

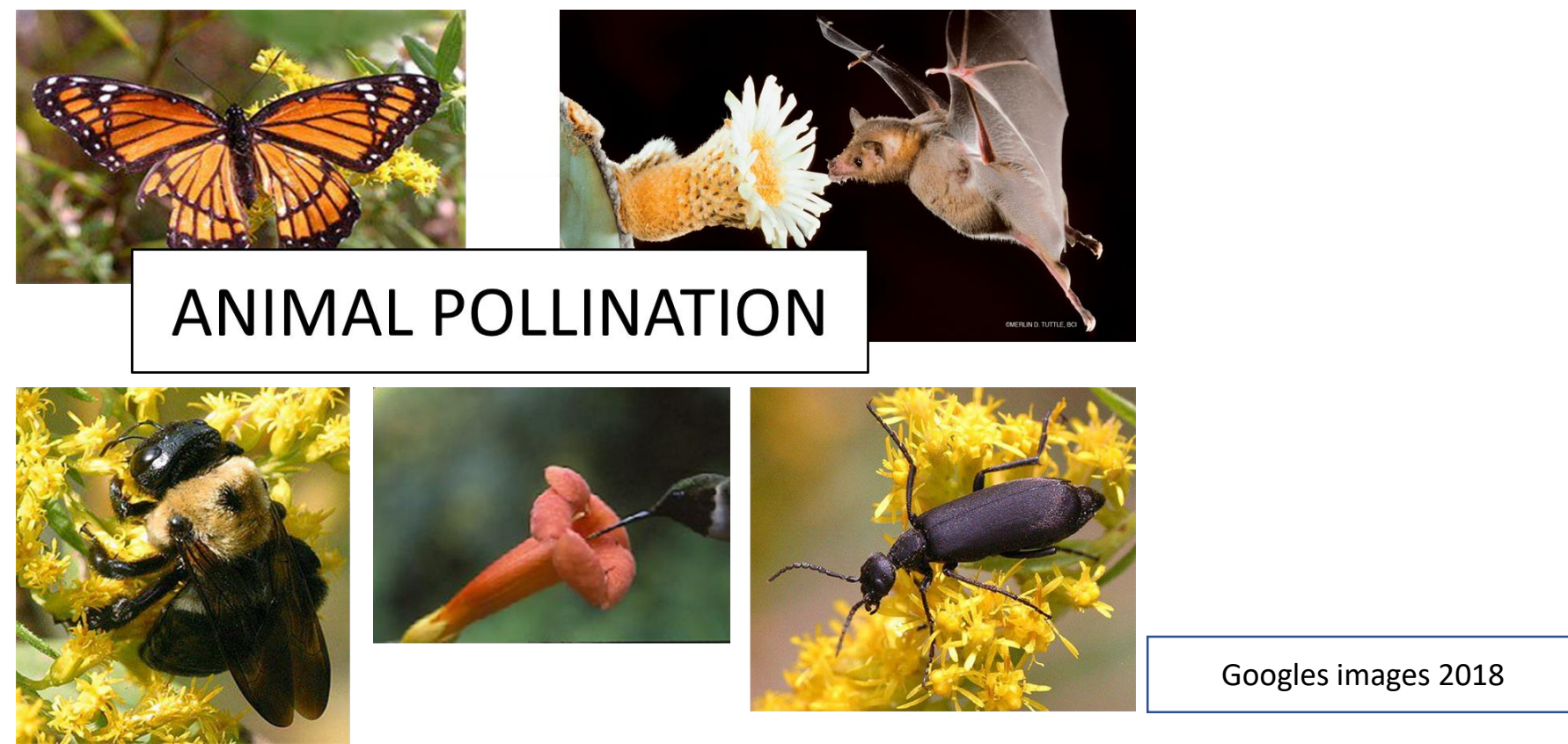


Current and potential spatial distribution of pollinators in Bolivia influenced by land-use and climate change

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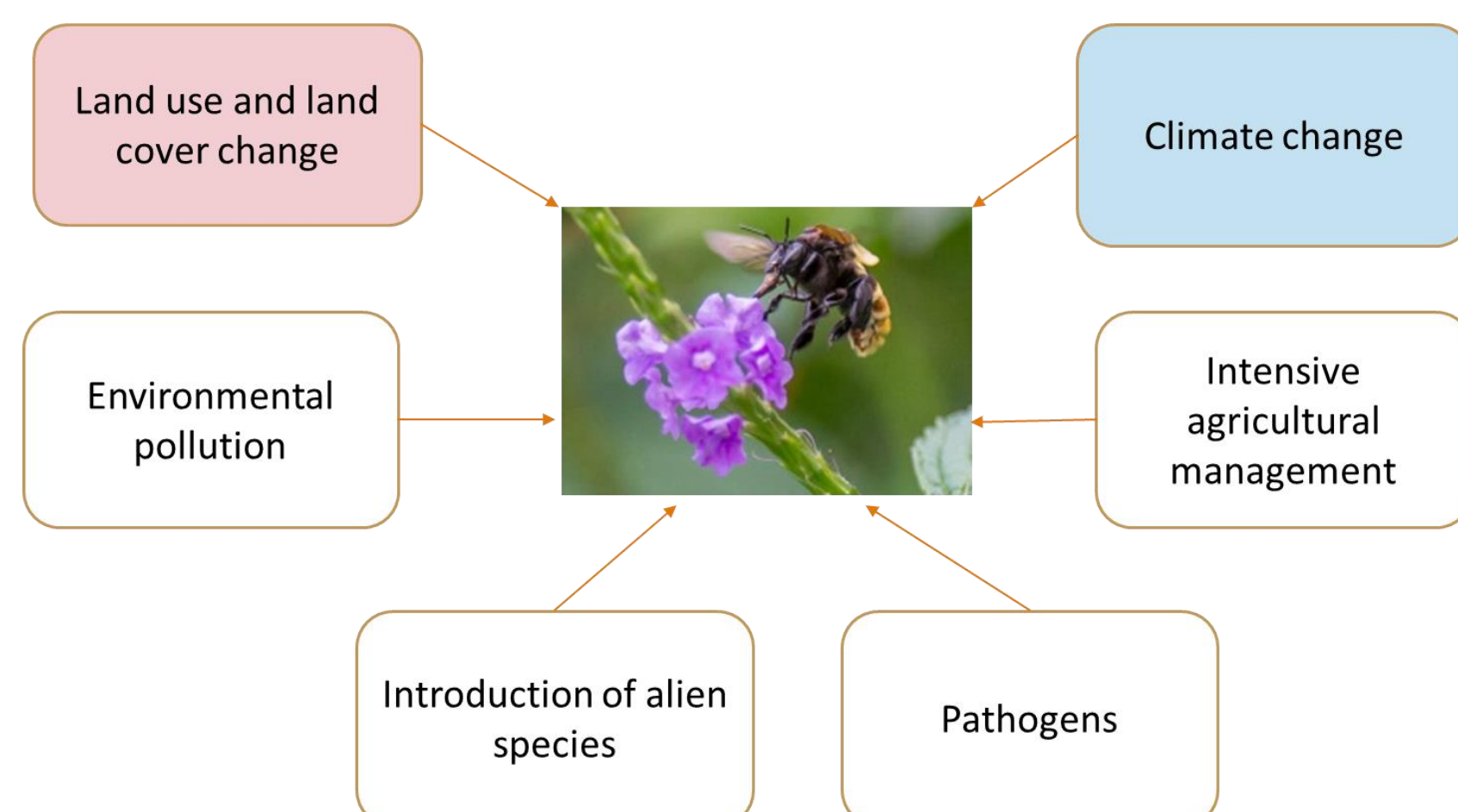
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What do we know so far ?



Animal pollination represents a key regulating ecosystem service, involved in wild plant reproduction and responsible for more than 35% of world crop production.

Potential drivers of pollinator declines



Recently, an increasing decline of pollinators has been evidenced. Although, global changes such as land-use and climate are known to have important impacts on pollinator communities, clear relationships between these drivers and pollinator loss remain little investigated.

In Bolivia most of the information is local-oriented, however a current status of pollinators and which is the effect of these drivers on their distribution are still missing.

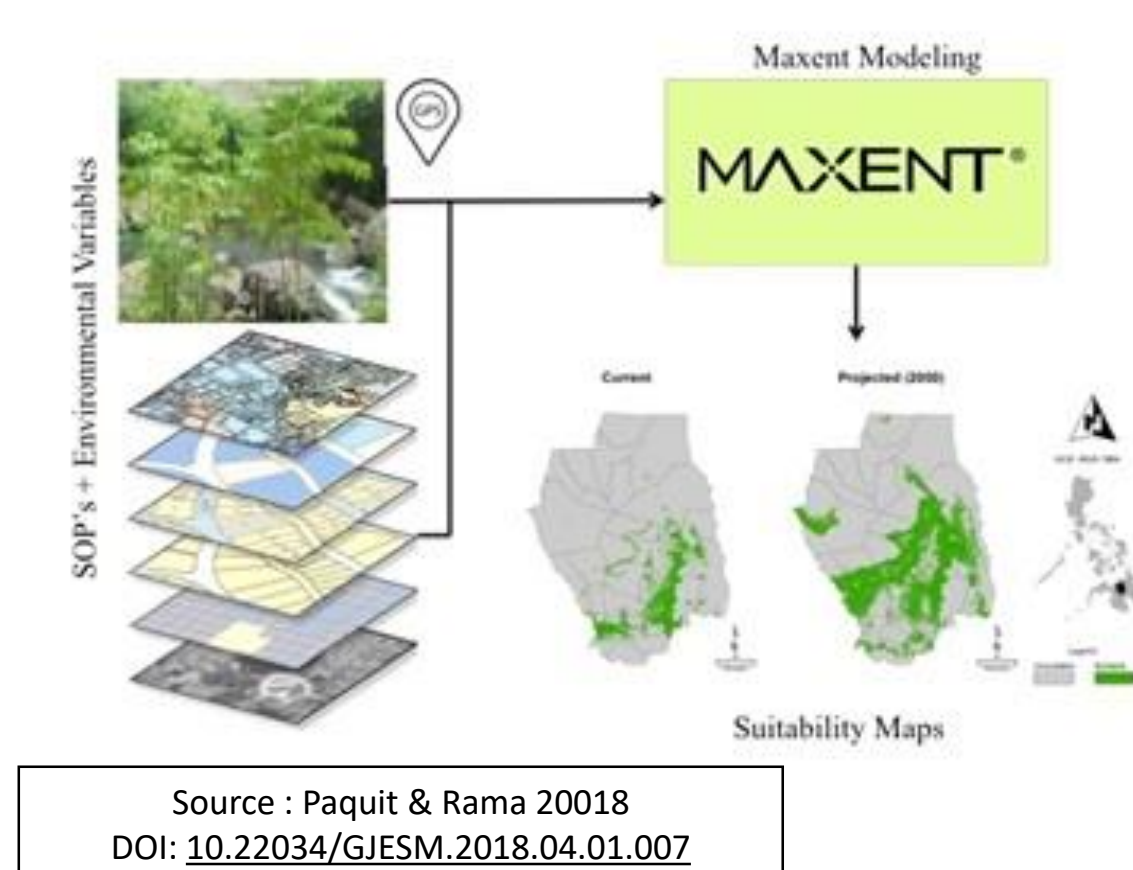
What do we want to achieve?

- Determine the effect of land-use and climate change on current spatial distribution of pollinators (bees, wasp, hummingbirds and butterflies) in Bolivia.
- Determine how climate change influences the potential distribution of pollinators based on IPCC projections for the year 2050 and 2080.
- Evaluate the performance of species modelling to predict the distribution of pollinators.

How do we achieve it ?

The following data was combined in MaxEnt software package:

- presence-only records corresponding to three groups of pollinators (bees and wasp, butterflies and hummingbirds) obtained from open access databases such as Predicts project, GBIF and published papers;
- environmental variables (temperature and precipitation) derived from remote sensing techniques (MODIS).
- environmental variables derived from WORLDCLIM model. A set of 19 bioclimatic layers representing combinations of temperature and precipitation for the past 50 years with a resolution of 2.5 arc-min was used.
- Land-use cover. A supervised classification using LANSAT 8 image.

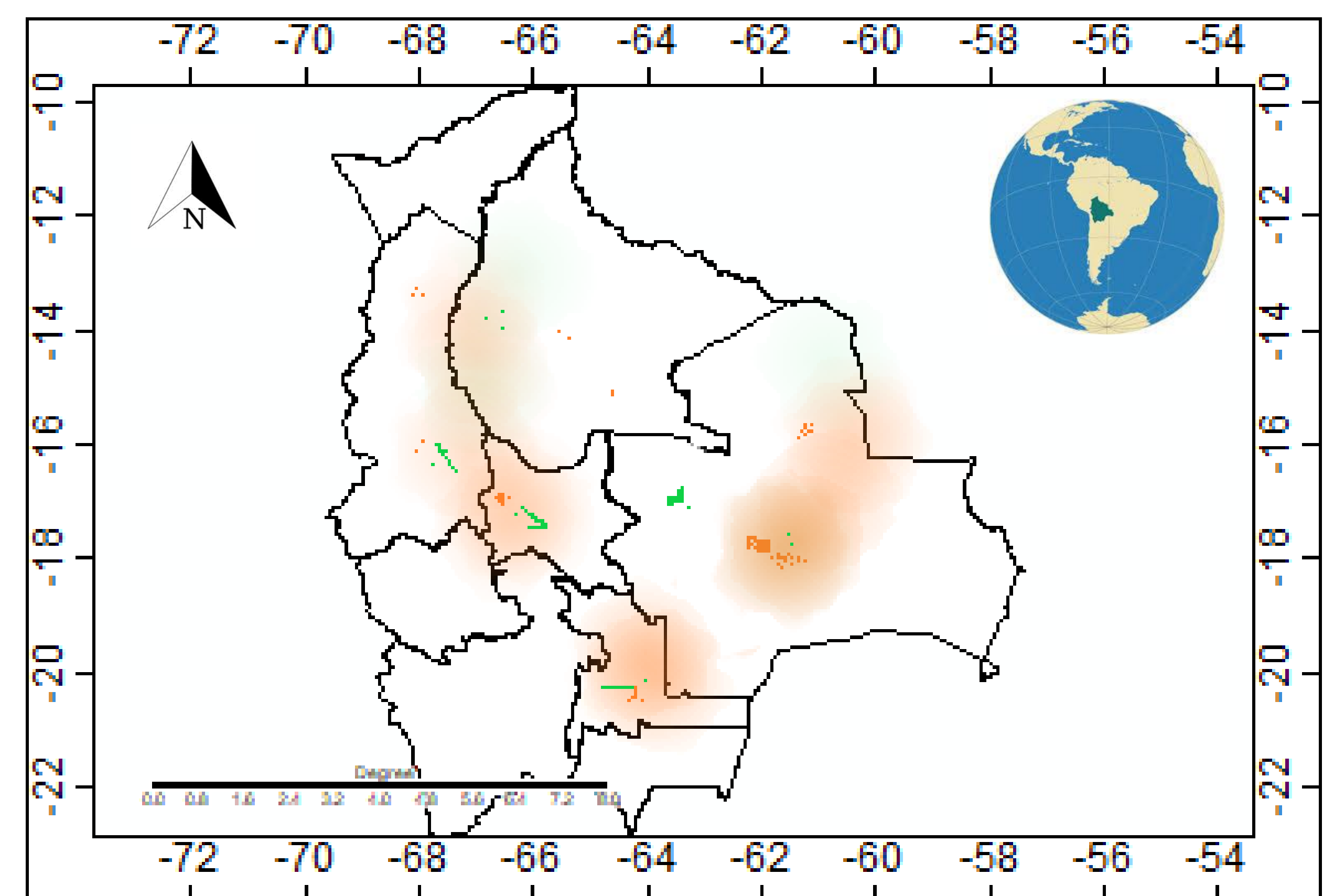


REFERENCES

- IPCC, 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Billir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. Phillips SJ, Anderson RP, Schapire RE (2006). Maximum entropy modeling of species geographic distributions. *Ecol Modell.* :190(3-4):231-259. doi: 10.1016/j.ecolmodel.2005.03.026.
- Grünwald, B. 2010. Is Pollination at risk? Current threats and conservation of bees. *Gaia* 19/1: 61-69 p.
- Hegland SJ, Nielsen A, Lázaro A, Bjerknes A-L, Totland 2009. How does climate warming affect plant-pollinator interactions? *Ecol Lett* 12(2):184-95.
- Soria-Auza RW, Kessler M, Bach K, Barajas-Barbosa PM, Lehnert M, et al. (2010) Impact of the quality of climate models for modelling species occurrences in countries with poor climatic documentation: a case study from Bolivia. *Ecol Model* 221: 1221–1229.

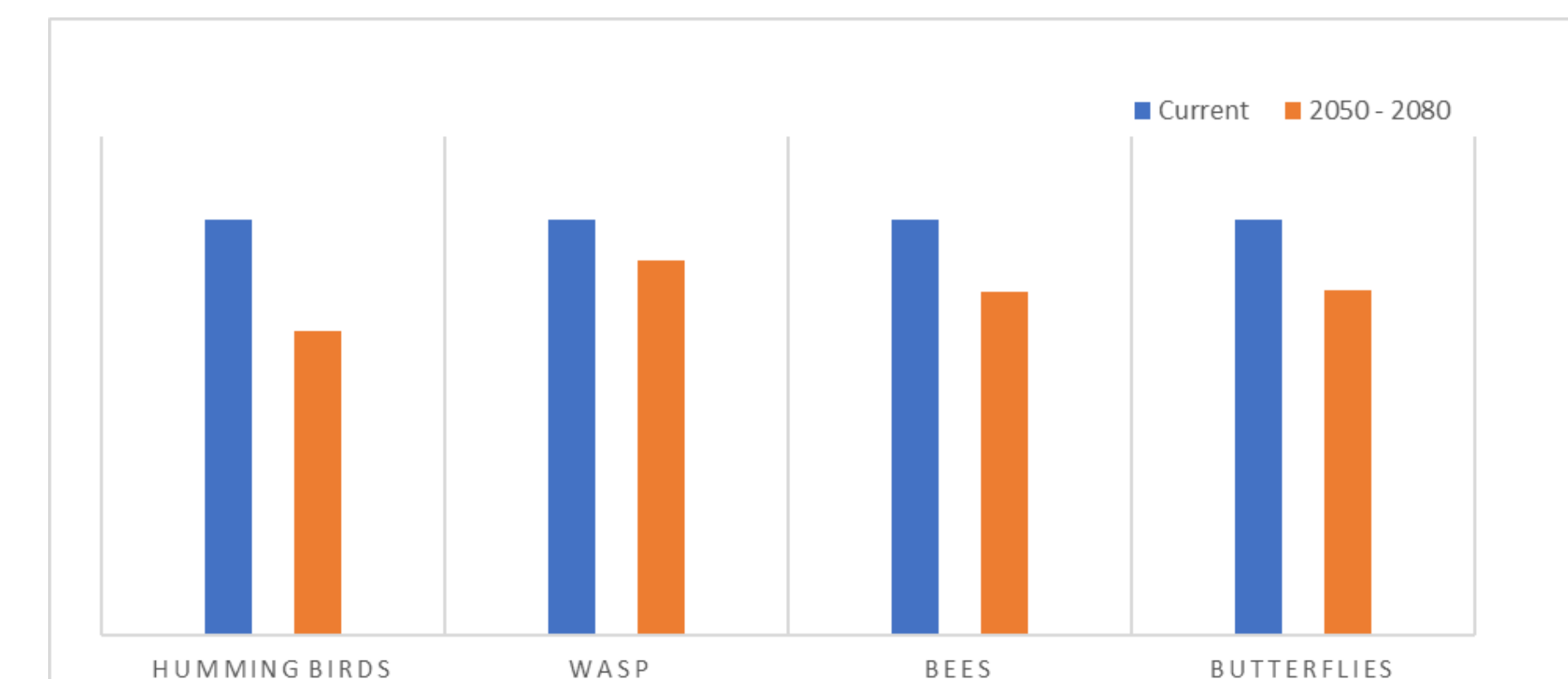
Which results did we obtain?

The actual status of pollinators in Bolivia is threatened by land-use and climate conditions, especially in eastern regions, where extensive land-use (agro-industrial activities and deforestation) and increase in temperatures have been observed.



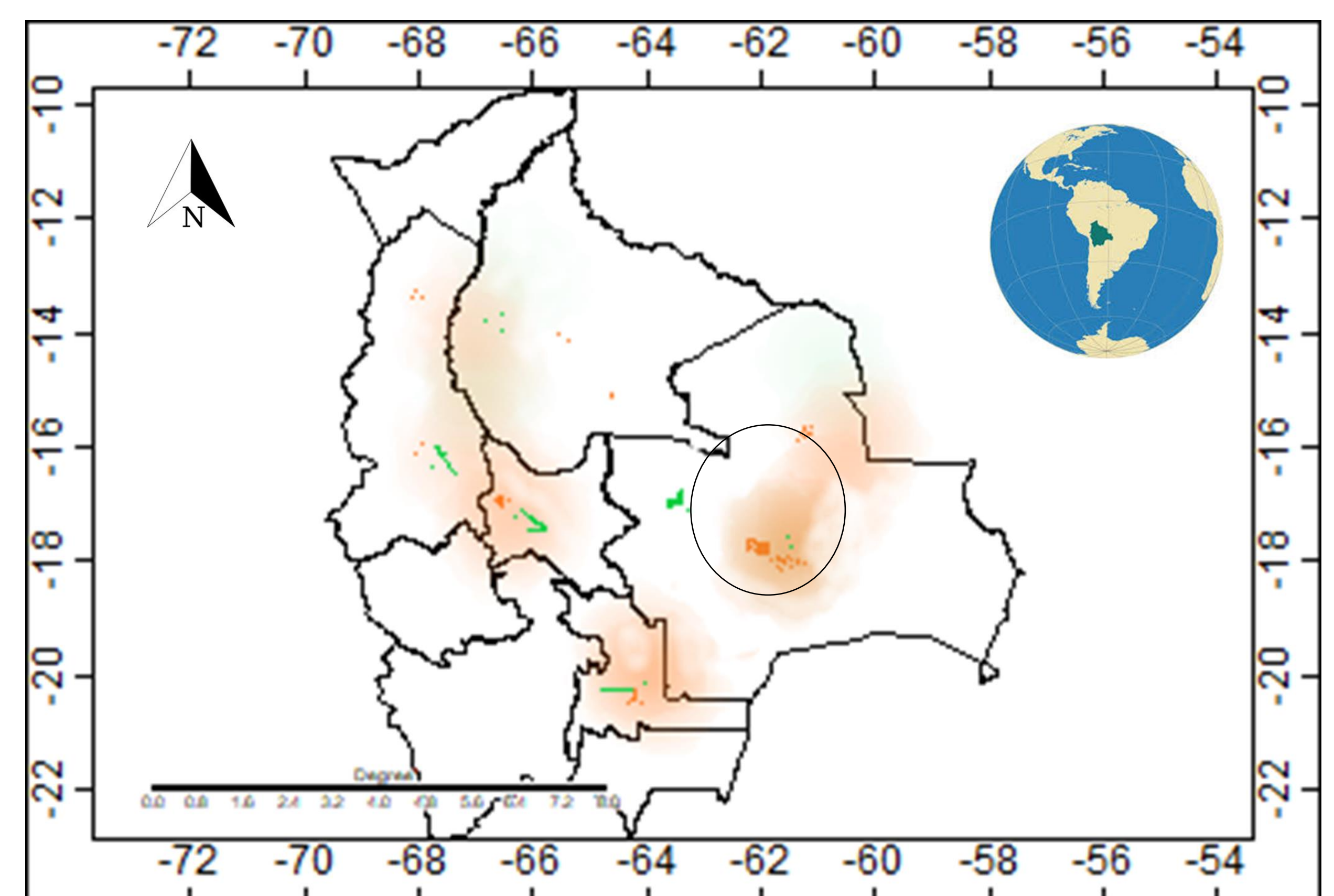
Current distribution of pollinators determined by land use cover and climatic conditions

According to the analysis, there is a reduction of the geographic range of pollinators, although differences in response among groups are detected. Bees and wasps seems to be less susceptible to climate change in comparison to butterflies and hummingbirds.



Reduction in suitable habitat of pollinators according to the IPCC climatic scenarios (2050-2080)

Under future scenarios 2050 and 2080, a moderate to extensive shift of pollinators range was observed, mainly in hummingbirds whose habitat might be reduced enormously as result of change in suitable environmental conditions.



Distribution of pollinators based on IPCC climate change scenarios (2050 – 2080)

Key Messages and Future questions

- Key environmental parameters drive the distribution and abundance of pollinators across landscapes and determine how they occupy habitats.
- Species distribution modelling could be applied as a useful tool to support decisions on pollinator conservation, particularly during the decision-making process.
- How different trends in land use cover and land use change in the future would affect the distribution of pollinators in Bolivia?