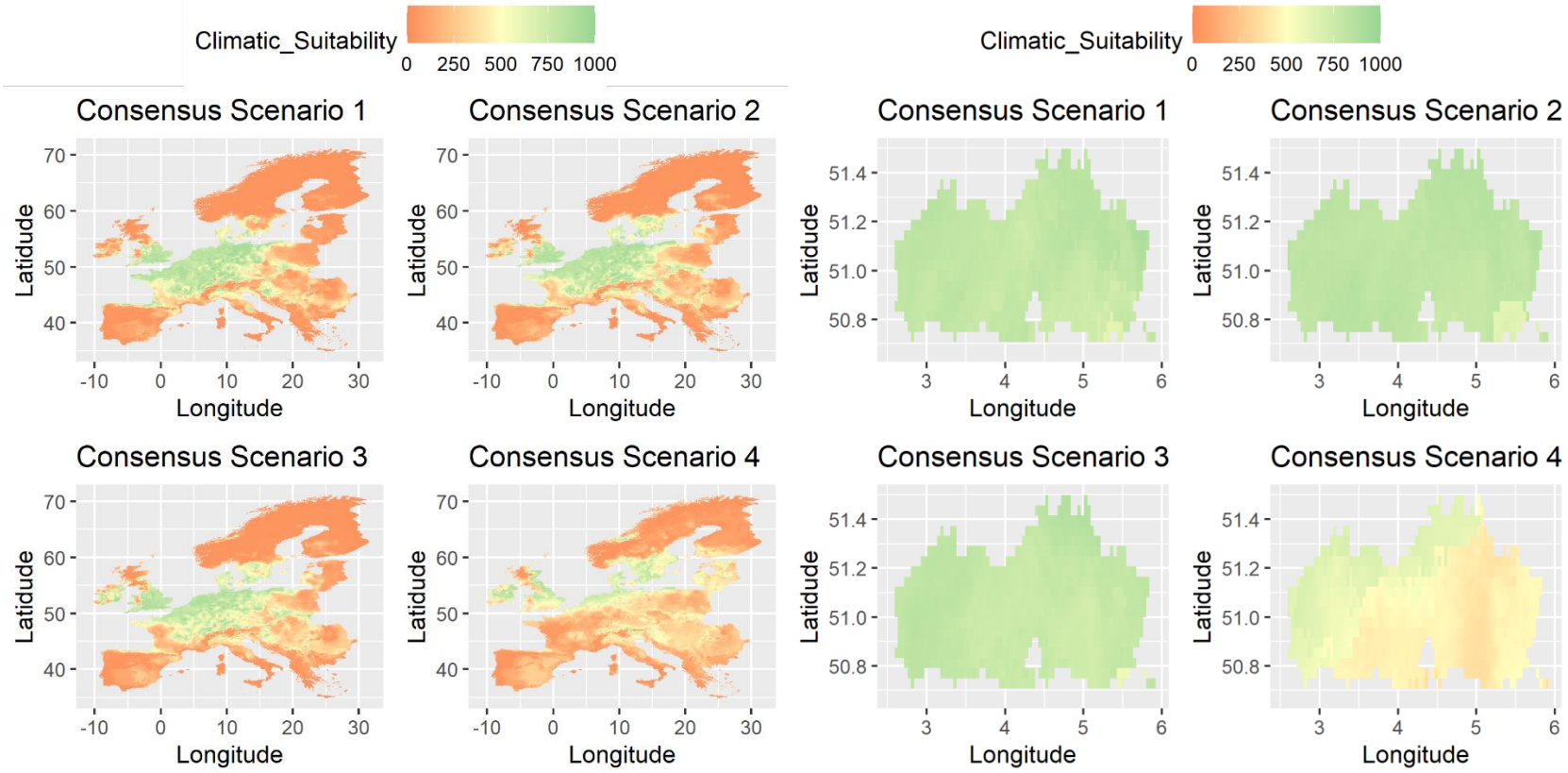
Tamarix gallica L.

n = 7.447



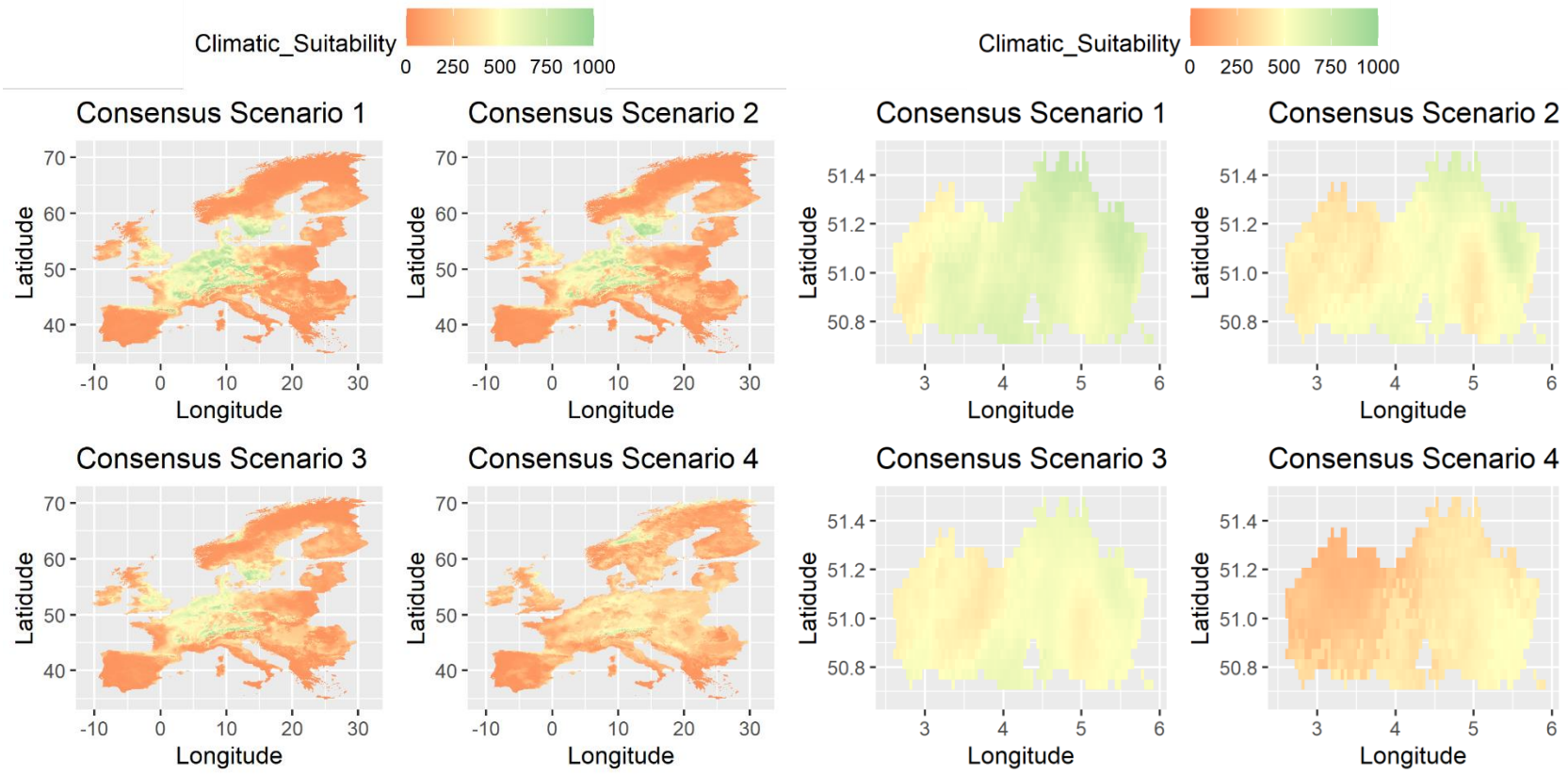
Taxodium distichum (L.) Rich.

n = 2.726



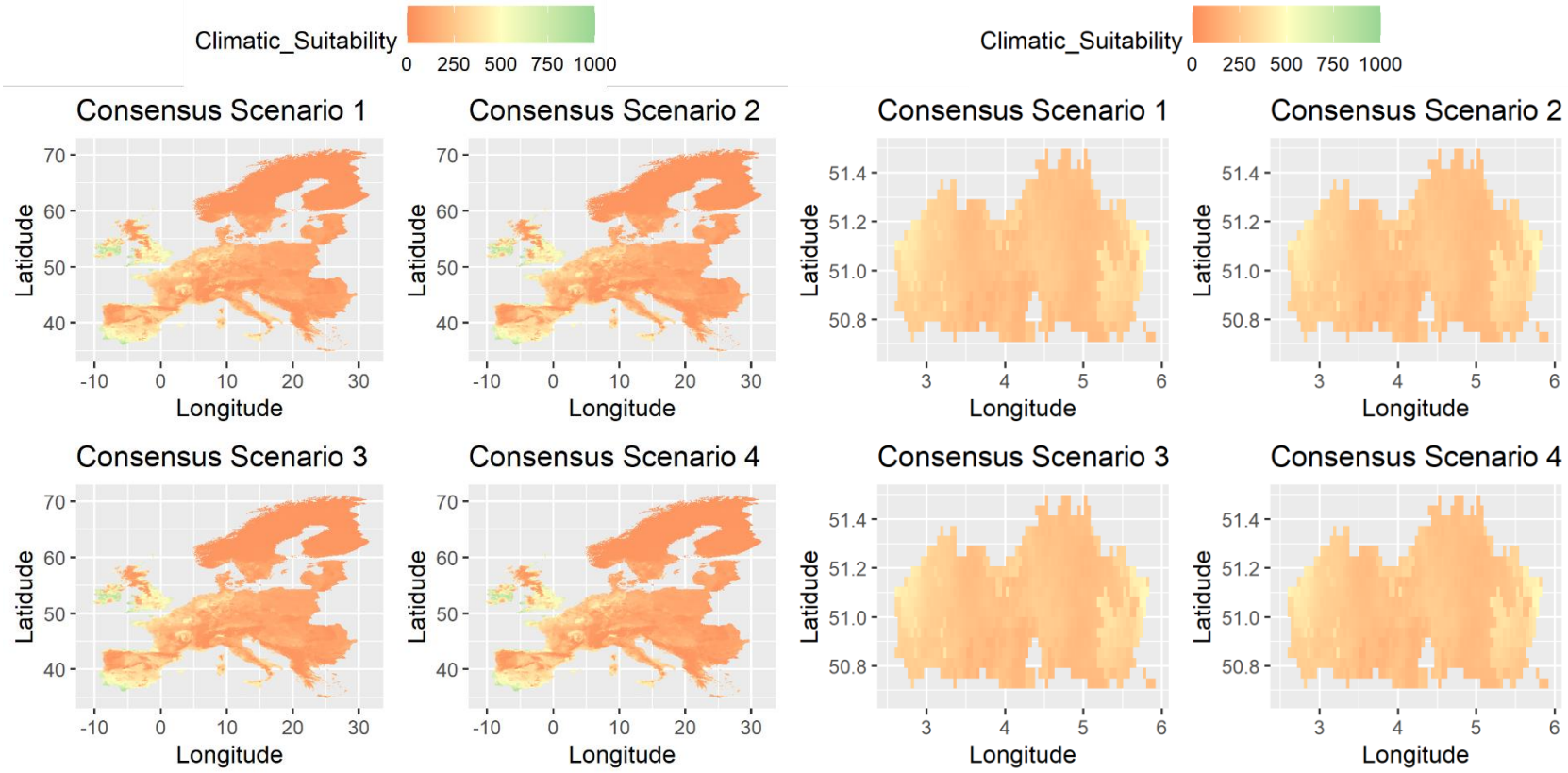
Tilia platyphyllos Scop.

n =



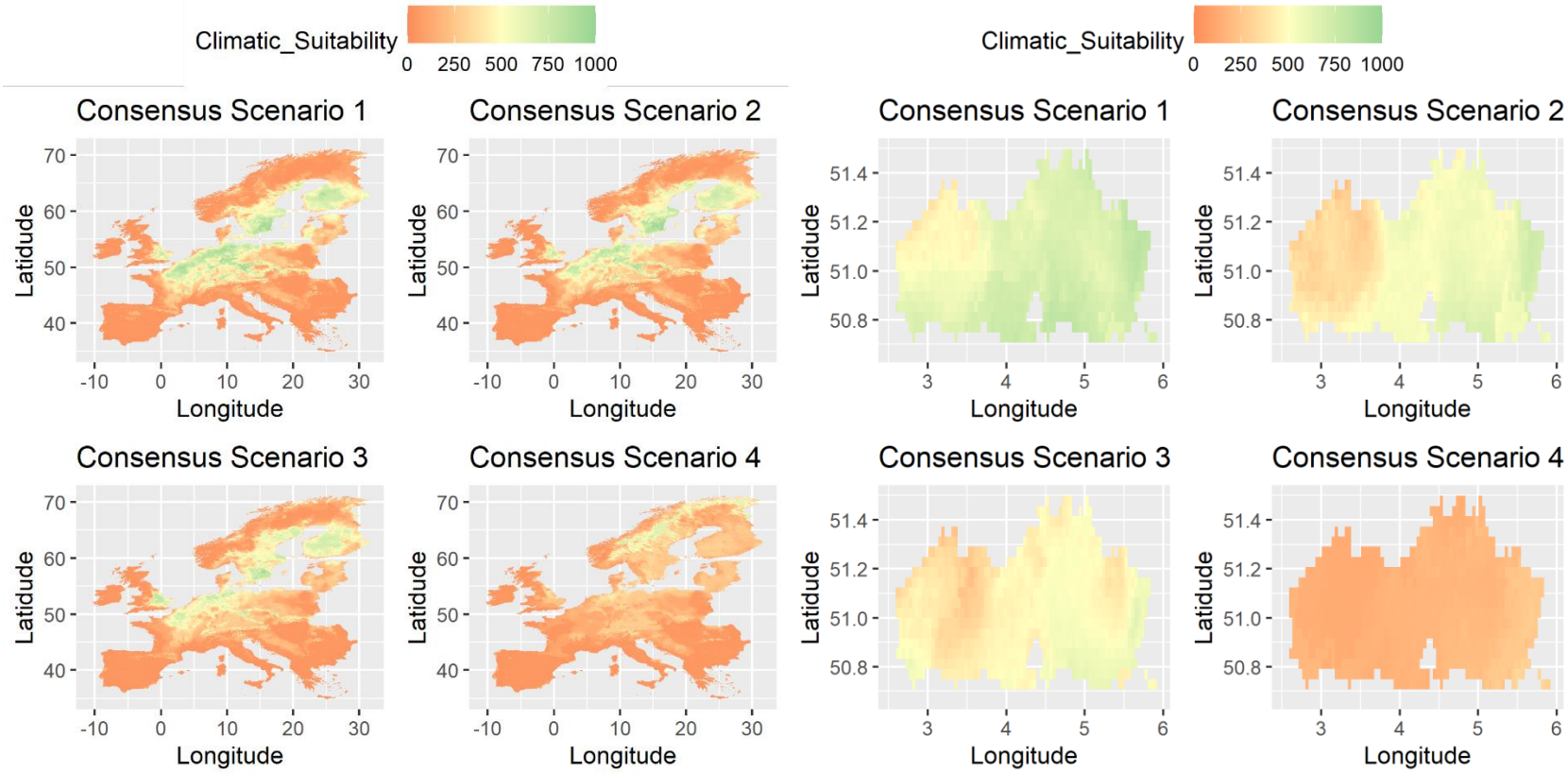
Tilia tomentosa Moench

n = 240



Ulmus laevis Pall.

n = 5.077



Ziziphus jujuba Mill.

n = 2.090