Getting Out of Harm's Way

FY16 tsunami evacuation research at the USGS

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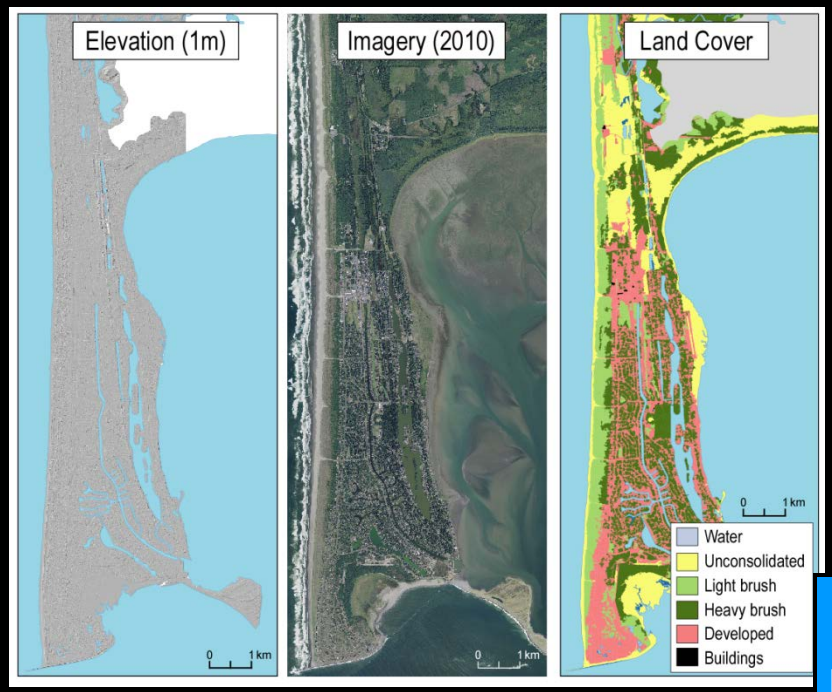
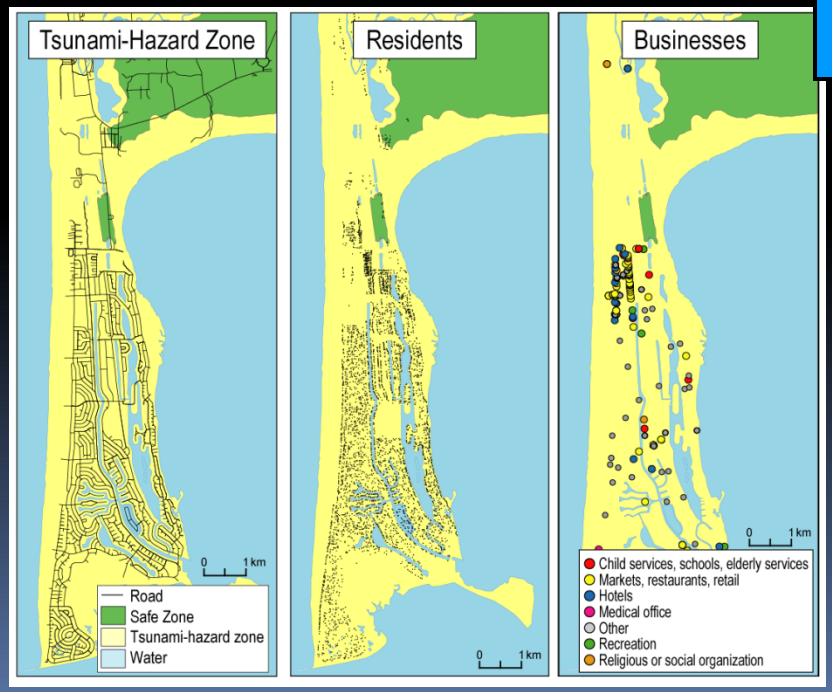
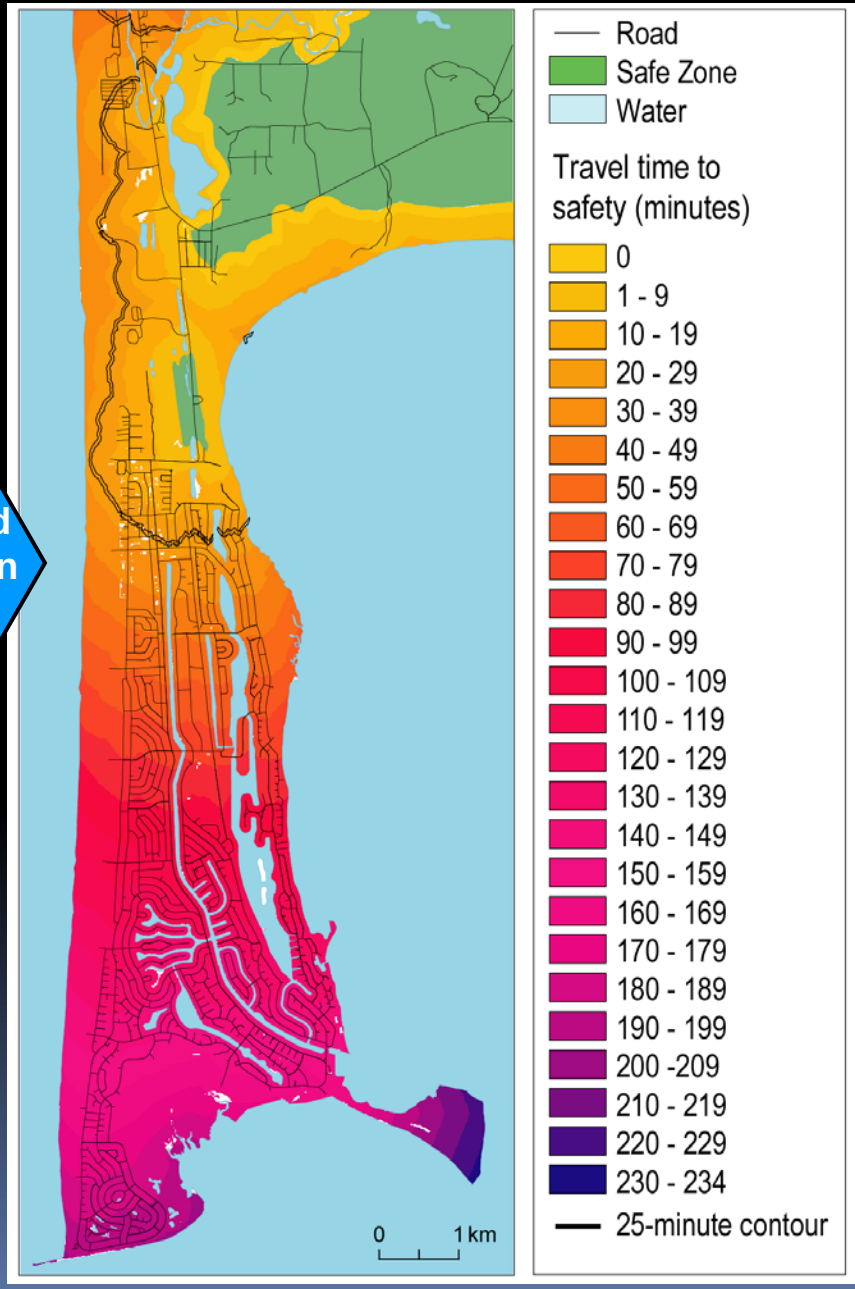
U.S. Geological Survey

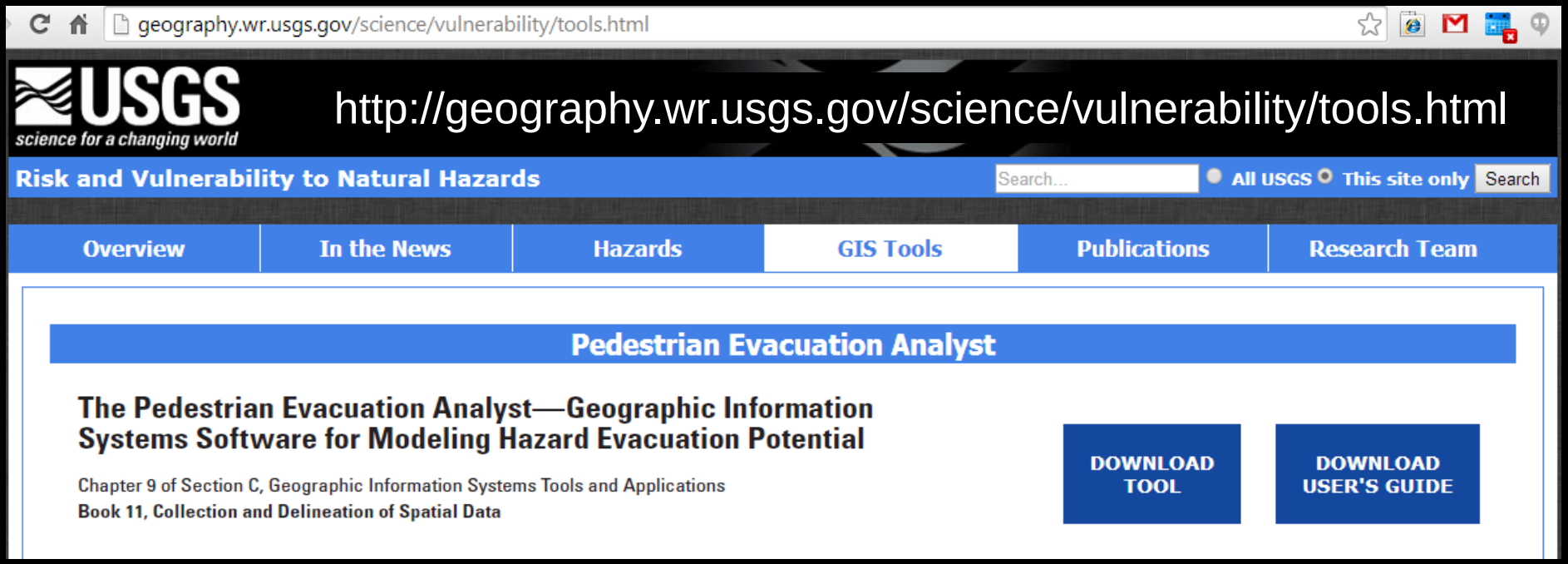
Modeling Evacuation Travel Times





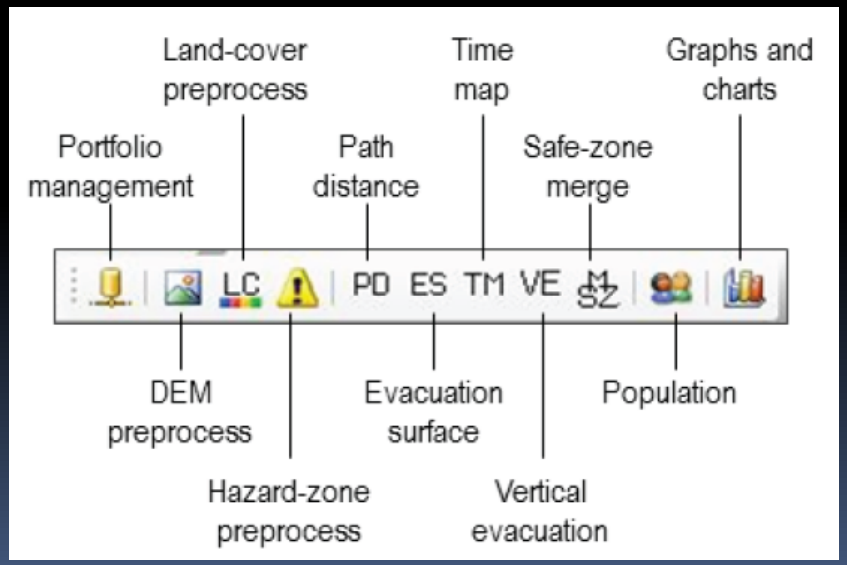
GIS-based Evacuation Modeling



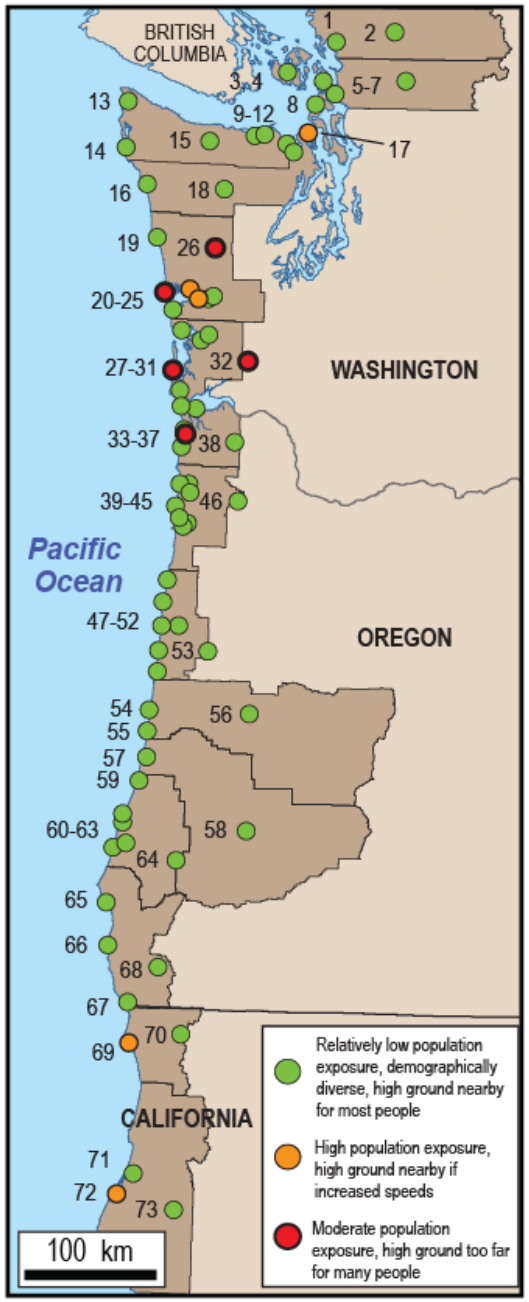


Evacuation Analyst Training

- DOGAMI
- Univ. of Alaska, Fairbanks
- City/county/state in CA Bay Area
- New Zealand



Community clusters of tsunami vulnerability



WASHINGTON

1. Bellingham
2. Whatcom Co.
3. Friday Harbor
4. San Juan Co.
5. Anacortes
6. La Conner
7. Skagit Co.
8. Island Co.
9. Jamestown S'Klallam IR
10. Sequim
11. Port Angeles
12. Lower Elwha IR
13. Makah IR
14. Quileute IR
15. Clallam Co.
16. Hoh IR
17. **Port Townsend**
18. Jefferson Co.
19. Quinault IR
20. **Ocean Shores**
21. **Hoquiam**
22. **Aberdeen**
23. Cosmopolis
24. Montesano
25. Westport
26. **Grays Harbor Co.**
27. Shoalwater Bay IR
28. Raymond
29. South Bend
30. **Long Beach**
31. Ilwaco
32. **Pacific Co.**

OREGON

33. Astoria
34. Warrenton
35. Gearhart
36. **Seaside**
37. Cannon Beach
38. Clatsop Co.
39. Manzanita
40. Nehalem
41. Wheeler
42. Rockaway Beach
43. Garibaldi
44. Bay City
45. Tillamook
46. Tillamook Co.
47. Lincoln City
48. Depoe Bay
49. Newport
50. Toledo
51. Waldport
52. Yachats
53. Lincoln Co.
54. Florence
55. Dunes City
56. Lane Co.
57. Reedsport
58. Douglas Co.
59. Lakeside
60. North Bend
61. Coos Bay
62. Coquille
63. Bandon
64. Coos Co.
65. Port Orford
66. Gold Beach
67. Brookings
68. Curry Co.

CALIFORNIA

69. **Crescent City**
70. Del Norte Co.
71. Arcata
72. **Eureka**
73. Humboldt Co.

Group 1

Communities	*Summary*	*Risk reduction*
Many (see map)	Moderate number of residents in hazard zones and high ground largely accessible available before wave arrival	Tsunami education

Group 2

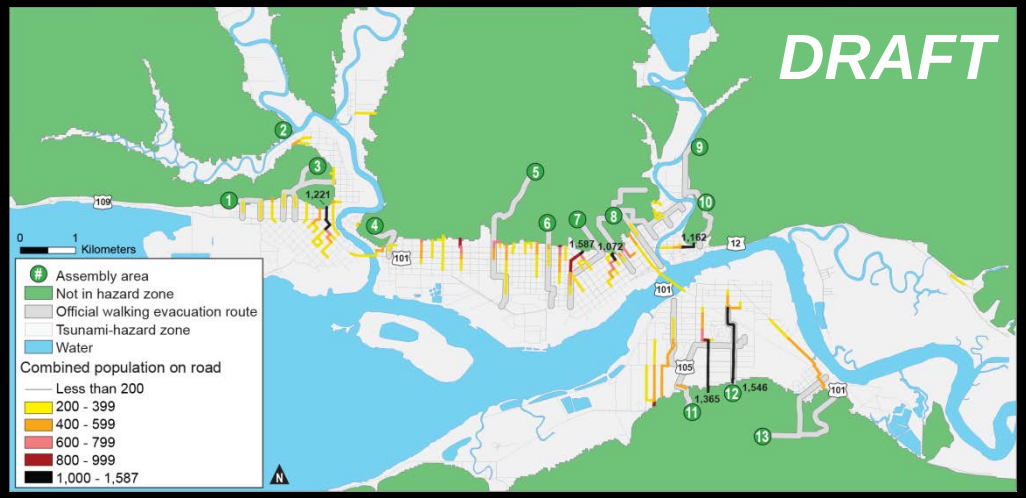
Communities	*Summary*	*Risk reduction*
Crescent City Hoquiam Port Townsend Aberdeen Eureka	Highest number of residents in hazard zones and high ground accessible if people move at higher speeds	Tsunami education Evacuation training

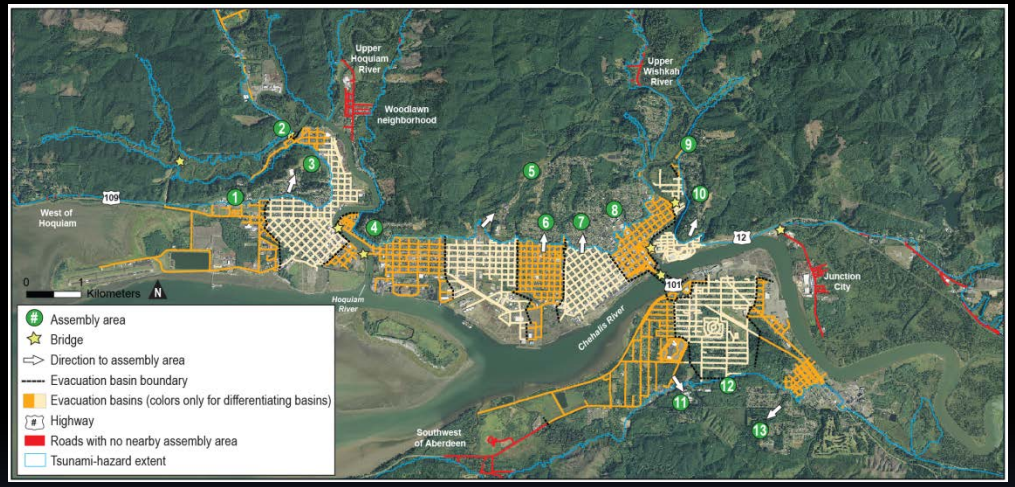
Group 3

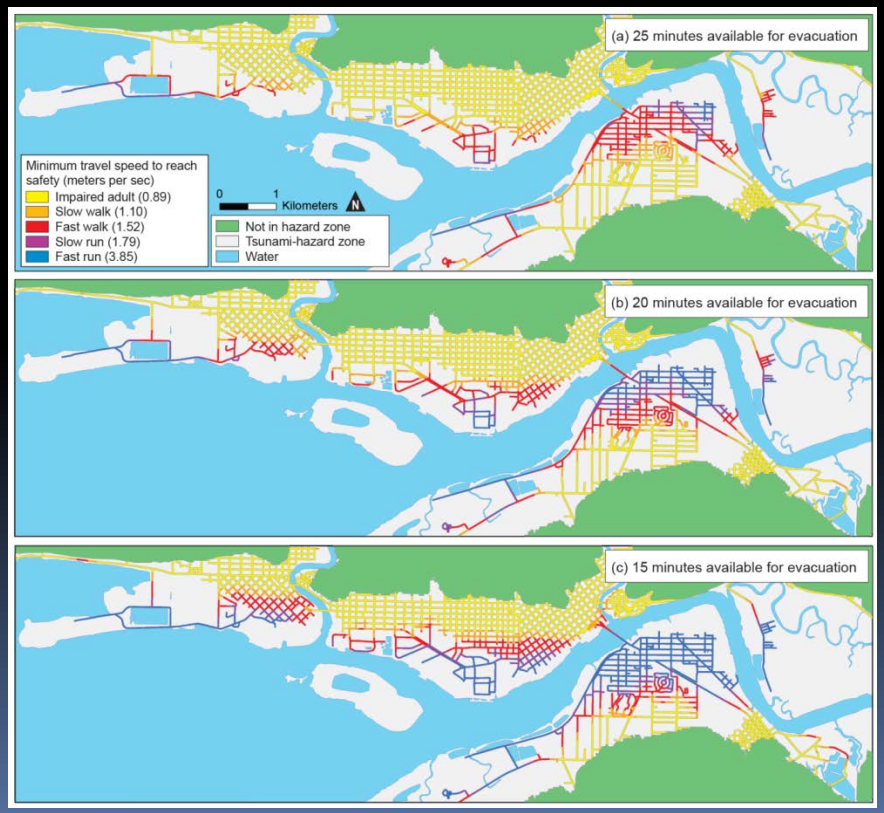
Communities	*Summary*	*Risk reduction*
Unincorporated Grays Harbor Co. Long Beach Unincorporated Pacific Co. Ocean Shores Seaside	Moderate number of residents in hazard zones and high ground not available before wave arrival	Tsunami education Evacuation training Vertical-evacuation shelters or refuges

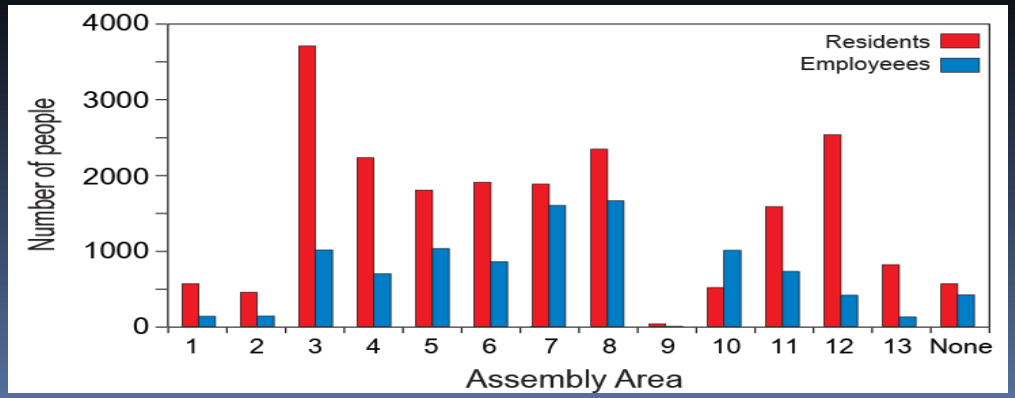
- **Number of people in hazard zones**
- **Type of residents in hazard zones**
- **Number of people with insufficient time to evacuate (slow walk)**
- **Number of people with insufficient time to evacuate (fast walk)**

Modeling evacuation pathways and population demand at assembly areas

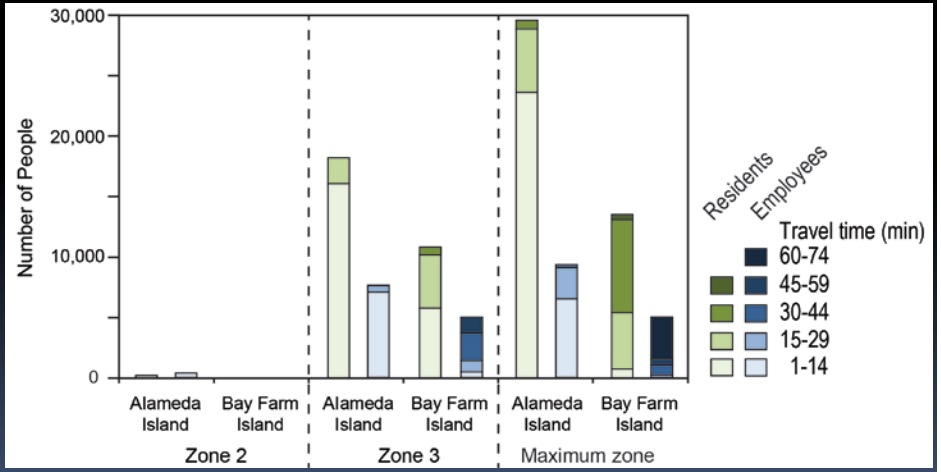


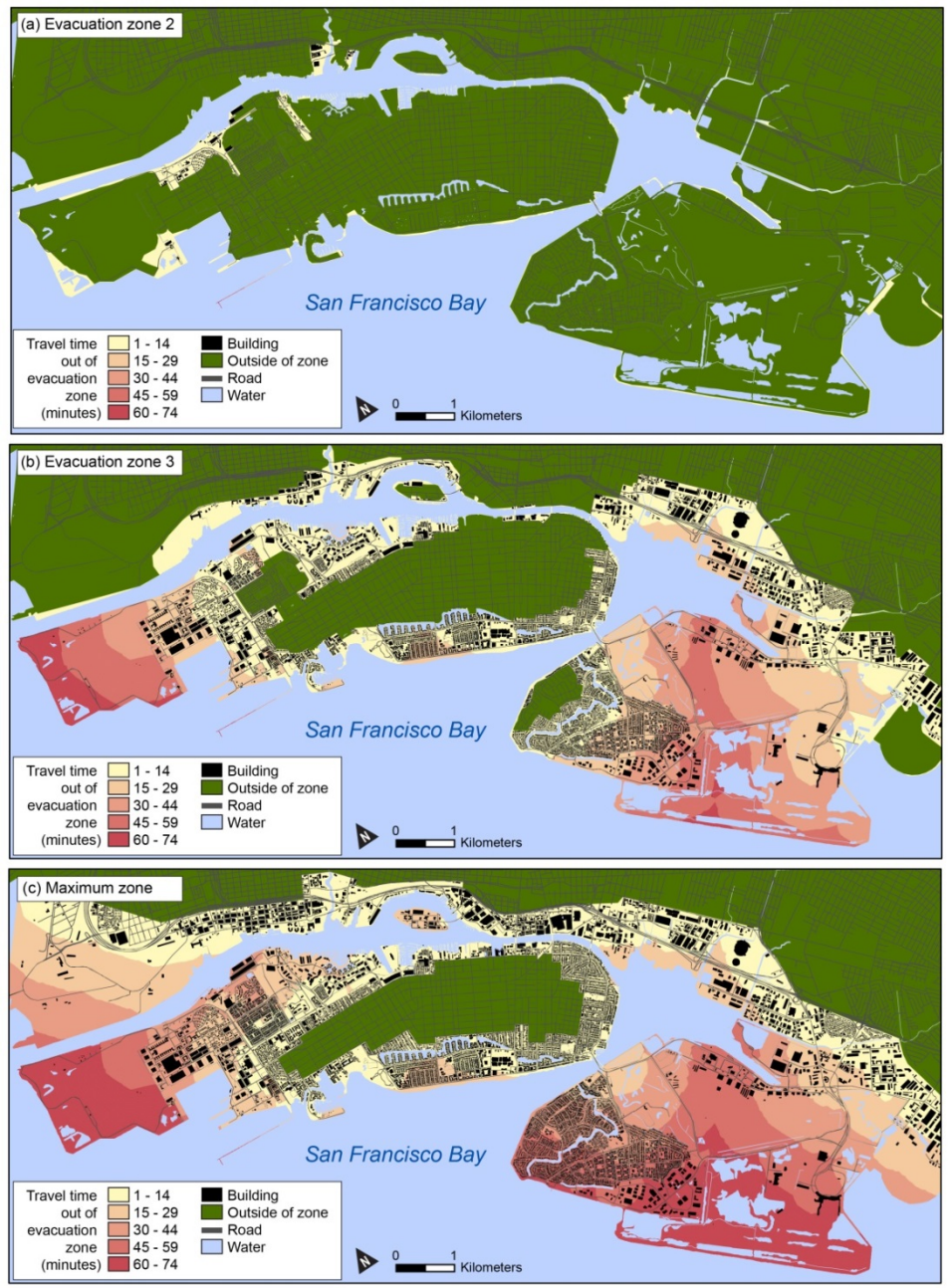






Evacuation modeling for CA Tsunami Playbooks





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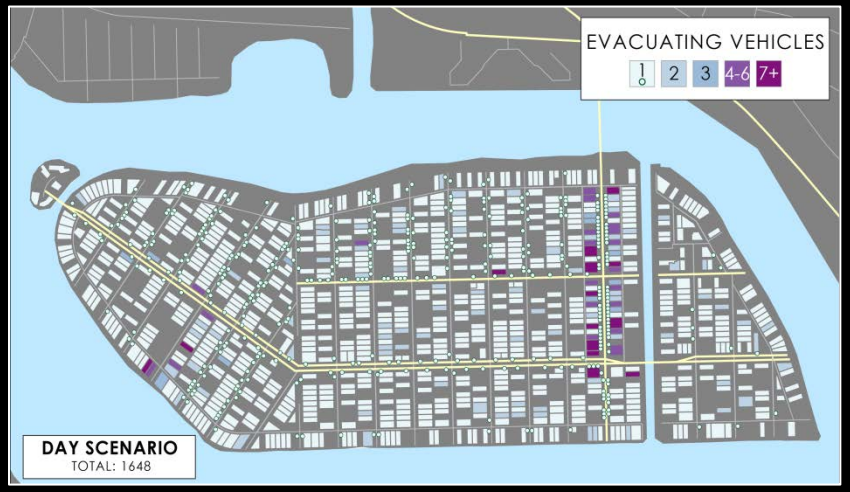
Road hotspot indices for improving vehicular evacuations

Multi-modal evacuation modeling on Balboa Island



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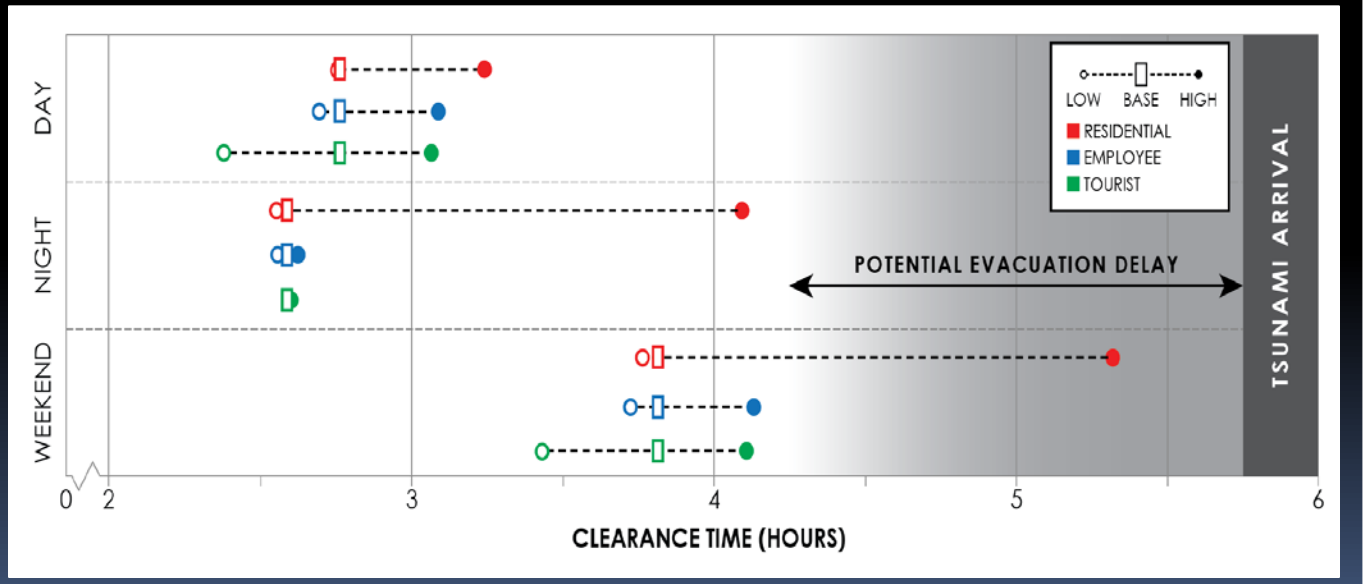

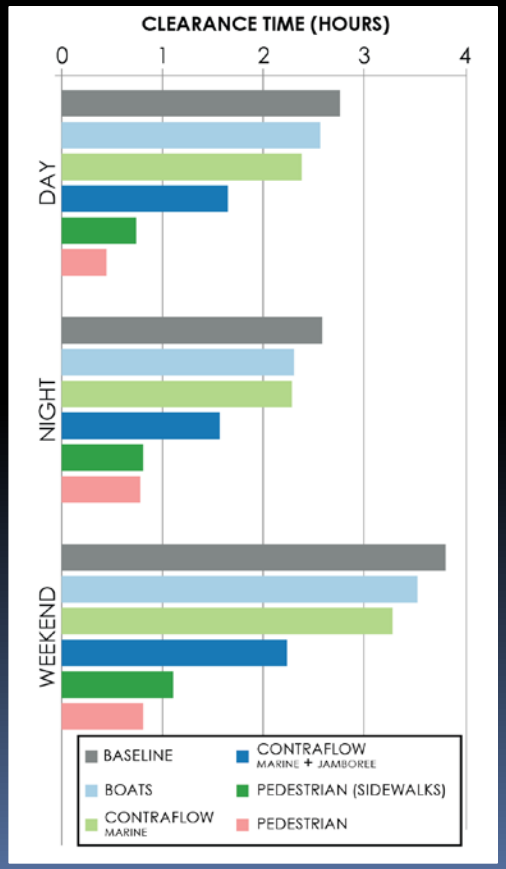

Planned work

Multi-model evacuation modeling for the northern shore of Oahu

Evacuation mitigation alternatives in American Samoa