



Building a Greener Laguna Beach: Sustainable Infrastructure

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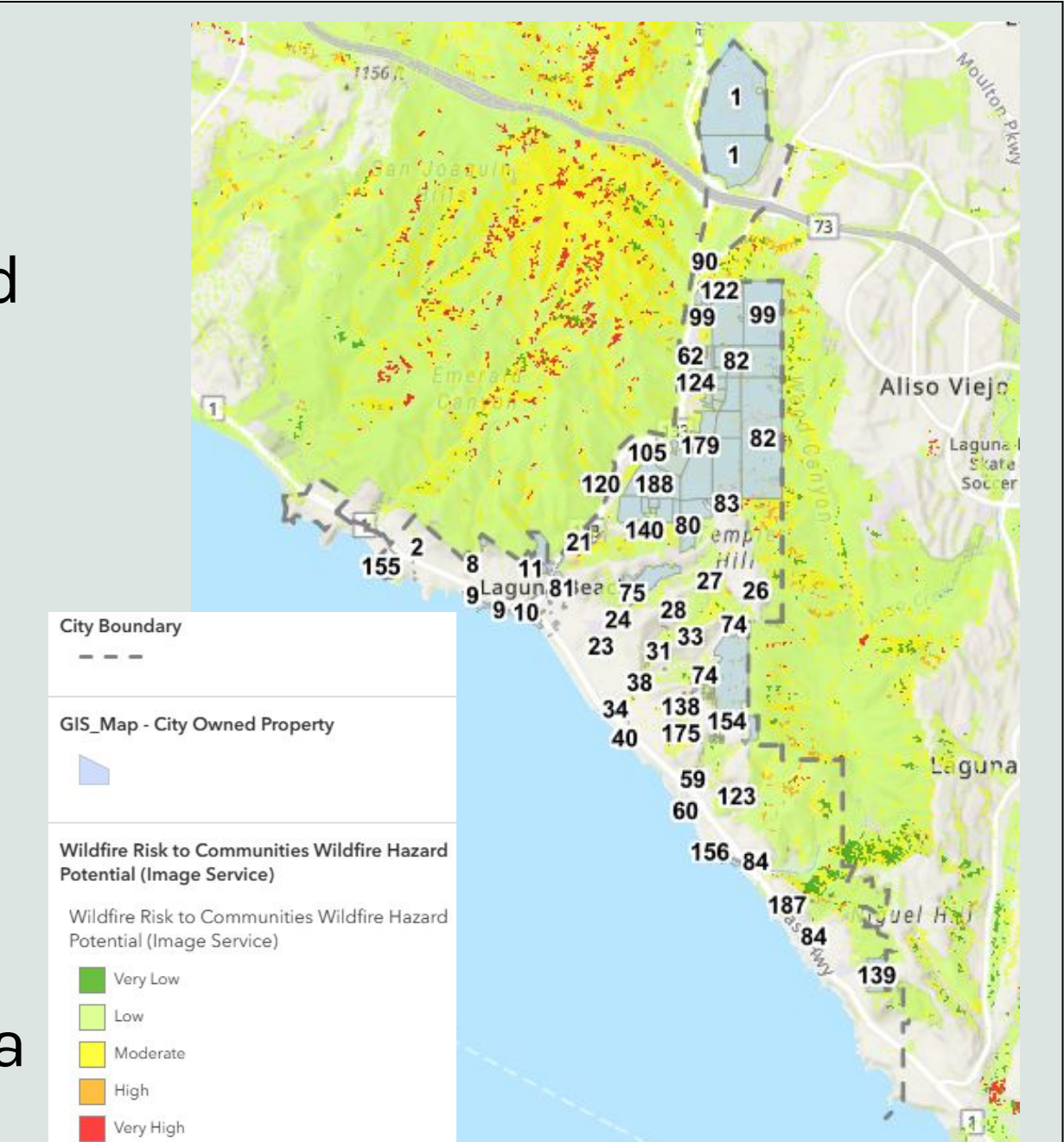
INTRODUCTION

- Growing wildfire risk and environmental pressures highlight the urgent need for sustainable infrastructure investment in coastal cities like Laguna Beach
- Examines the feasibility of concrete alternatives and cool roofs as solutions that balance sustainability with preserving historical charm and aesthetic character
- Goals include improving energy efficiency and reducing CO₂ emissions without compromising what makes Laguna Beach unique

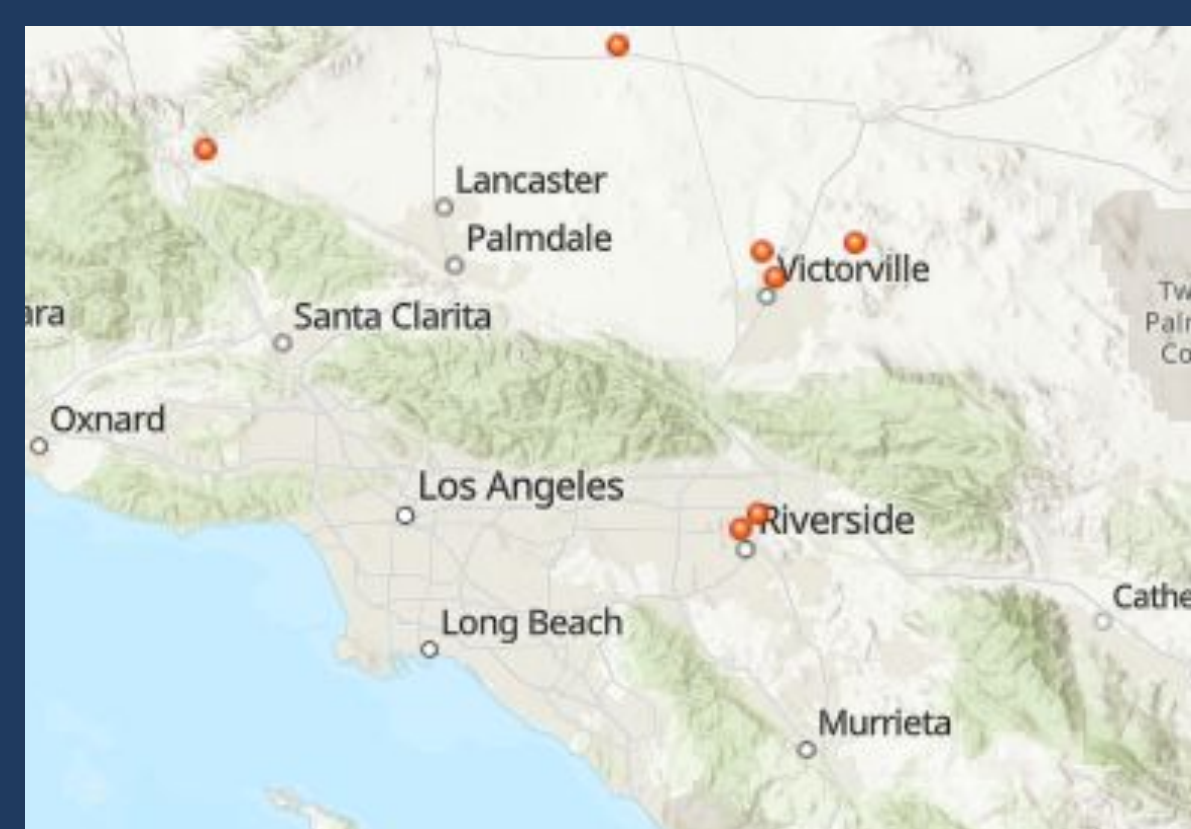


RESEARCH METHODOLOGIES

- Conducted a comparative analysis using ArcGIS and additional data sources to evaluate concrete alternatives and cool roofs against traditional materials and methods
- Distributed a survey to approximately 30 professionals including structural/civil engineers, architects, and contractors to gather qualitative feedback
- Combined quantitative and qualitative methods to assess feasibility, cost, and performance in a real-world coastal context
- Used Laguna Beach High School's white painted cool roof as a local example



DATA AND FINDINGS



- ★ 7 cement plants in this region (150 mile radius) compared to 6 others on the West Coast (CA, OR, & WA)

	Emissions vs. Portland Cement	Cost (\$/m ³)
Traditional (Portland Cement)	Baseline (100%)	\$196-248/m ³ (\$150-190/yd ³ SoCal) (Home Blue)
Hempcrete (Hemp + Lime Binder)	~130-140% better (net carbon negative)	\$215-390/m ³ (\$165-300/yd ³ materials + labor; ~10-25% premium over conventional framed + insulated wall)
Ashcrete (Fly Ash Concrete)	~25-54% reduction (fly ash replaces Portland cement clinker; higher % = more savings)	\$170-215/m ³ (\$130-165/yd ³ ; 5-15% cheaper than standard concrete due to low fly ash cost)



ArcGIS Story Map QR Code



Quantitative Raw Data Spreadsheet

Laguna Beach High School - white cool roof



	Traditional Roof	Cool Roof
Roof temp after reflective coating	175 °F	120 °F
Indoor temp reduction (no A/C)	N/A	2.2-5.9° lower
Peak cooling demand reduction	Baseline	11-27% lower

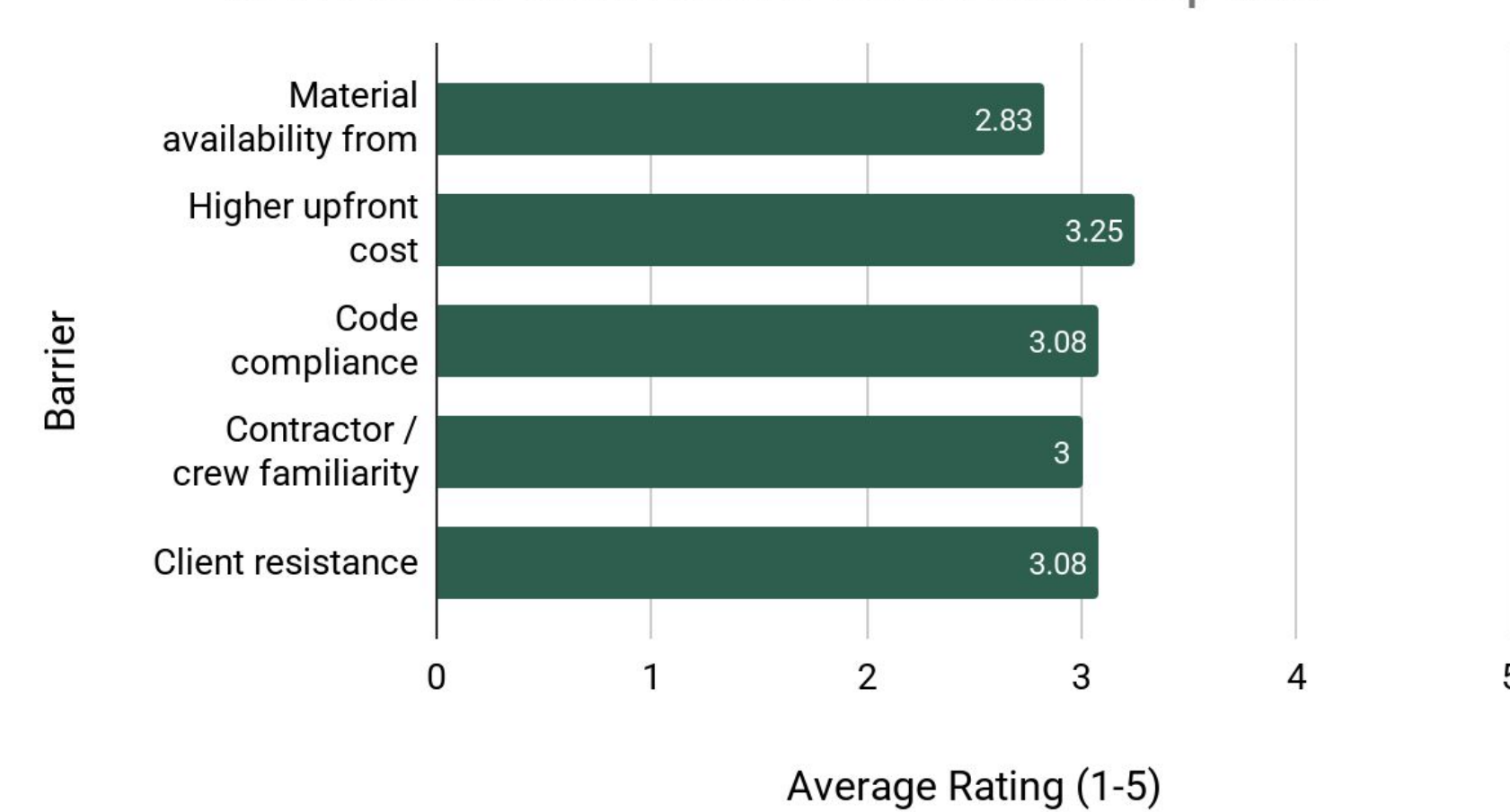
CONCLUSIONS, IMPLICATIONS, AND NEXT STEPS

- Upfront cost remains the biggest hurdle, but long term energy savings and carbon reductions are key for this investment
- Aesthetic concerns were addressed in a way for sustainability and Laguna's historic character to coexist
- City owned land offers a natural starting point for the city to lead by example and build momentum
- Fire resistant material selection must remain a priority given the city's ongoing wildfire vulnerability
- Looking ahead, updated building codes, local supplier development, and early engagement with contractors and developers will be key to turning these findings into real change

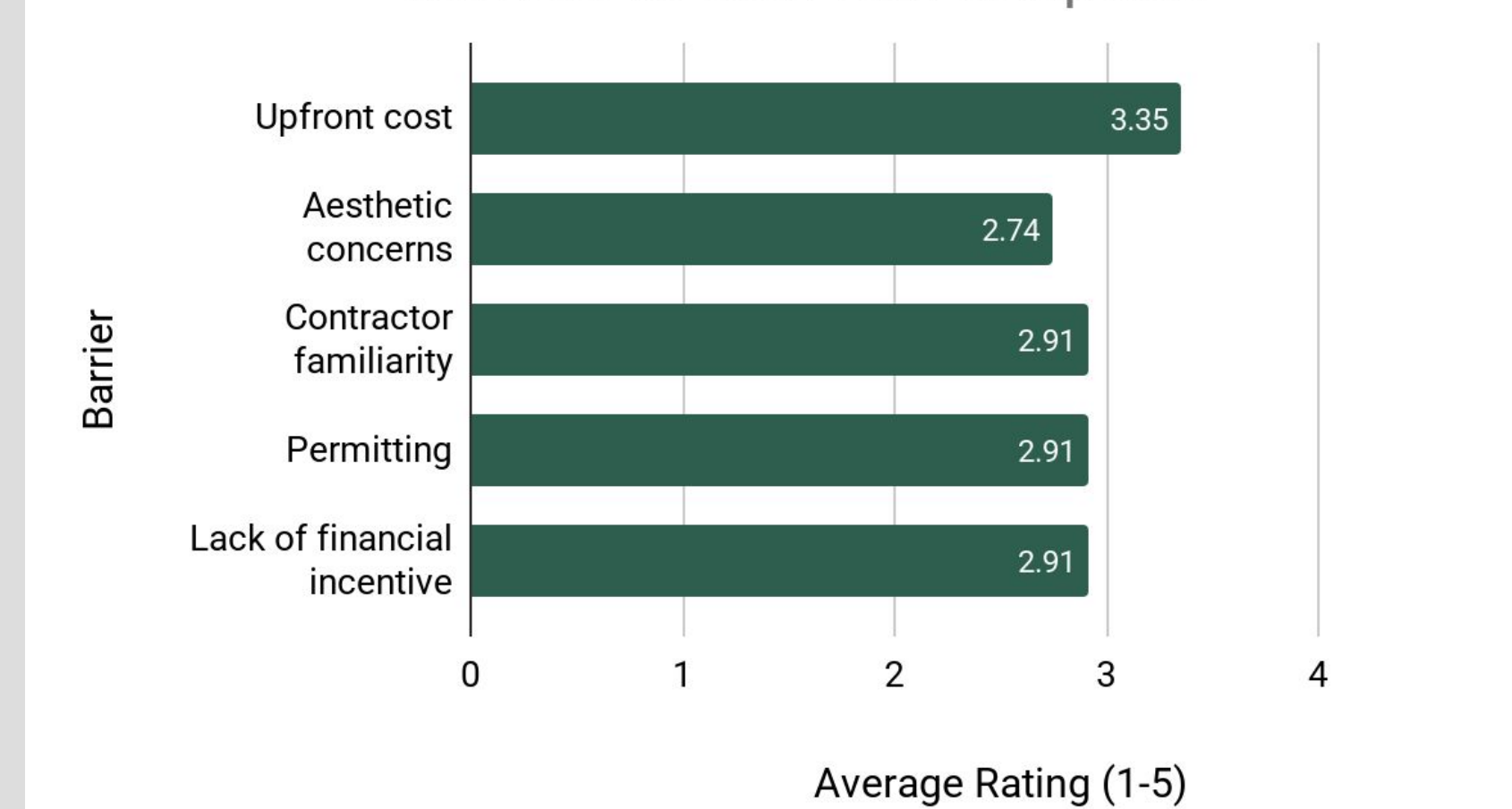


DISCUSSION, ANALYSIS, AND EVALUATION

Barriers to alternative concrete adoption



Barriers to cool roof adoption



Professionals rated five potential barriers to adoption on a scale of 1-5. Upfront cost ranked highest for both categories, yet no barrier reached a major level, suggesting adoption is challenging but achievable.

ACKNOWLEDGEMENTS / REFERENCES

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***QR CODE TO FULL PAPER:

