

Conveners Logos

# Leveraging Industry 4.0 Technologies for Managing Soil Salinization and Drought

10:30, Tuesday 1st October

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# Soil: The Foundation of Life

- Without soil, our very existence would come to an end!
- Healthy soils: A prerequisite to achieve the SDGs

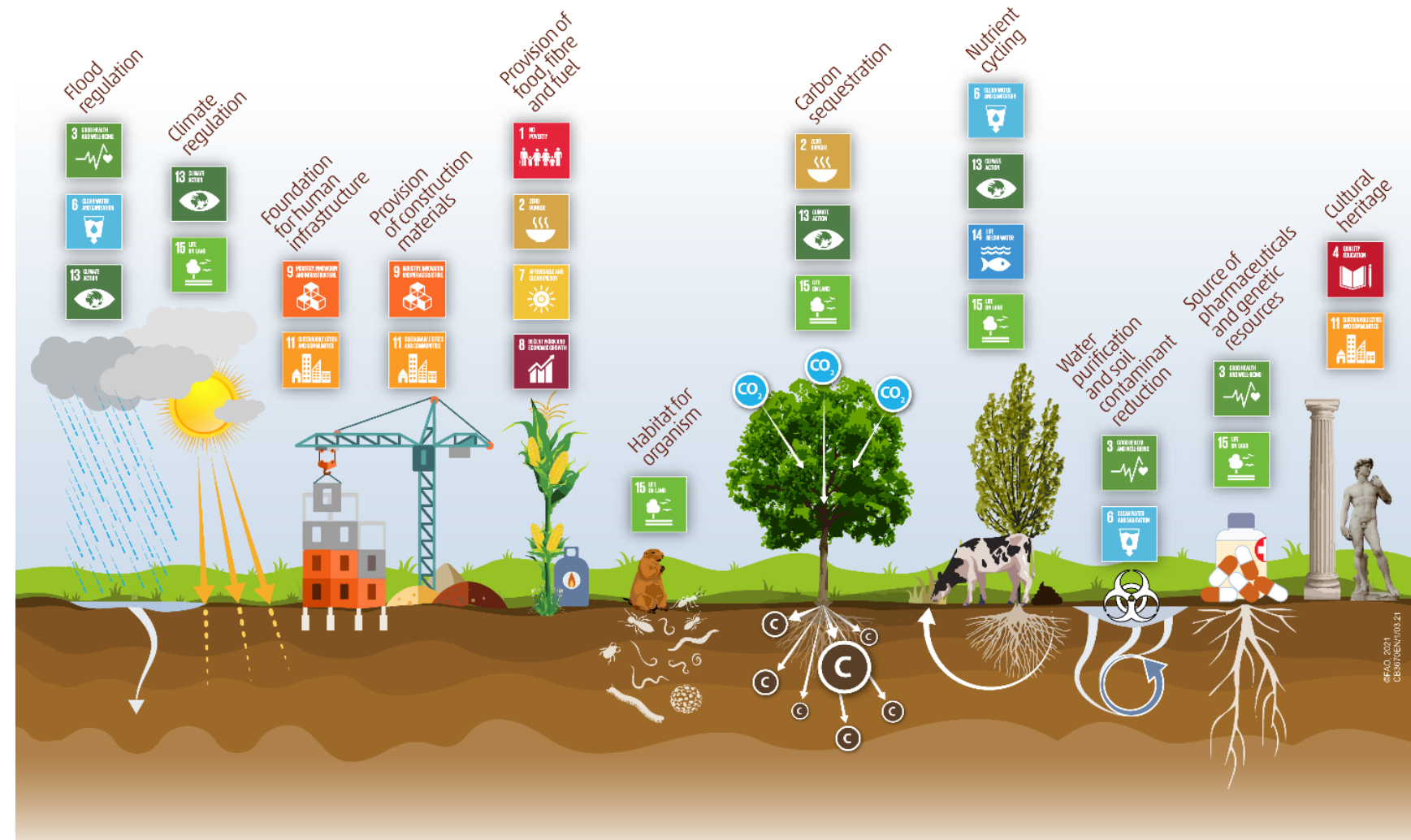
Food Security

Biodiversity

Water Regulation

Climate Regulation

Social welfare

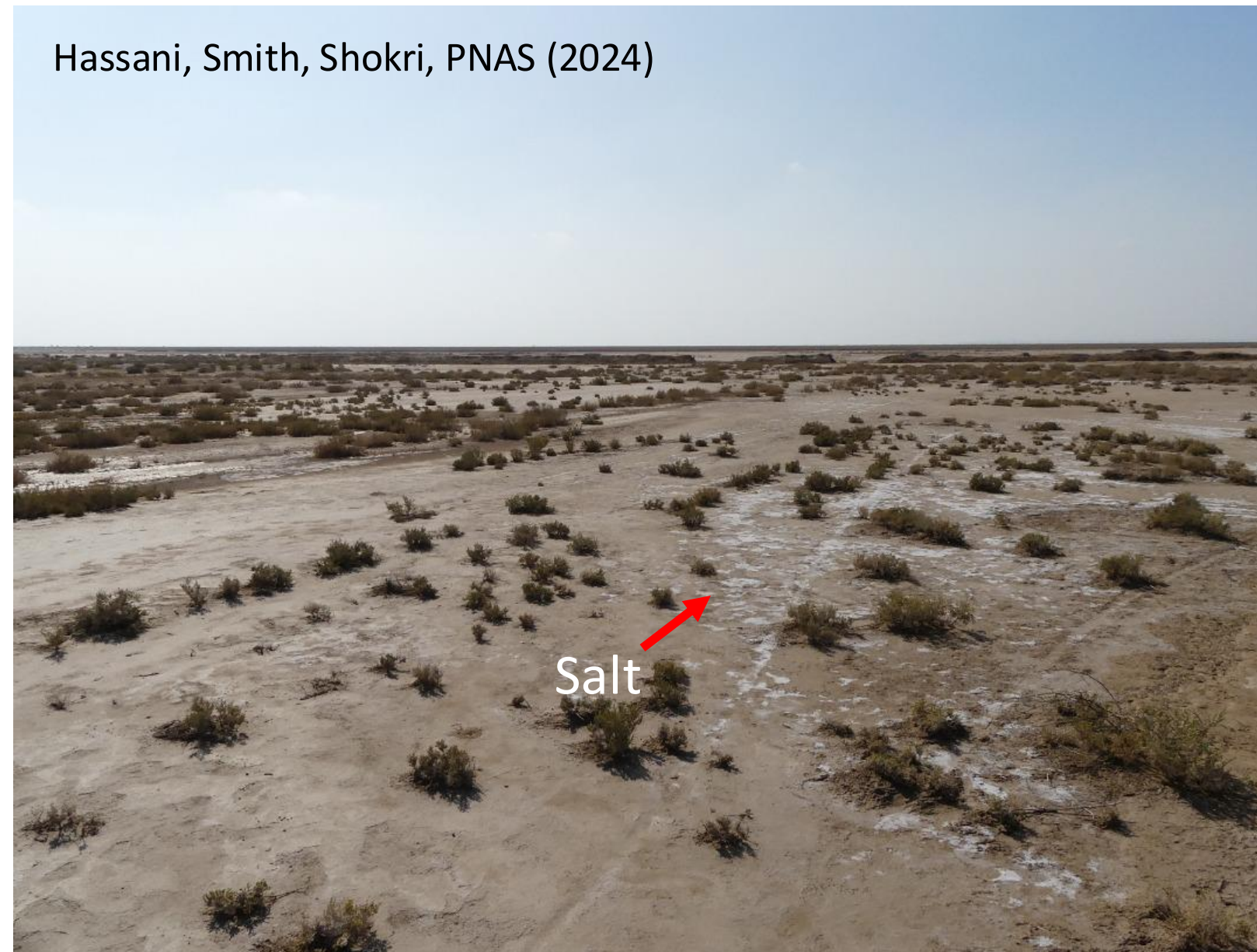


#SaveSoil

# Soil Salinization: A Growing Threat to Soil Health

Soil salinization refers to the excessive accumulation of soluble salts in soil to a degree that adversely influences vegetation and environmental health

Hassani, Smith, Shokri, PNAS (2024)





# Soil salinization – Drought Nexus

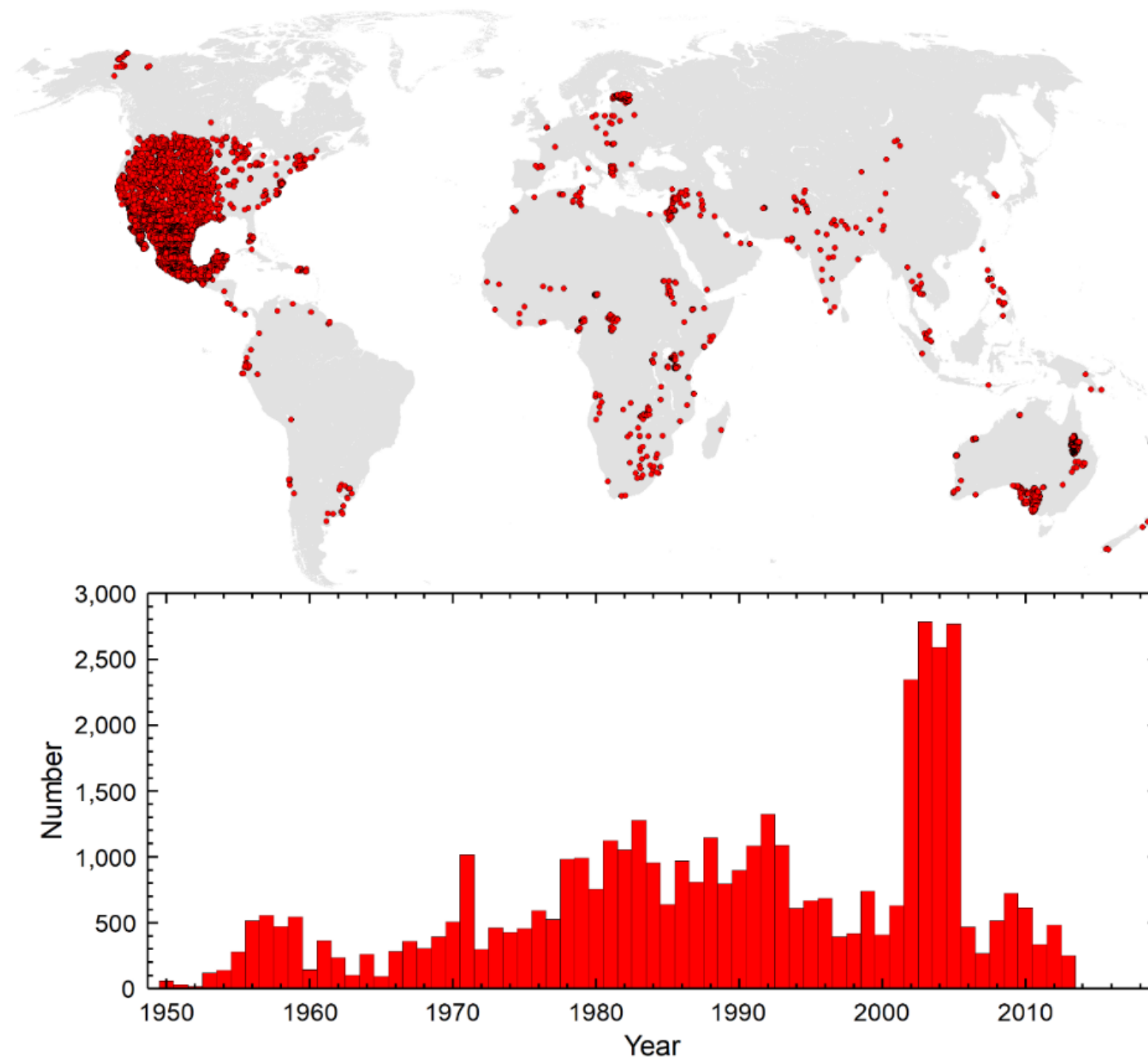
- As salinization increases, soil becomes less productive and more susceptible to drought
- Salinized soils reduce vegetation cover, exacerbating drought impacts on agriculture and ecosystems
- Stress from the combined effects of salinity and drought has more severe negative impacts on plant growth than either stress alone
- To effectively combat drought, we must also understand and manage soil salinization as the two are deeply interconnected

Shokri, Hassani, Sahimi, Rev. Geophys. (2024)

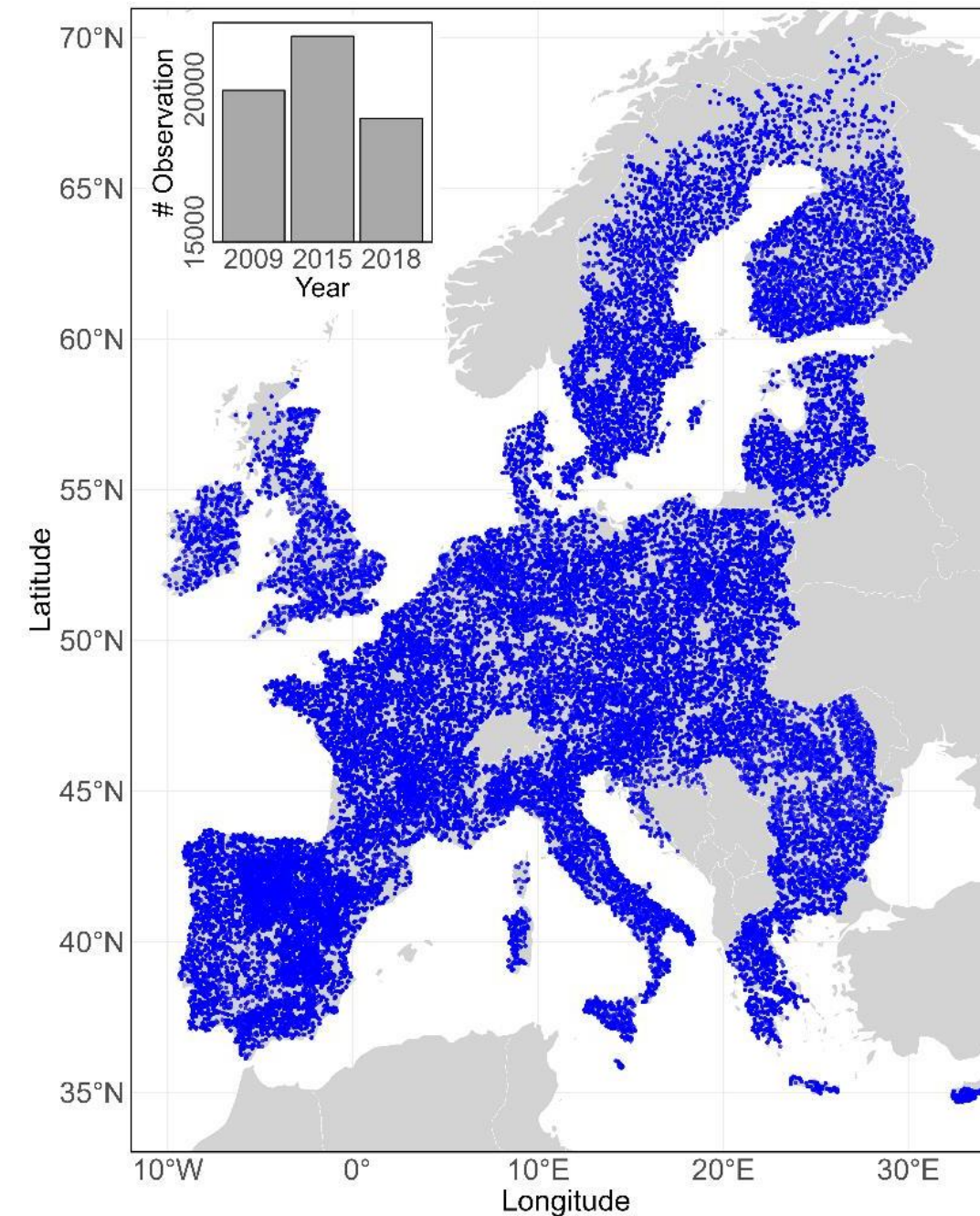


Combination of drought, salinity and water scarcity turned the soils of this farmer from Iraq into unusable areas. Photo credit: courtesy of Sebastian Castelier/Shutterstock.com.

# Data Inequality in Soil Salinity Monitoring



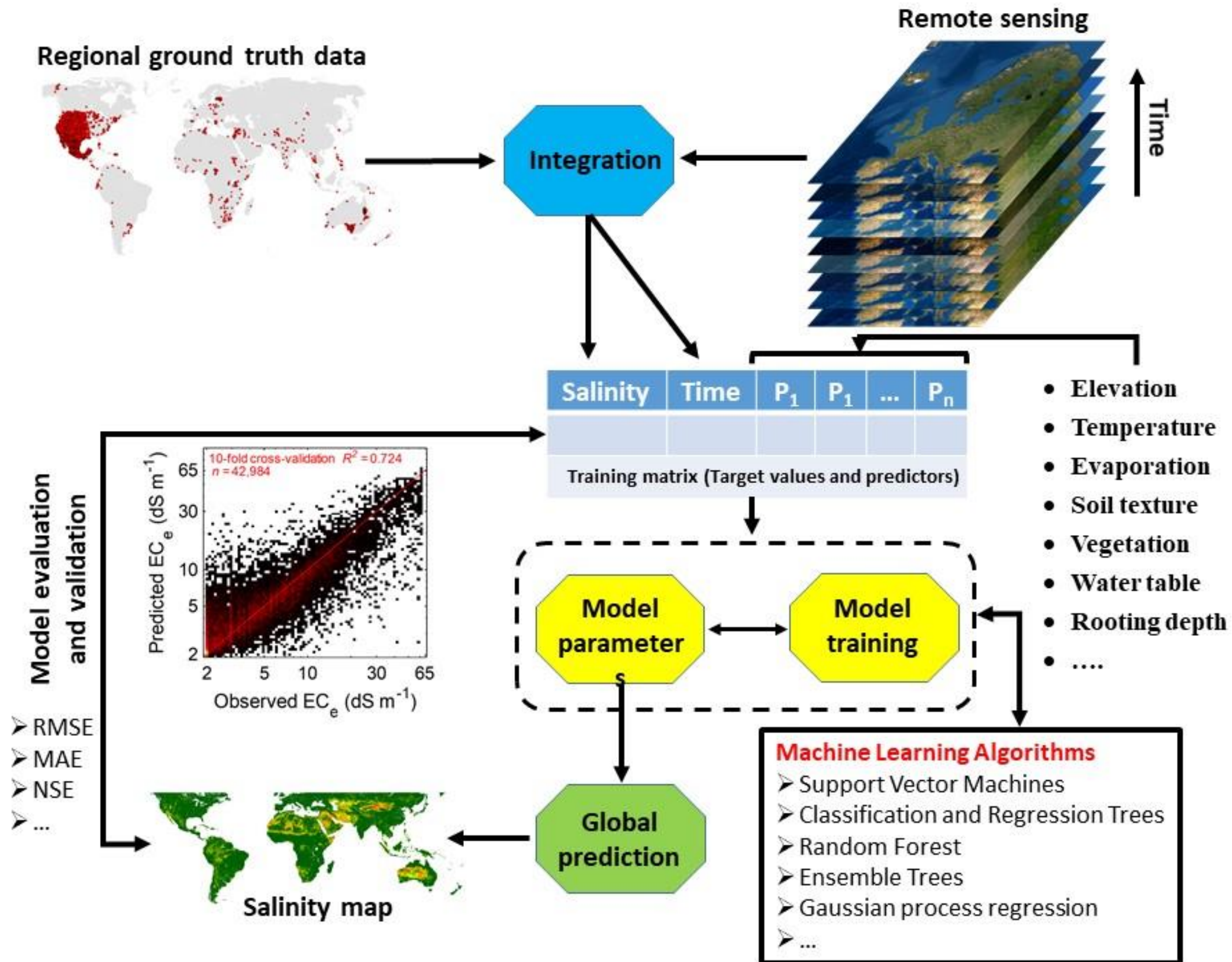
Hassani, Azapagic, Shokri, Nat. Commun. (2021)



LUCAS Soil, the largest soil dataset for Europe



# Bridging Data Gaps with Industry 4.0 Technologies

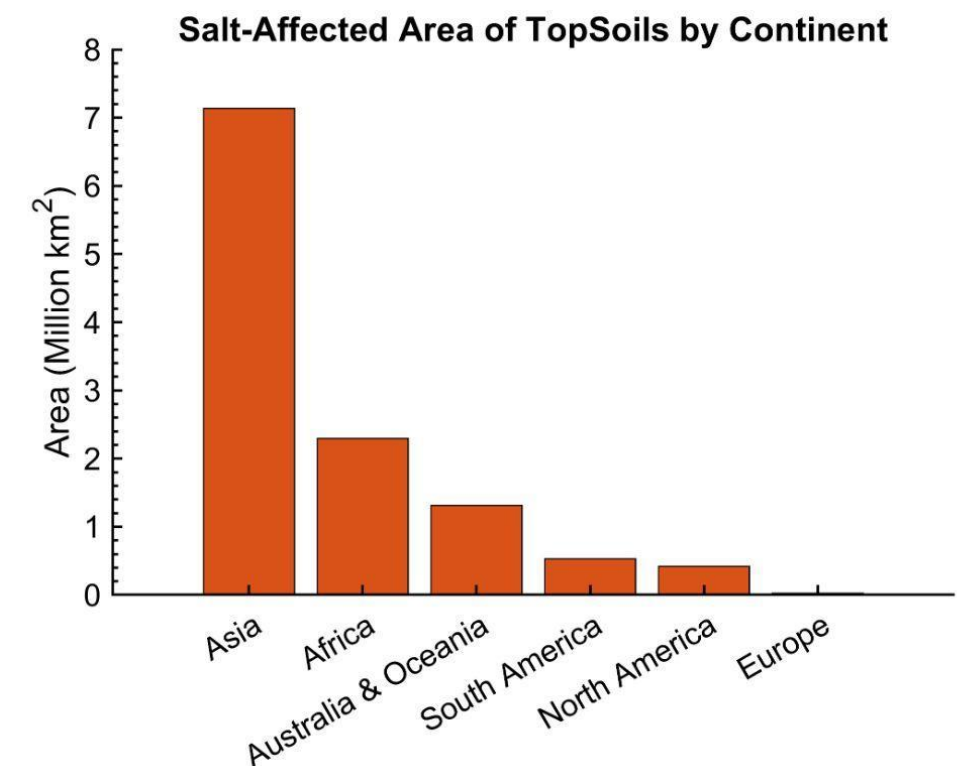
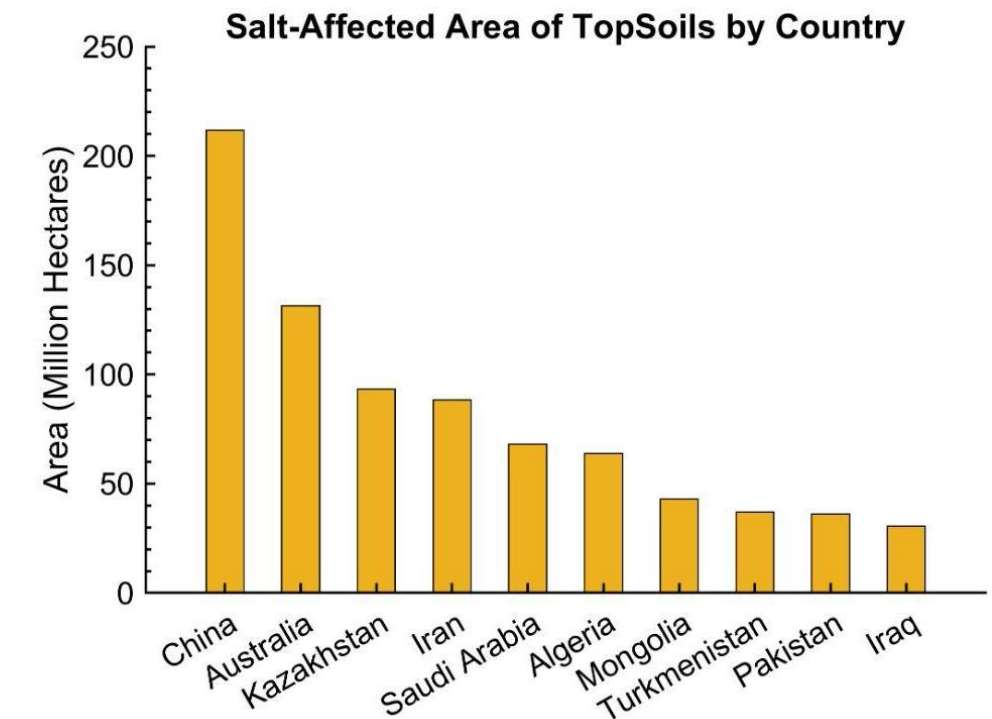
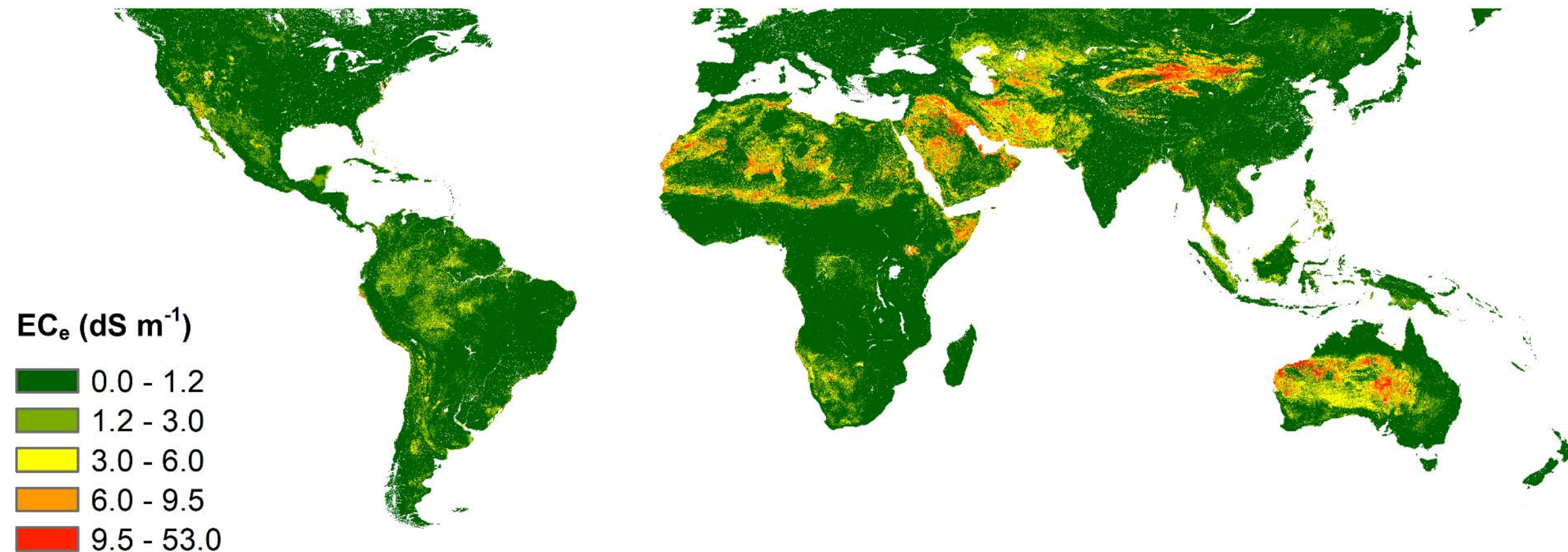




# Global Scale Prediction of Soil Salinization

The continents with the highest salt-affected areas are Asia (particularly China, Kazakhstan, and Iran), Africa, and Australia

Average predicted saturated soil-paste electrical conductivity (1980 - 2018)

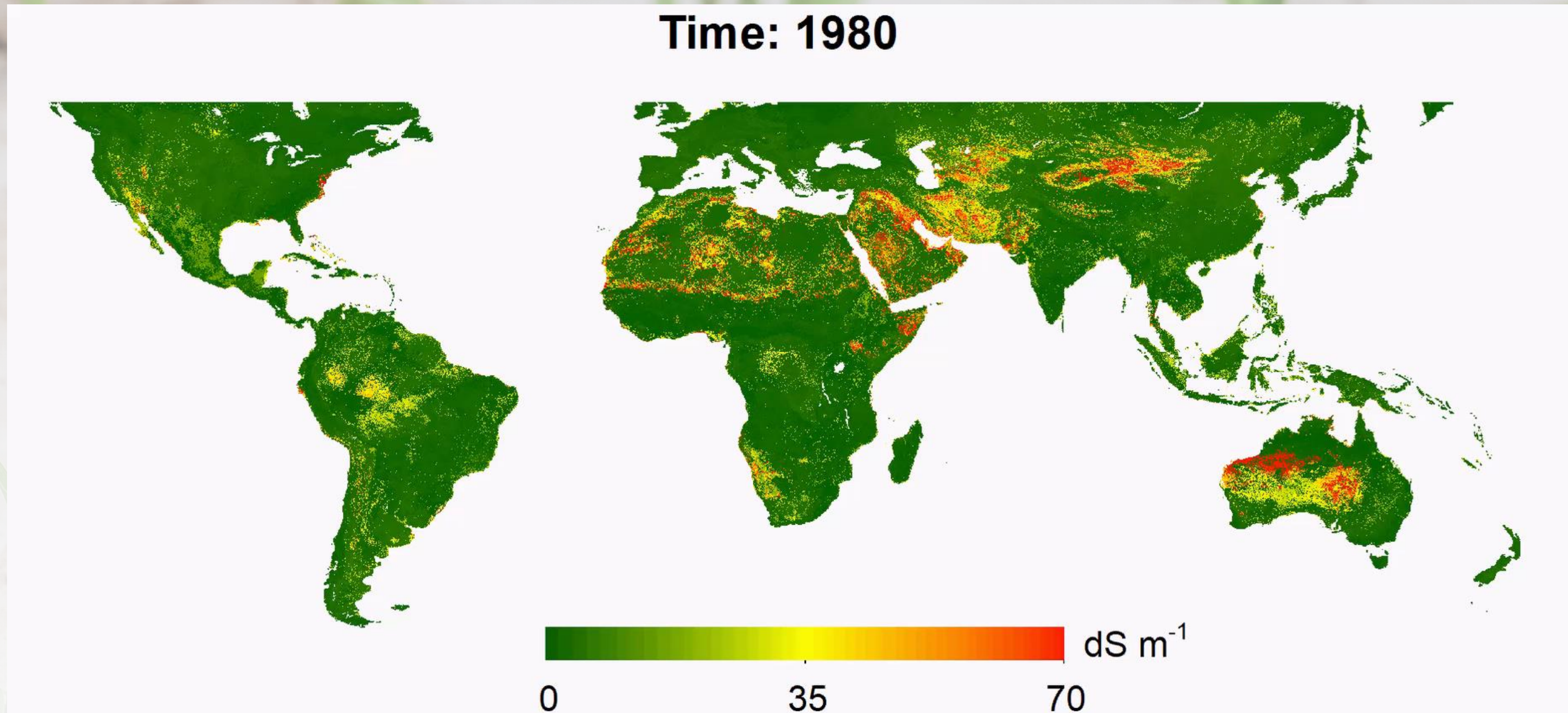


Hassani, Azapagic, Shokri, PNAS (2020)



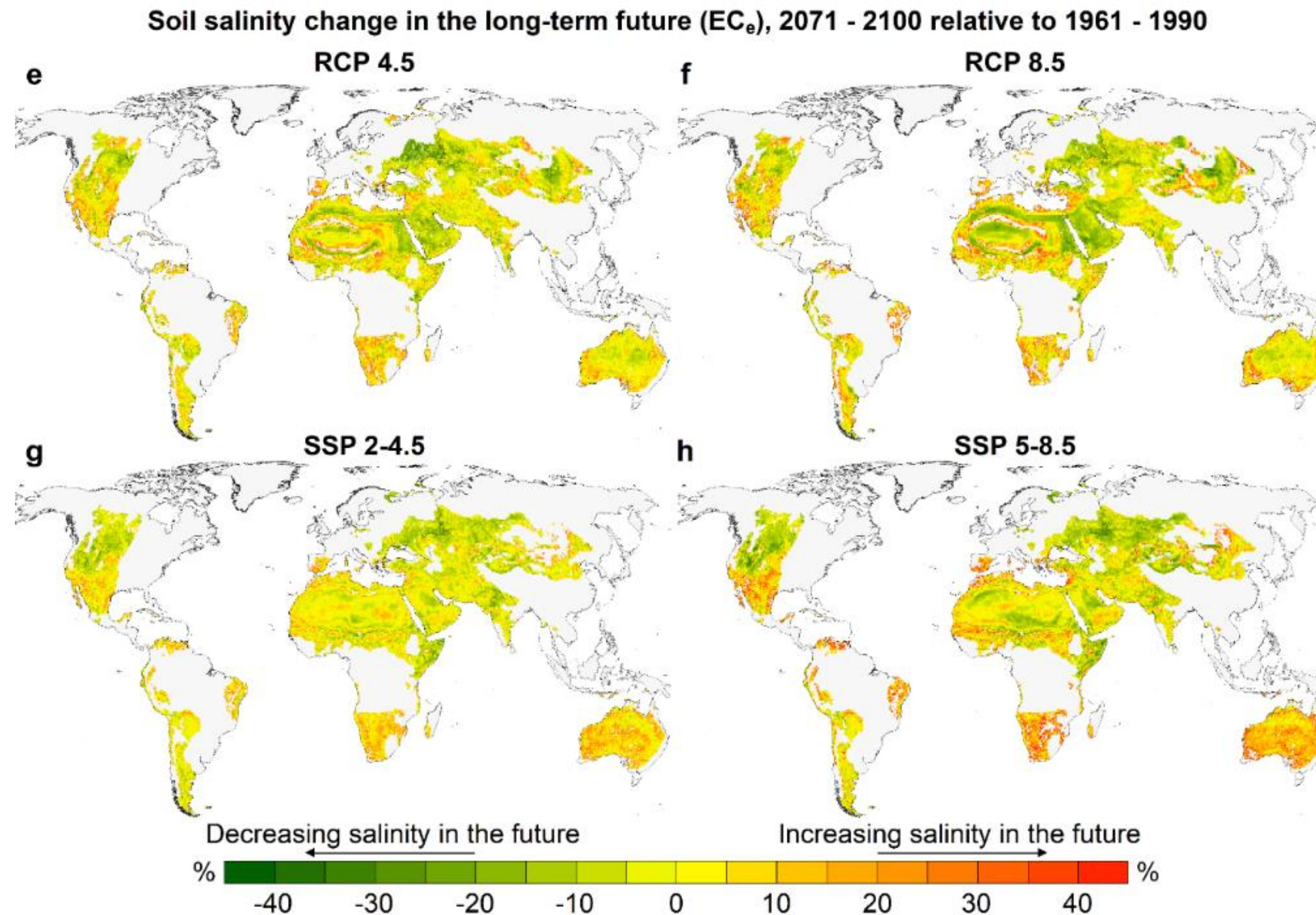
# Global Scale Prediction of Soil Salinization

Time: 1980





# Salinity Projection Under Different Climate Scenarios



# Recommendations and Next Steps

- Strengthen Global Soil Health Monitoring Systems
- Utilize technologies from Industry 4.0 revolution such as AI, big data, and remote sensing to fill data gaps and improve monitoring of soil salinization and drought on a global scale
- Recognize the importance of maintaining soil health, including managing salinization, as a key component of building resilience to drought
- Promote Global Collaboration, Data Sharing and Joint Efforts for Soil Conservation
- Invest in new generation of predictive models to assess the future impact of climate extremes on soil salinization and drought, enabling proactive policy and adaptation measures
- Capacity building in regions most affected by salinization and drought through technology transfer and education





# Thank you!