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RESPONSE TO EFFUSIVE BASALTIC ERUPTIONS IN URBAN ENVIRONMENTS: LESSONS FROM THE 2014-2015 PAHOA LAVA FLOW CRISIS

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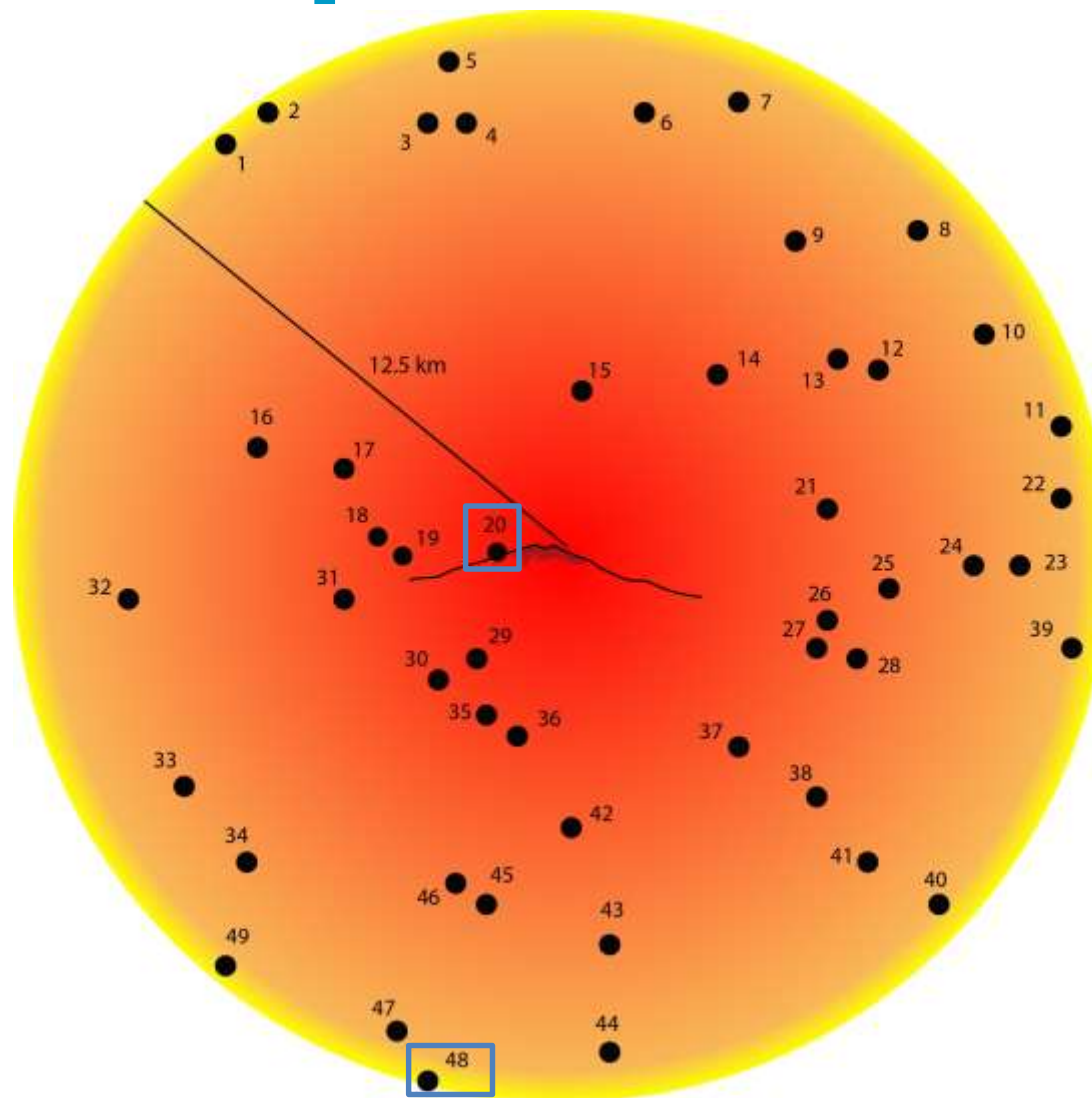
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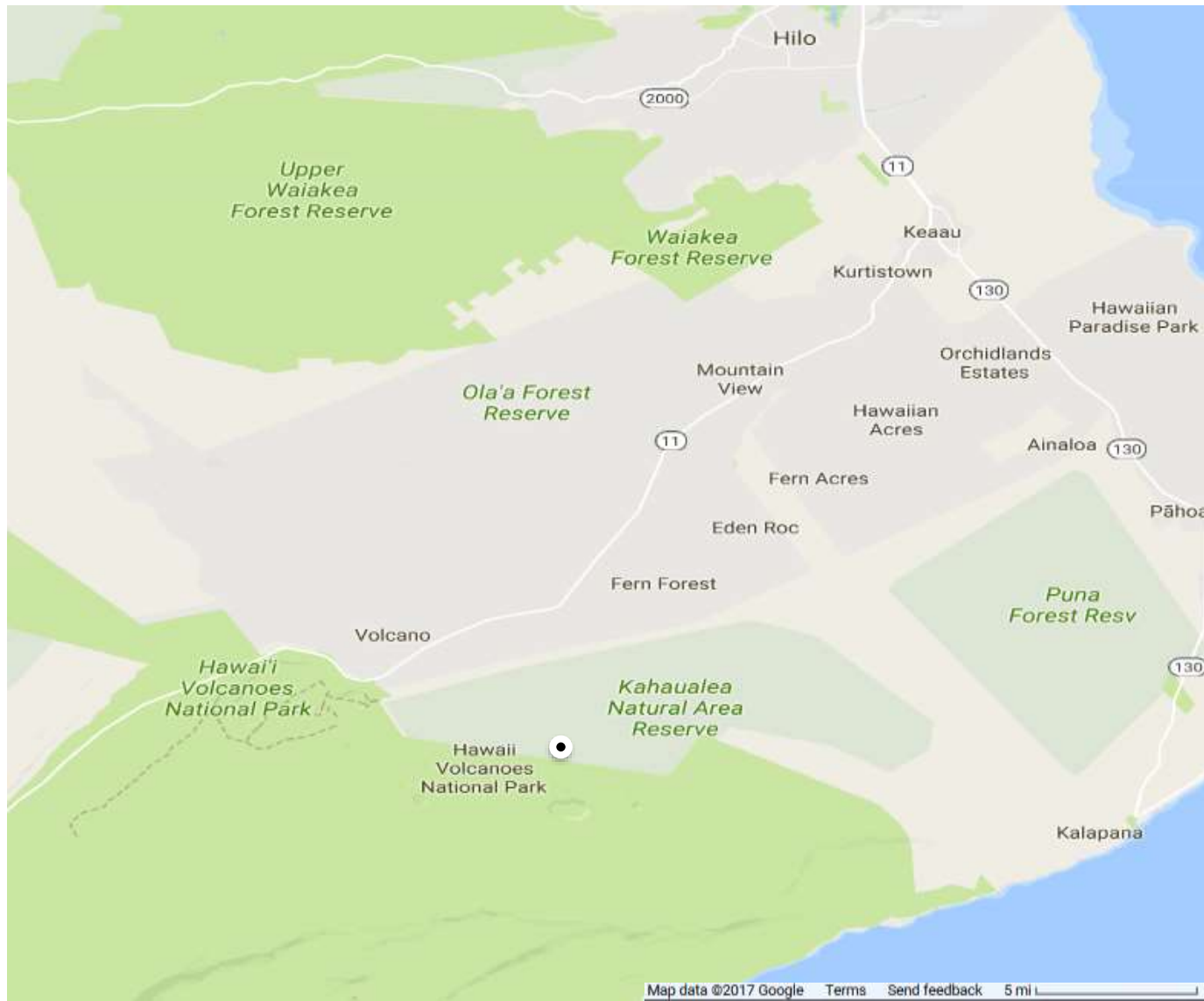
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An Exposed Population



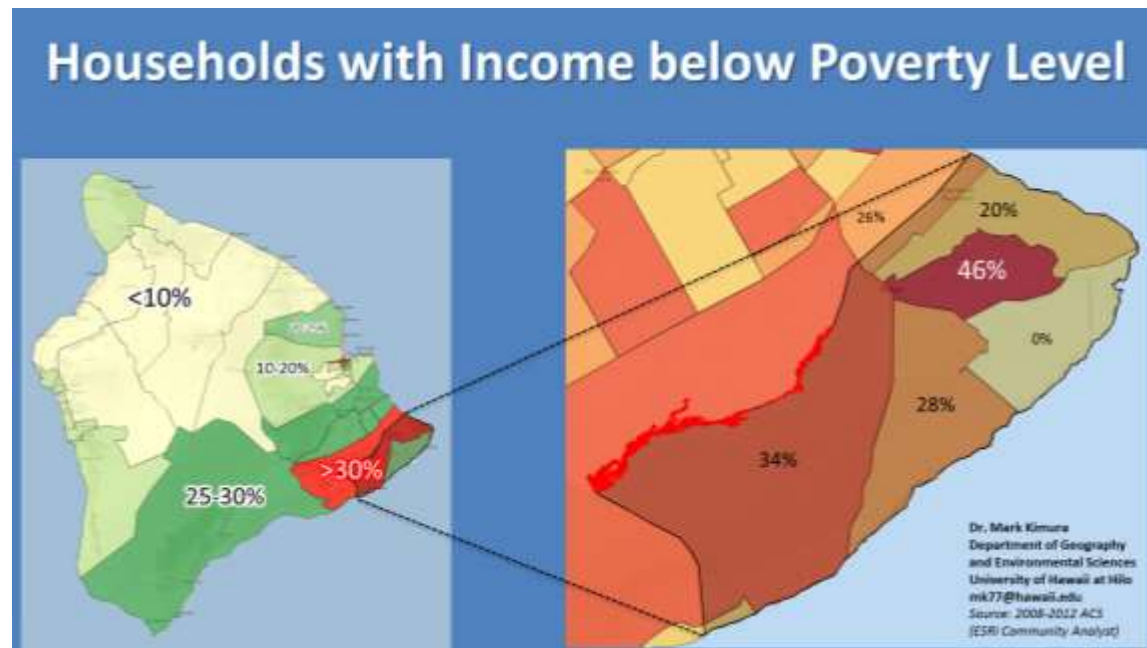
- | | |
|--------------------------------------|---|
| 1: Tateli (Mahawu) | 26: Tomohon (Lokon) |
| 2: Casiguran (Bulusan) | 27: Tulungredjo (Kelut) |
| 3: Tabaco (Mayon) | 28: Buea (Cameroon) |
| 4: Tateli (Lokon) | 29: Santa Barbara (Terceira) |
| 5: Cisarua (Gede) | 30: Saint-Claude (Soufriere Guadeloupe) |
| 6: Mosteiros (Fogo) | 31: Bedua (Manam) |
| 7: Galilo (Witori) | 32: Kotamobagu (Ambang) |
| 8: Barang Kulon (Sundoro) | 33: Wonosobo (Sundoro) |
| 9: Biscoitos (Terceira) | 34: Basse Terre (Soufriere Guadeloupe) |
| 10: San Miguel (San Miguel) | 35: Storhofoi (Eldfell) |
| 11: Langoan (Soputan) | 36: Tomohon (Mahawu) |
| 12: Putus (Tengger Caldera) | 37: Tondano (Mahawu) |
| 13: El Pueblo (La Palme) | 38: Cova Figueira (Fogo) |
| 14: Cibodas (Gede) | 39: Zafferana (Etna) |
| 15: Kota Ende (Iya) | 40: Mukingo (Visoke) |
| 16: Puerto de Naos (La Palme) | 41: Angradolteroismo (Terceira) |
| 17: Bieng (Manam) | 42: Baturaden (Slamet) |
| 18: Kayabe (Komagatake) | 43: Troises Rivières (Soufriere Guadeloupe) |
| 19: Miyake (Miyakejima) | 44: Kameda (Komagatake) |
| 20: Vestmannaey (Eldfell) | 45: Irosin (Bulusan) |
| 21: Volcano (Kilauea) | 46: Las Indias (La Palme) |
| 22: Parakan (Sundoro) | 47: Cigalontang (Galunggung) |
| 23: Belle Eau (Soufriere Guadeloupe) | 48: Goma (Nyiragongo) |
| 24: Santo Domingo (Mayon) | 49: Guinobatan (Mayon) |
| 25: Bulusan (Bulusan) | |

Learning from Others- Context



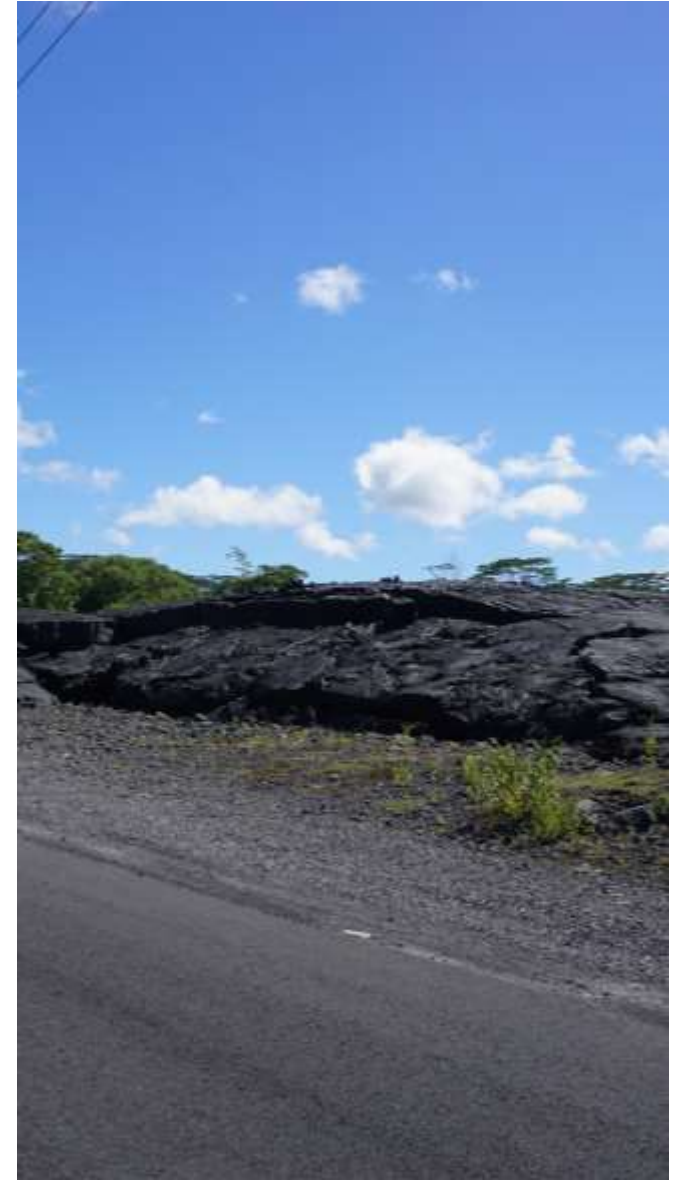
Vulnerability- Puna

- Population:
 - Pahoā: 945 (2010 Census)
 - Lower Puna: 9,417 (Stewart, 2014)
- Native Hawaiian communities & immigrants (primarily from the mainland)
 - Rapidly growing area
- Rich in history



Timeline: Pahoa, HI, USA

- **June 2014:** Kilauea lava flow from Pu'u'o'o
- **August 2014:** Tropical Storm Iselle
- June 27th flow remerged from crack system
- **October 2014:** Physical impacts to Pahoa
- **March 2015:** Volcanic alert-level downgraded



Methods

- Semi-structured meetings ranging from 20 minutes to 3 hours:
 - 29 interviews
 - 7 focus groups
- Scientists (physical & social), government departments, companies, & non-governmental organizations
- March to May 2017 (two years after VAL downgrade)
- Focus on response actions, key measures that would be used again, measures that could be improved



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Policy Suggestions

- Plans should be:
 - Multi agency
 - Including chain of command
 - Efficiency
 - Especially on public facing exercises like surveying
 - Utilize pre-existing tools
- Know what is acceptable beforehand
- Media



Physical Response Insights



Photo taken by Jan Lindsay



Photo courtesy of HELCO

Emerging Learnings for Education

- Lots of lead time
- Priority is safety
- Stayed until end of school year
 - Normalcy
 - Some stayed permanently
- Children's fears
 - Put spin on it
 - Teaching opportunity



Photo courtesy of HI DOE



Physical Recovery Lessons

- Lava as a binary hazard
 - Caveats
- Removed lava & continued to use facilities
- Would have removed less equipment
 - Businesses & government departments



Challenges

- Some place specific strategies
- Broad specificity
 - Auckland
- Communication before the onset





Thank you.

A special thank you to all my participants and to HVO for welcoming me for the past two months

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Photo by George Williams