

# Green Roof LCA Literature Review

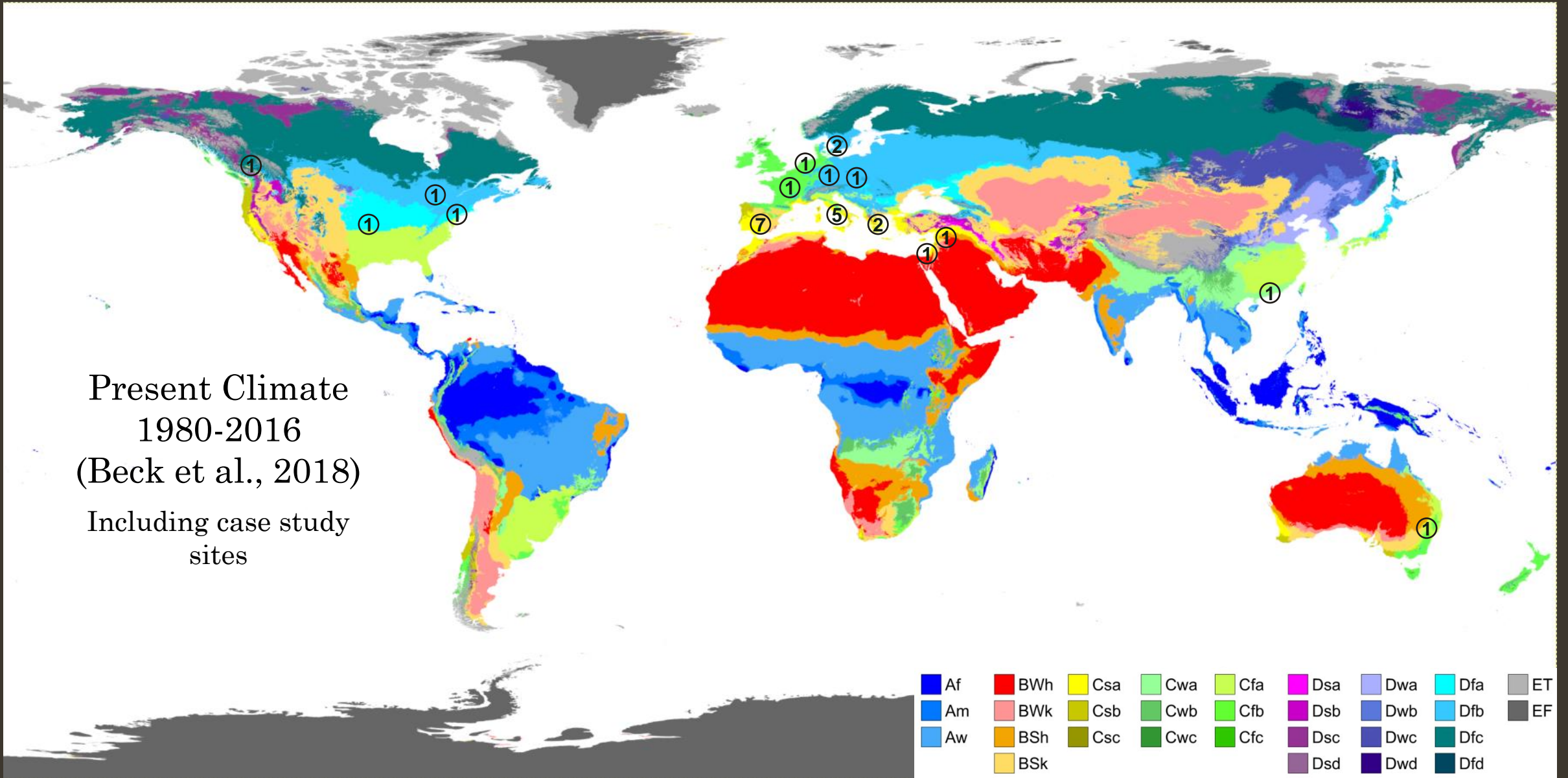
By Ella Farmer

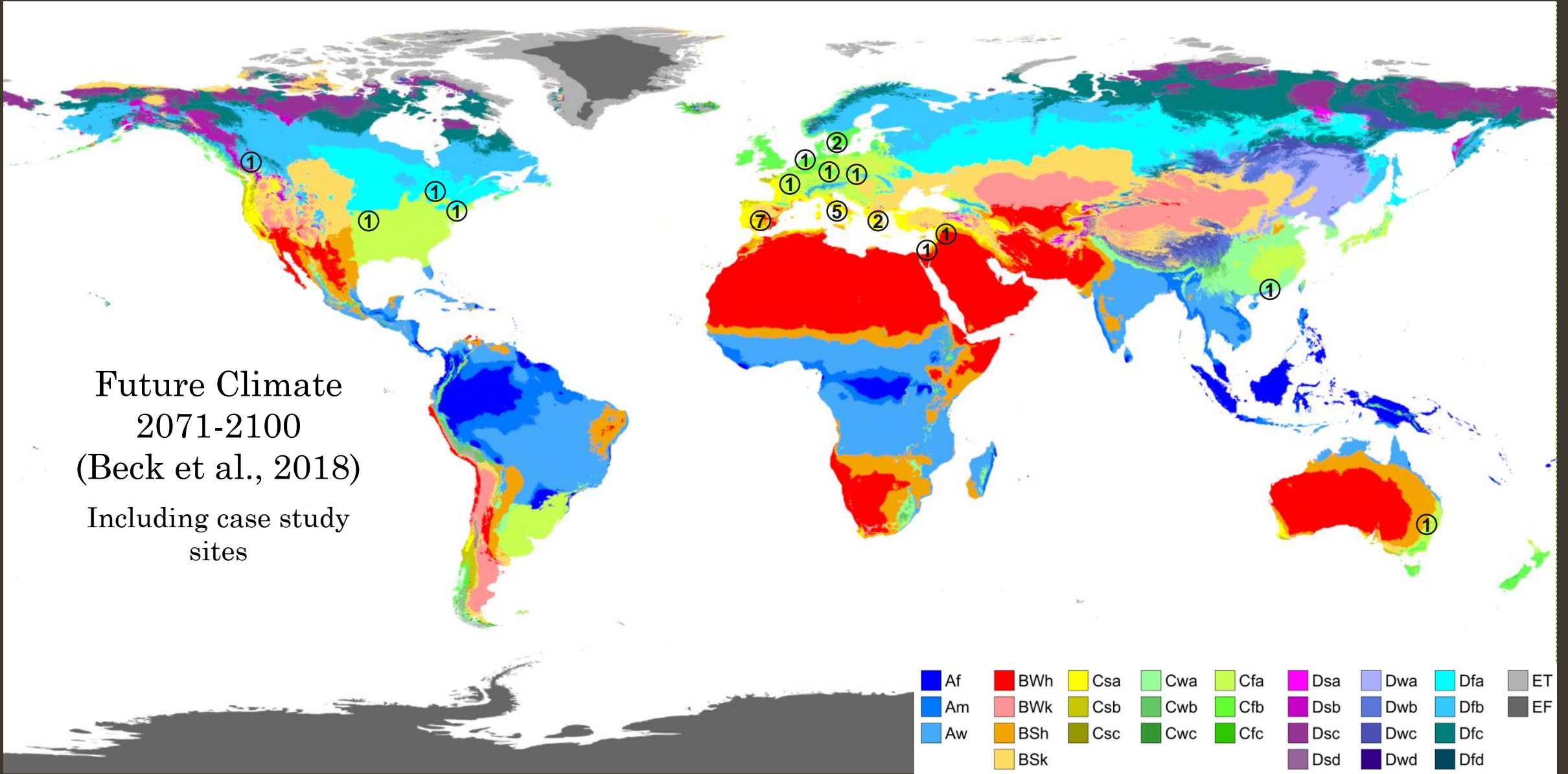


# Green Infrastructure and Life Cycle Analyses

- GI is presented as a method to reduce urban climate change pressures and increase urban biodiversity
- LCAs are used to determine the sustainability of these measures
- They combine data on energy use, carbon impact of transport, raw material extraction, construction costs, etc. to determine the impact of the GI

Present Climate  
1980-2016  
(Beck et al., 2018)  
Including case study  
sites





Future Climate  
 2071-2100  
 (Beck et al., 2018)  
 Including case study  
 sites

Af	BWh	Csa	Cwa	Cfa	Dsa	Dwa	Dfa	ET
Am	BWk	Csb	Cwb	Cfb	Dsb	Dwb	Dfb	EF
Aw	BSh	Csc	Cwc	Cfc	Dsc	Dwc	Dfc	
	BSk				Dsd	Dwd	Dfd	

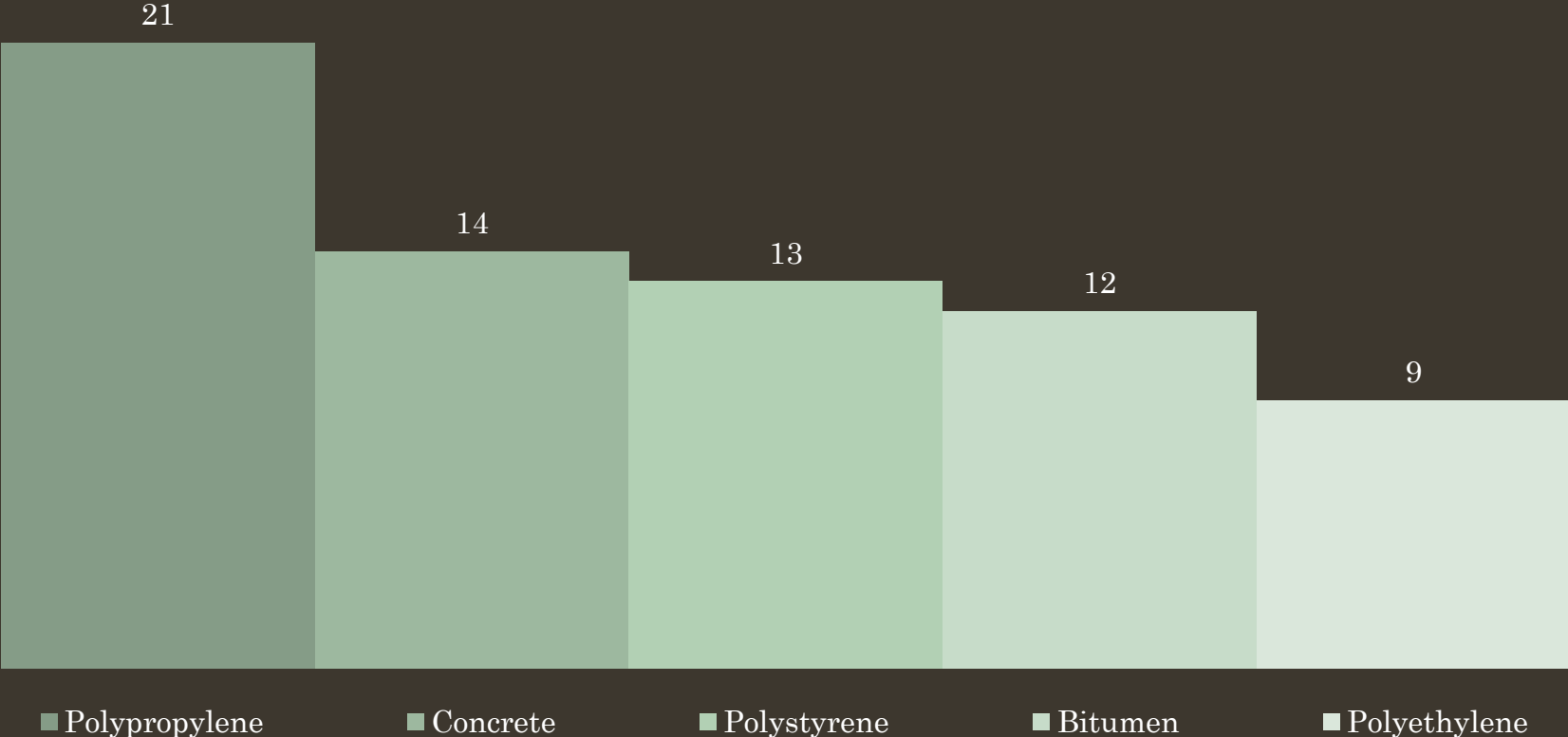
# Literature Review

- 34 LCA papers
- From years 2006-2022
- Types of Green Roofs: Intensive, Extensive, Flat, PV-Green, and Alternative/Recycled
- Categories of review: Type of GI, Location, Local Climate, Materials, Building Specifications, Lifetime (years), Plant Species, Intended CCA Benefits, LCA Software and Databases, LCA Phases, Excluded Elements, Main and Quantified Conclusions, and Research Gaps

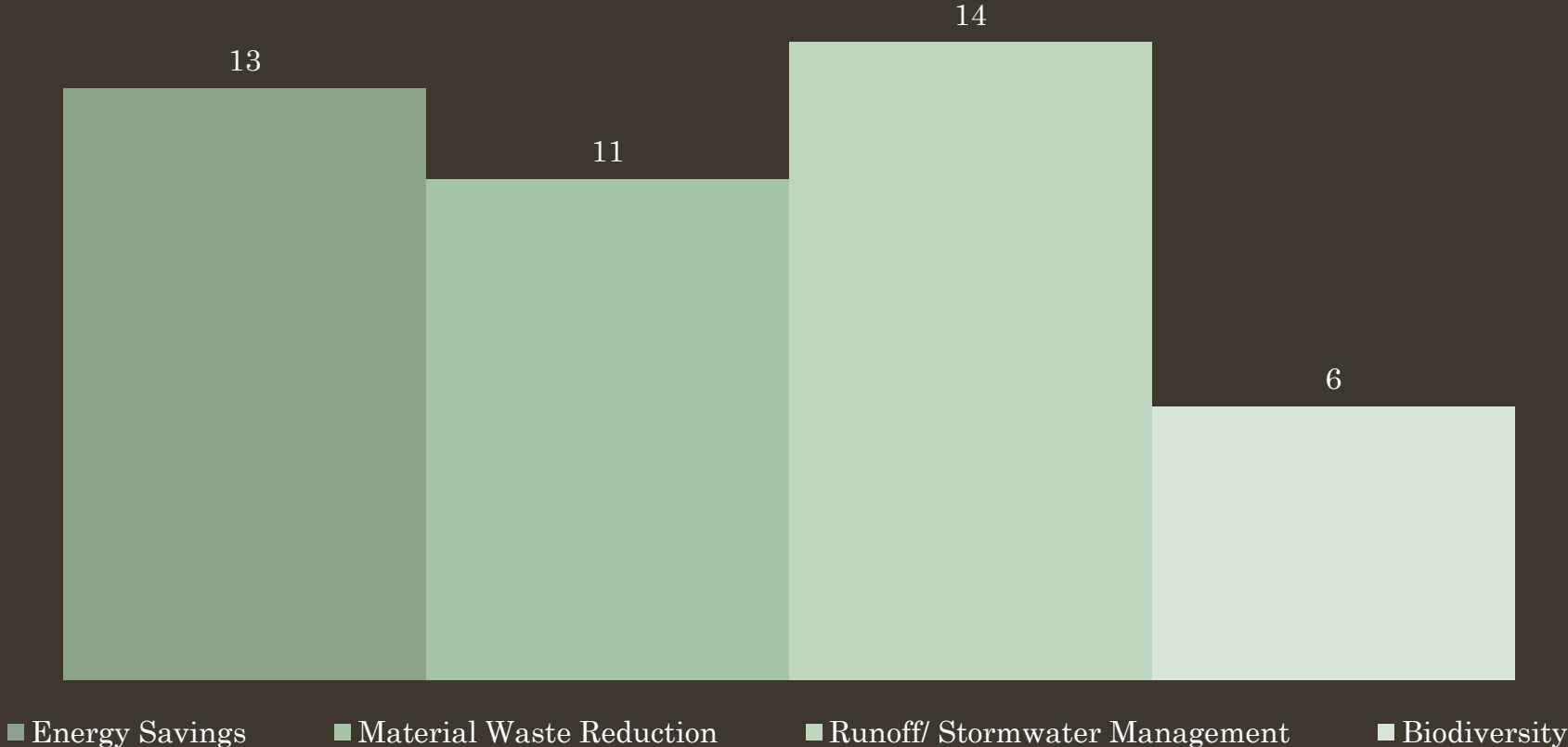
# Findings

- The average lifetime assessed was 37.19 years
- The most common software and databases were SimaPro, Ecoinvent and ReCiPe
- Even split between residential, commercial and functional unit buildings
- Sedums were the most common plant species used, though 40% of papers did not specify the plants used
- 47% did not include cut-off criteria

# Most Common Materials



# Most Common CCA Benefits



# Overall Conclusions

- Green roofs can contribute to energy savings and GHG emission reductions
- They are also more beneficial to biodiversity than non-green roofs
- Green roofs require more materials which can cause them to have a higher environmental impact than conventional roofs, as well as being more expensive
- Using recycled or local materials as well as simplified green roof systems can contribute to lessening the environmental impact
- When comparing green roofs, extensive perform better than intensive

# Future Research

- Improving input data for LCA
  - More data is needed (especially in the Manufacturing and End-of-Life phases) in order to perform more detailed LCAs
  - Incorporating data on benefits of green roofs such as biodiversity impacts, carbon fixation, and insulation into databases
- Reducing waste and cost of green roofs
  - Determining materials and methods that can be better recycled, reused or composted is necessary to reduce environmental impacts
  - Also necessary to determine ways to reduce the cost of green roofs for wider implementation

# My Thesis

“The distributive justice implications of coastal flood adaptations in the New Orleans tropical cyclone region”

- Comparing nature-based and engineered-based adaptations
- Creating scenarios for improving the distributive justice of future coastal flood adaptations

