JAMIE CAPLAN CONSULTING LLC
Emergency Management Services

Nature-Based Solutions Workshop for Hazard Mitigation

American Samoa

August 25, 2021, via Zoom

Instructions

The Pacific Islands Regional Climate Assessment (PIRCA) and NBS in American Samoa

Victoria Keener, PhD & Chris Shuler, PhD

Senior Fellow, East-West Center| Researcher, UH Manoa WRRC

Nature-Based Solutions Workshop

August 25, 2021

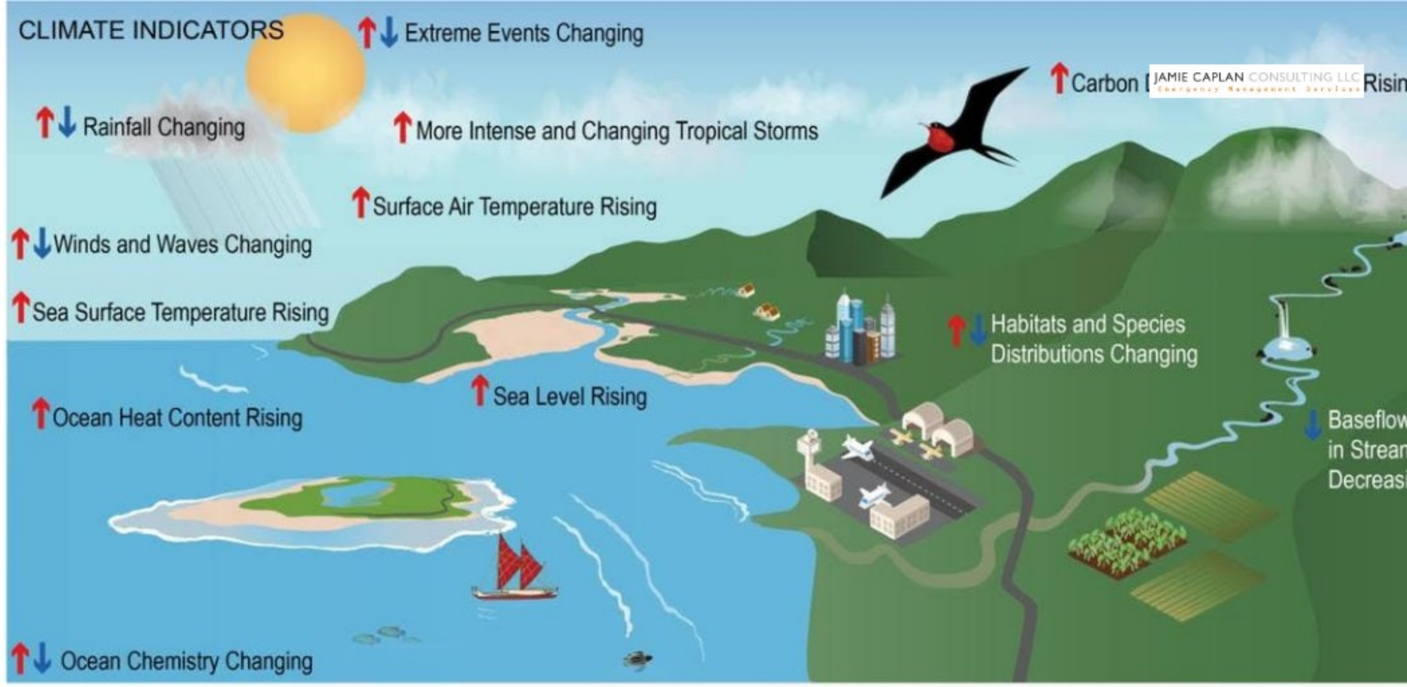
Photo: Valentine Vaeoso

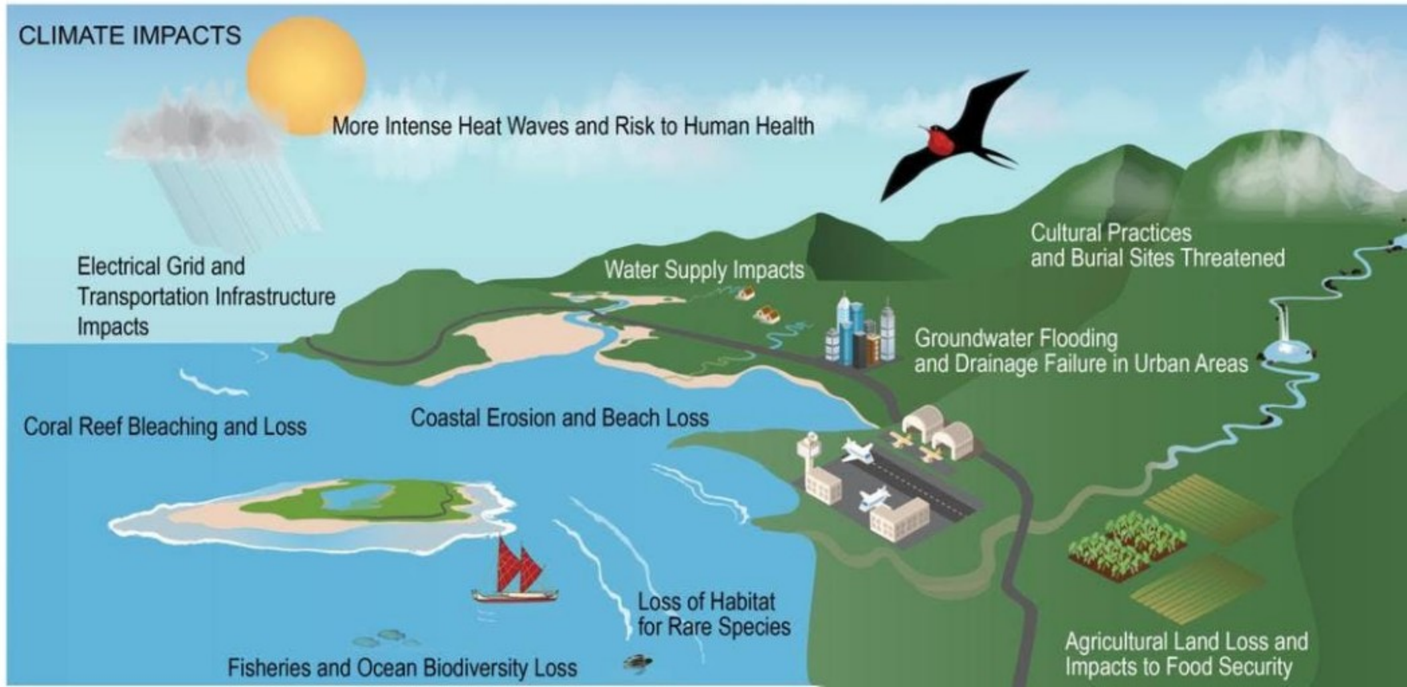
The Pacific Islands Regional Climate Assessment (PIRCA)

- A collaborative umbrella organization of academics, non-profits, local and national governments, NGOs, community organizations, and businesses
- Assesses and collects climate observations, trends, and projections from peer-reviewed, white, and grey literature
- Partners with local managers, practitioners, and experts to frame and prioritize climate impacts across key local sectors
  - 5 lead authors, 23 technical contributors

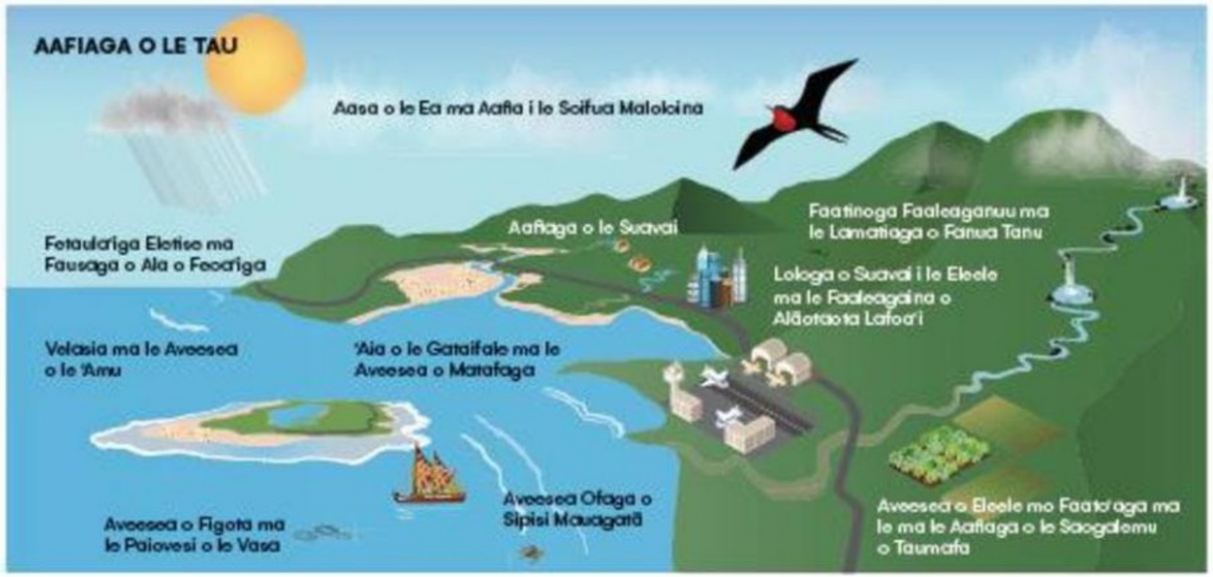
Key Issues for Policymakers

- ↑ Air Temperatures: more hot days and fewer cool nights
- ↑ Extreme rainfall and flooding
- ↑ Coral reef bleaching and loss
- ↑ Sea level rise
- ↑ Inequitable impacts on communities
- ↑ Threats to community health
- ↓ Freshwater supplies
- ↓ Ecosystem health and biodiversity
- ↑ Threats to infrastructure





Samoan Translation of Key Issues



Suiga o le Tau i Amerika Sāmoa: Faailo & Mau Iloiloina e Vaega Autu

Ripoti mo le Iloiloga o le Tau i le Itulagi o Motu o le Pasefika (PIRCA) 2021

Manatu Autu mo Taitai ma ē Faia Aiaiga

Siisii le vevela o le ea — Ua faaopoopo aso vevela, aʻo faaitiiti ifo po malulu i Amerika Sāmoa. E faaauau pea le siisii o le mafanafana i siʻomaga uma i le lumanaʻi.

E faaopoopo lologa i timuga — Ua vaaia o le a tupu soo pea timuga mamafa ma le matuiā i Amerika Samoa i le lumanaʻi, ma e faaopoopo atili ai tafega ma le lamatia i lologa.

Lē mautinoa le fua o timuga — E le mautinoa se suiga o le fua o timuga i lenei senituri atoa i Amerika Sāmoa. O le tele o vaaiga mamao i le tau o loo folasia mai, e faapea, naʻo nai suiga laiti i le fua o timuga toʻulu i le lumanaʻi e oo i le 20% le alu ifo poo le alu i luga. E ono susū tele, mago tele, poo le leai se suiga o le tau i le lumanaʻi.

Velasia ma Faaleagaina ʻamu — O loo siisii le mafanafana o ogasami, ua matua ai ona velasia soo le ʻamu ma ua ogaoga tele i le Teritori. E faitau i miliona tala i le tausaga e maua i ʻamu ma figota o le sami e faaopoopo i tamaoaiga o Amerika Sāmoa ma maua ai le puipuiga faanatura mai lolo ma afā.

Siisii le maualuga o le suāsami — Ua saosaoa le siisii o le suāsami i le kelope atoa ma le gataifale. Ua tuufaatasi le goto ifo o le eleele i le lalolagi ona o mafuiʻe tetele o le 2009, ma le siisii o le aafia o le suasami ma le ʻāia o eleele o matafaga. Ua aafia foi le suavai i le eleele i laufanua mafola e lata i le talafatai ona o le siisii o le suasami, ua lofia ai le suavai taumafa. I le taimi nei, ua oo i laau toto le lofia i le siisii o le suasami, e pei o taufusi i Aunuʻu (e maua ai talo i le pala), i nisi o eleele maulalo.

Manatu e Fai Tutusa — Ua faatalitalia le luluina o vaega o tele o le soifuaga i Amerika Sāmoa ona o le suiga o le tau, ma o le a aafia tele nisi vaega. O i latou e maʻaleʻale e pei o tamaiti, tagata matutua, i latou e iai gasegase tumau, ma komiuniti e maulalo le tupemaua, atoa ma i latou o loo nonofo i nuu e maulalo eleele tu lata i le talafatai ma nuu i tua, e sili ona lamatia i mea e tutupu i le tau. E lavelave le mataupu e uiga i le seʻe ese o tagata mai nofoaga o tuaʻa ona o aganuu i fanua ma faasinomaga tau gataifale, ma e le fia o ese komiuniti mai o latou laueleele, vaiʻ, ma le sami.

Lamatiaga o le soifua maloloina o le komiuniti — O suiga i timuga ma gasologa o le mago e ono faatetele ai le namu, e ono fatetele ai le fetaiaʻi o tagata ma faamaʻi feʻavaiʻi e namu e pei o le dengue, Zika, chikungunya, ma le mumū tutupa. O nei faamaʻi e tele ina aafia ai tagata e leai ni uaea valavala i faamalama, poo nisi puipuiga i o latou fale, ma laralata i mea e toʻa ai le vaitimu. E atili aafiaga i faamaʻi pepesi faamatagi malosi i le utiuti o punaoa o le soifua maloloina i le Teritori.

Lamatiaga o le vaiauli fou — E faatetele le moomia o le vai i le vevela o le ʻea, ae faaititia ai le suavai. I le ma lea, o le siisii o le suasami e lamatia ai le vai i gasologa o le eleele i itulagi e maulalo le eleele. E iai le aogā o le faaopoopo o le iloa ma le nofo uta i tagata o le komiuniti e uiga i le aafia o gasologa o le suavai, ma fesootaʻiga manino i le va o lālā ma vaega e pulea le suavai, e faaoso ai le malosi e tali ai suiga i le tau ma isi tulaga tugā e faateʻia ai.

Lamatiaga o le fetaulaʻiga ola faanatura – ekosisitema, ma le lasilasi o meaola – paiotaivesi — O suiga i le vevela o leʻea, timuga, ma afā ua atili salalau ai manu ninii faalafua ma faaititia ai le malosi o meaola i le vai, sami ma le eleele e tausi ai ma puipui meaola mauagatā. E mafai ona fesoasoani ni taumafaiga e unaʻi le paiotaivesi ma faalelei le talitali atu a le ekosisitema ina ia mafai e komiuniti ni fetuunaʻiga e tali ai.

Lamatiaga i le tino o le siʻomaga — O le tupu soo ma le malolosi o lologa i talafatai ma le ʻāia o matāfaga ua aafia ai meatotino ma eleele o le siʻomaga. O le a faateteleina nei tulaga i le faitau taʻisefulu o tausaga o loo lumanaʻi nei aʻo saosaoa atili le siisii o le suasami.

What are the risks of extreme weather and climate change in key sectors?

- If you are a water resources or utilities manager
- If you work in public health or disaster management
- If you are a coastal infrastructure decision-maker
- If you are in fisheries or manage ocean resources
- If you are in agroforestry or farming
- If you are in recreation or tourism
- If you manage ecosystems and biodiversity
- If you are in finance or economic development
- If you are a cultural or historical resources steward
- If you are an educator

FEMA BRIC Community Lifelines

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Safety and Security - Law Enforcement/Security, Fire Service, Search and Rescue, Government Service, Community Safety

Food, Water, Shelter - Food, Water, Shelter, Agriculture

Health and Medical - Medical Care, Public Health, Patient Movement, Medical Supply Chain, Fatality Management

Energy - Power Grid, Fuel

Communications - Infrastructure, Responder Communications, Alerts Warnings and Messages, Finance, 911 and Dispatch

Transportation - Highway/Roadway/Motor Vehicle, Mass Transit, Railway, Aviation, Maritime

Hazardous Material - Facilities, HAZMAT, Pollutants, Contaminants

- The FEMA BRIC program emphasizes projects that address community lifeline functions
- These lifelines intersect with climate impacts outlined in different PIRCA sectors
- Combine BRIC lifelines, PIRCA climate impacts, and NBS for a triple threat project

Water Resources & Utilities

IMPACT

- Prepare for increased pollution in ground and surface water
- Monitor groundwater wells that are already salty
- Identify & harden water, wastewater, electrical, and other infrastructure vulnerable to sea level rise or storm damage

NBS

- Rain gardens, green roofs, stormwater retention wetlands
- Directed recharge areas
- Stream restoration

Taking water-quality samples from high level springs (Photo by Chris Shuler)

Public Health & Disaster Management

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IMPACT

- Prepare for more frequent extreme heat events and illness
- Expect more frequent freshwater contamination and floods
- Monitor vector-borne diseases

NBS

- Increase tree cover/shade
- Stormwater retention and treatment wetlands
- Decrease impermeable areas with standing water

In 2019, Coconut Point, Nu'uuli homes were flooded by a combination of a King Tide event with wind and ocean swell. (Photo by Kelley Anderson Tagarino)

Coastal Infrastructure

Flooding in Leloaloa impacts transportation, safety, and health. (Photo by KVZK-TV)

IMPACT

- More frequent coastal flooding and increased erosion
- More intense tropical cyclones and storm surge – reefs already protect over $46.5 million in infrastructure in American Samoa

NBS

- Prioritize reef conservation
- Facilitate mangrove restoration
- Stream restoration, vegetative buffers

Fisheries & Ocean Resources

IMPACT

- Increased frequency of coral bleaching
- Reduced reef and open-ocean fish catch

NBS

- Prioritize reef and ocean conservation and management
- Locate and farm local heat-resilient coral populations
- Reduce land-based pollution

Coral reefs in Tafuna experienced bleaching in 2020. (Photo by Valentine Vaeoso)

Agroforestry & Farming

Sea level rise and inundation threaten crops in low lying areas. (Photo by Valentine Vaeoso)

IMPACT

- Increased food insecurity
- More stress on some crops in some locations (flood, heat, drought, disease, pests)
- Saltwater intrusion negatively impacting swamp taro

NBS

- Identify salt-tolerant crop varieties
- Increase local agroforestry and crop production
- Integrate traditional ecological knowledge and management

Take home messages

- Climate change is already affecting diverse sectors and communities across American Samoa, and will continue to do so
- Nature-based solutions to impacts from climate change can be combined with hazard planning
- There are available resources that identify key climate impacts, data, and future projections, and partners ready to collaborate on implementing solutions
- Increased adaptation measures now will decrease economic costs and safety risks in the future

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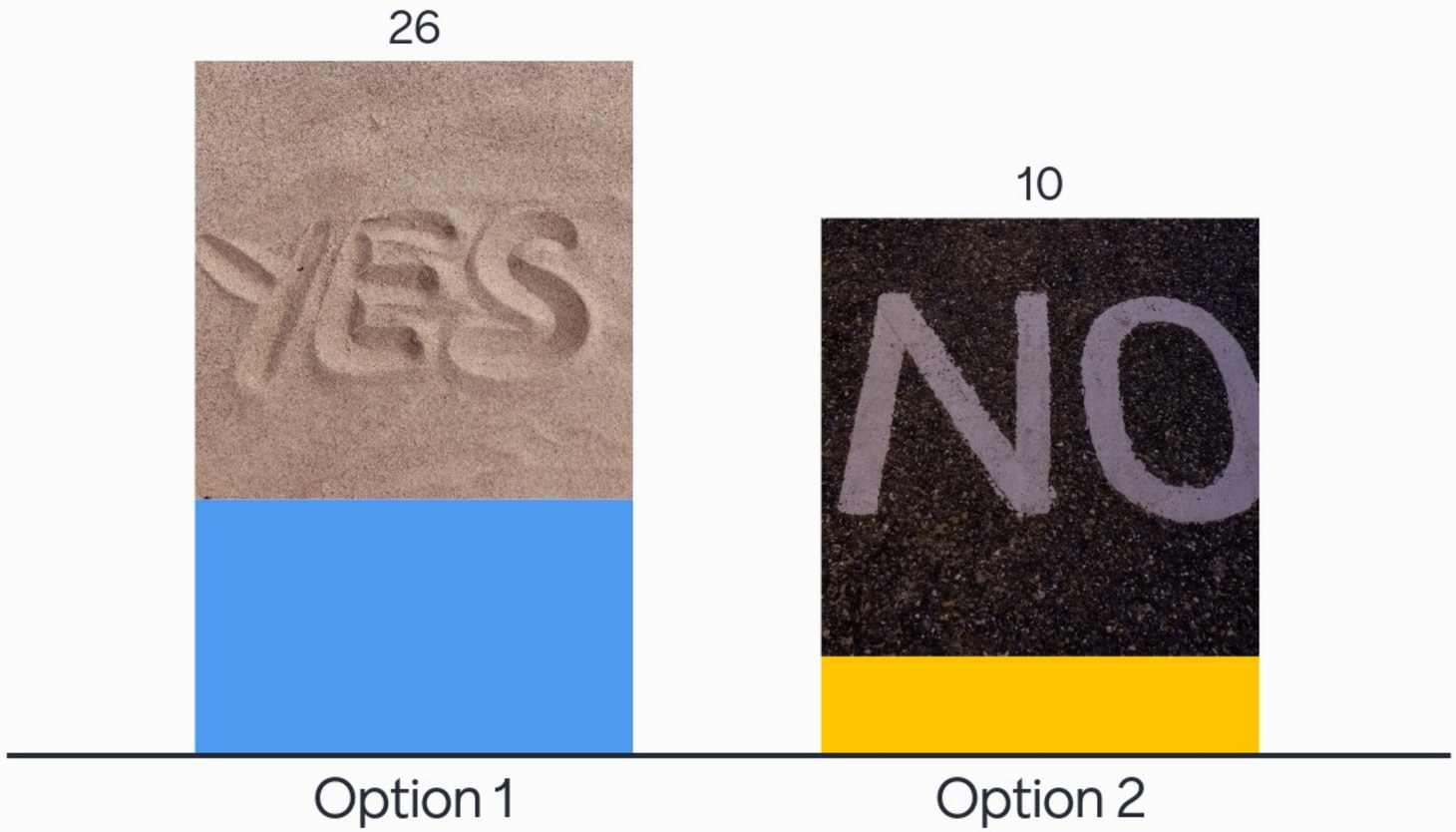
Instructions

Does your agency/organization currently integrate planning for climate impacts into their strategy?



What sectors do you see as having the most the most potential for integrating climate information into adaptation?

Freshwater and utilities

Public health & disaster management

Coastal Infrastructure

Fisheries and ocean resources

Agroforestry and farming

Recreation and tourism

Finance

Education

Cultural resources

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ENGINEERING WITH NATURE:
OPPORTUNITIES AND CHALLENGES IN AMERICAN SAMOA

Jessica Podoski, P.E.
US Army Corps of Engineers, Honolulu District
Coastal Engineer, Civil Works Technical Branch
Engineering and Construction Division

American Samoa Nature Based Solutions Workshop
August 2020

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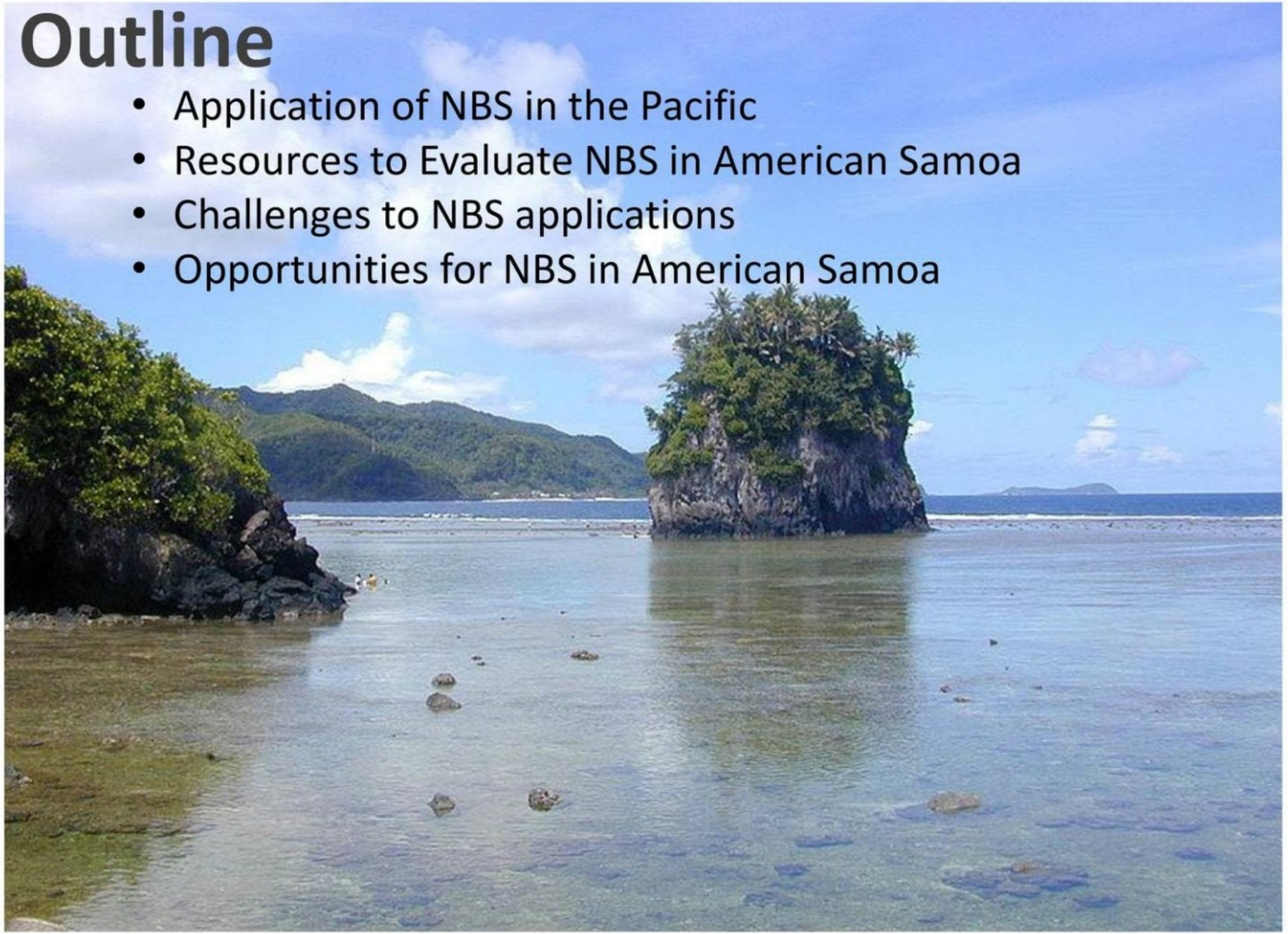
Outline

- Application of NBS in the Pacific
- Resources to Evaluate NBS in American Samoa
- Challenges to NBS applications
- Opportunities for NBS in American Samoa



Nature Based Solutions in the Pacific

- Beach Restoration
- Dunes
- Reefs and Submerged Breakwaters
- Mangroves
- Stream Stabilization

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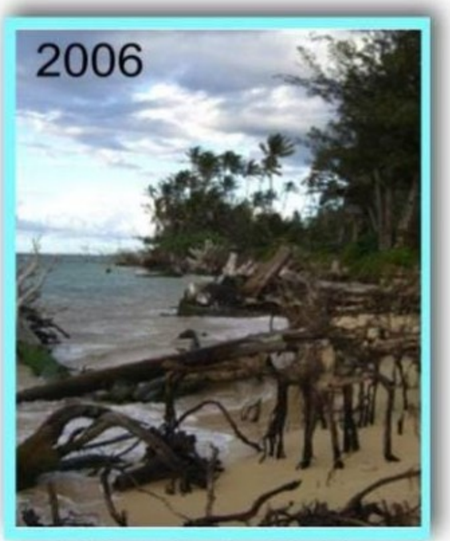
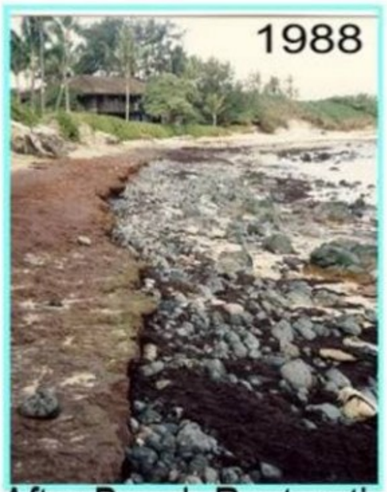
Beach Restoration in Hawaii



Stable Road - Before and After Groin Field project

Photos courtesy of Patti Cadiz



Sugar Cove Before and After Beach Restoration

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Beach Restoration in Hawaii

Iroquois Point, Oahu

Before and After T-Head groins

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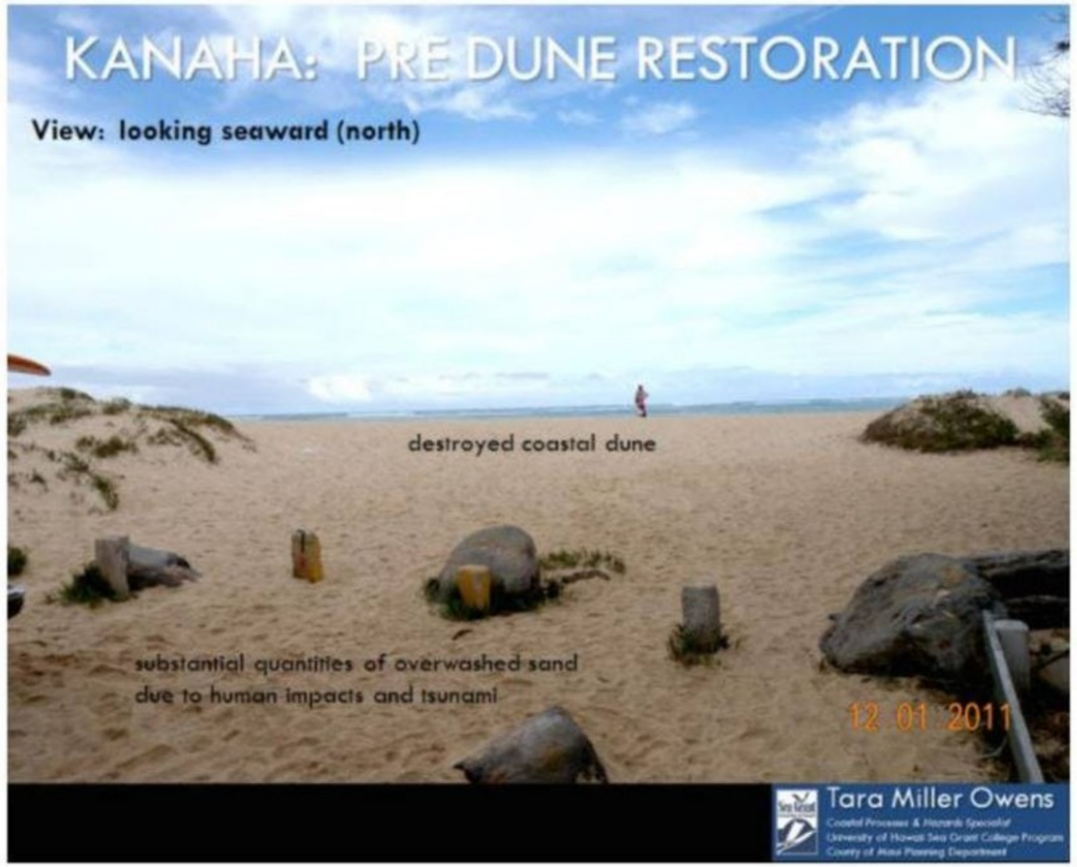
Photos courtesy of Patti Cadiz

Dune Restoration on Maui



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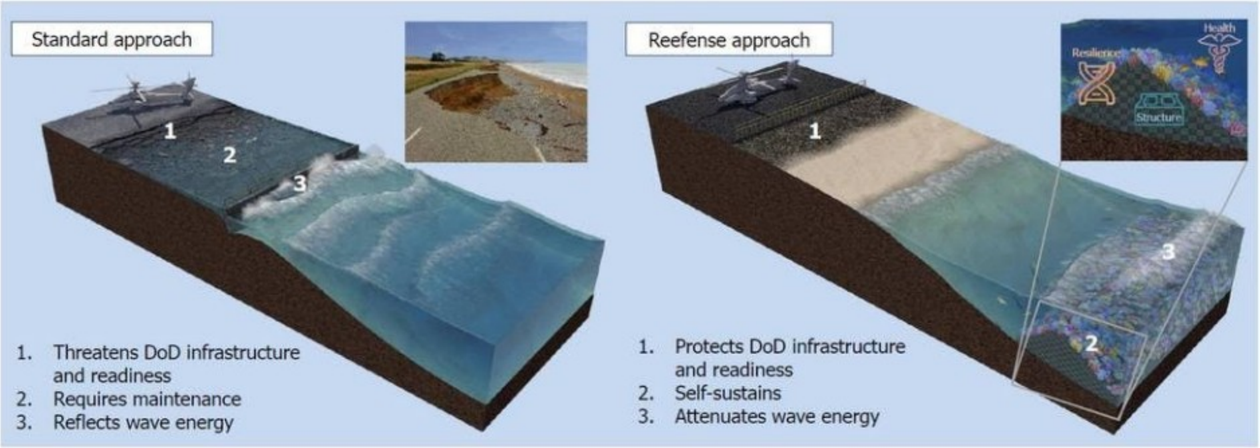
Submerged Breakwaters/Artificial Reefs

Artificial reef balls that have been in place for about 10 years with some encrusting corals, North Sulawesi, Indonesia, October 2009.

DARPA **Reefense Vision**

REEFENSE



Vision: Develop hybrid biological and engineered reef-mimicking structures to mitigate wave and storm damage that increasingly threaten DoD personnel and infrastructure

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Mangroves

Lagipoiva Cherelle Jackson, Contributor
Independent Samoan Writer

Mangroves and their value to Samoa

07/26/2017 07:04 pm ET

LAGIPOIVA CHERELLE JACKSON

The mangrove areas in the village of Moata'a. The village council is pursuing funding to further protect the mangroves.

https://www.huffpost.com/entry/mangroves-and-their-value-to-samoa_b_597903b7e4b06b305561cdbd

"Scientists note that the dense root systems of mangrove forests trap sediments flowing down rivers and off the land. This helps stabilizes the coastline and prevents erosion from waves and storms. In areas where mangroves have been cleared, coastal damage from hurricanes and typhoons is much more severe. By filtering out sediments, the forests also protect coral reefs and seagrass meadows from being smothered in sediment."

One study estimates that globally, intact mangroves prevent US$82 billion in flood damage every year

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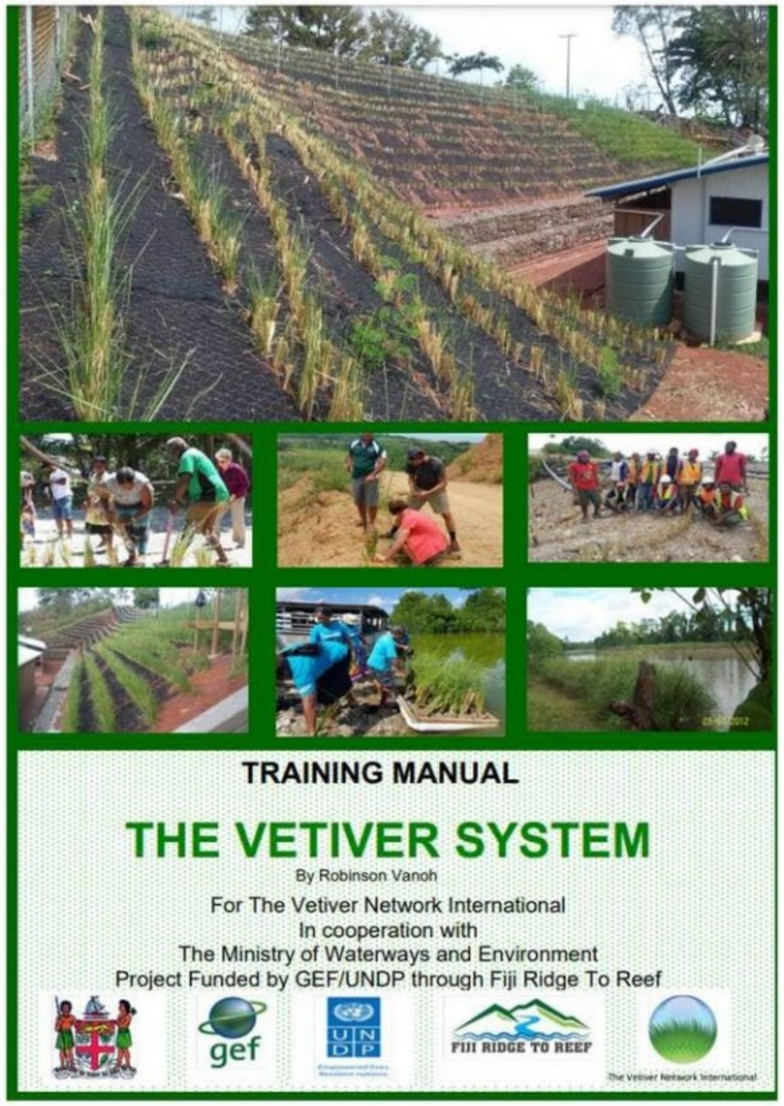
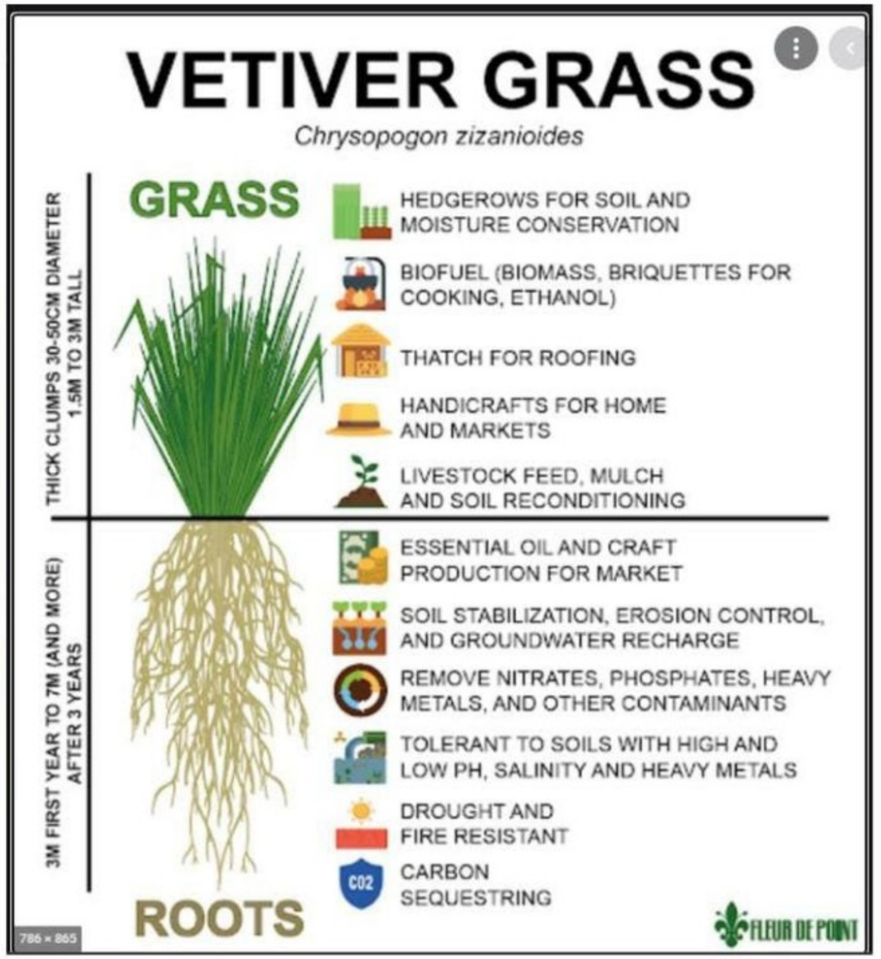
Stream Stabilization



Training Manual for Planting Vetiver



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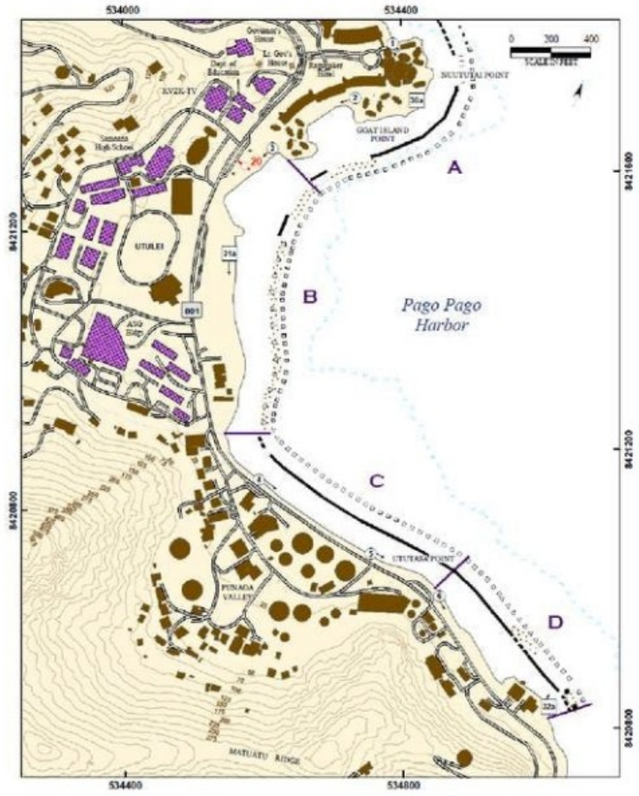
Resources for NBS Site Evaluation

USACE American Samoa Shoreline Atlas (2012)



Orthophoto taken on 09 November 2003

1

2

3

3-52

3-53

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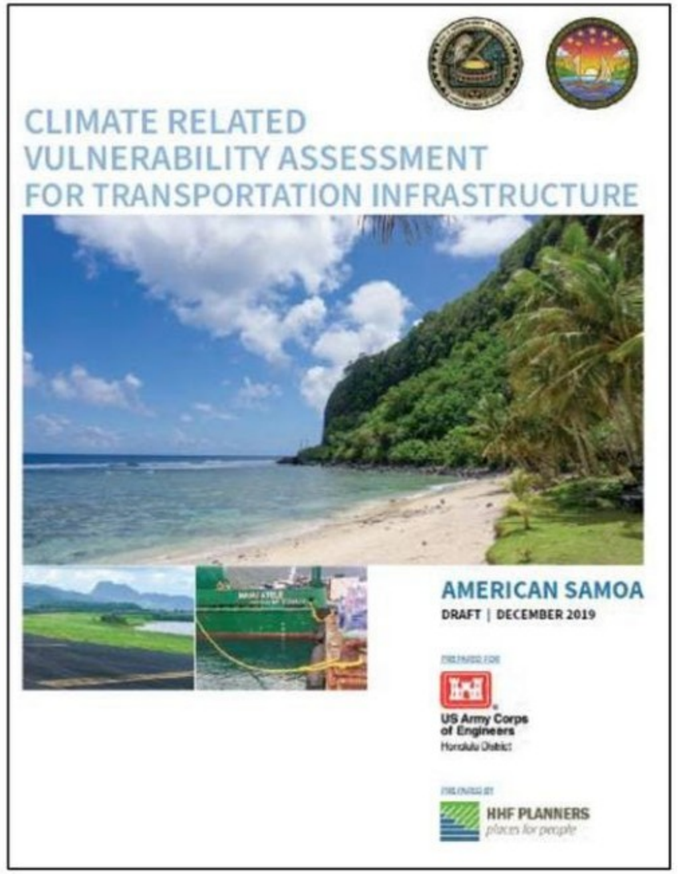
Resources for NBS Site Evaluation

USACE Climate Related Vulnerability Assessment (2020)

- First step for the territory to collect existing data, identify data gaps, engage stakeholders and decision makers
- Most vulnerable transportation infrastructure was identified and conceptual adaptation strategies and order of magnitude cost estimates provided
- GIS geodatabase provided to leverage for future studies
- List of 12 recommendations for future work



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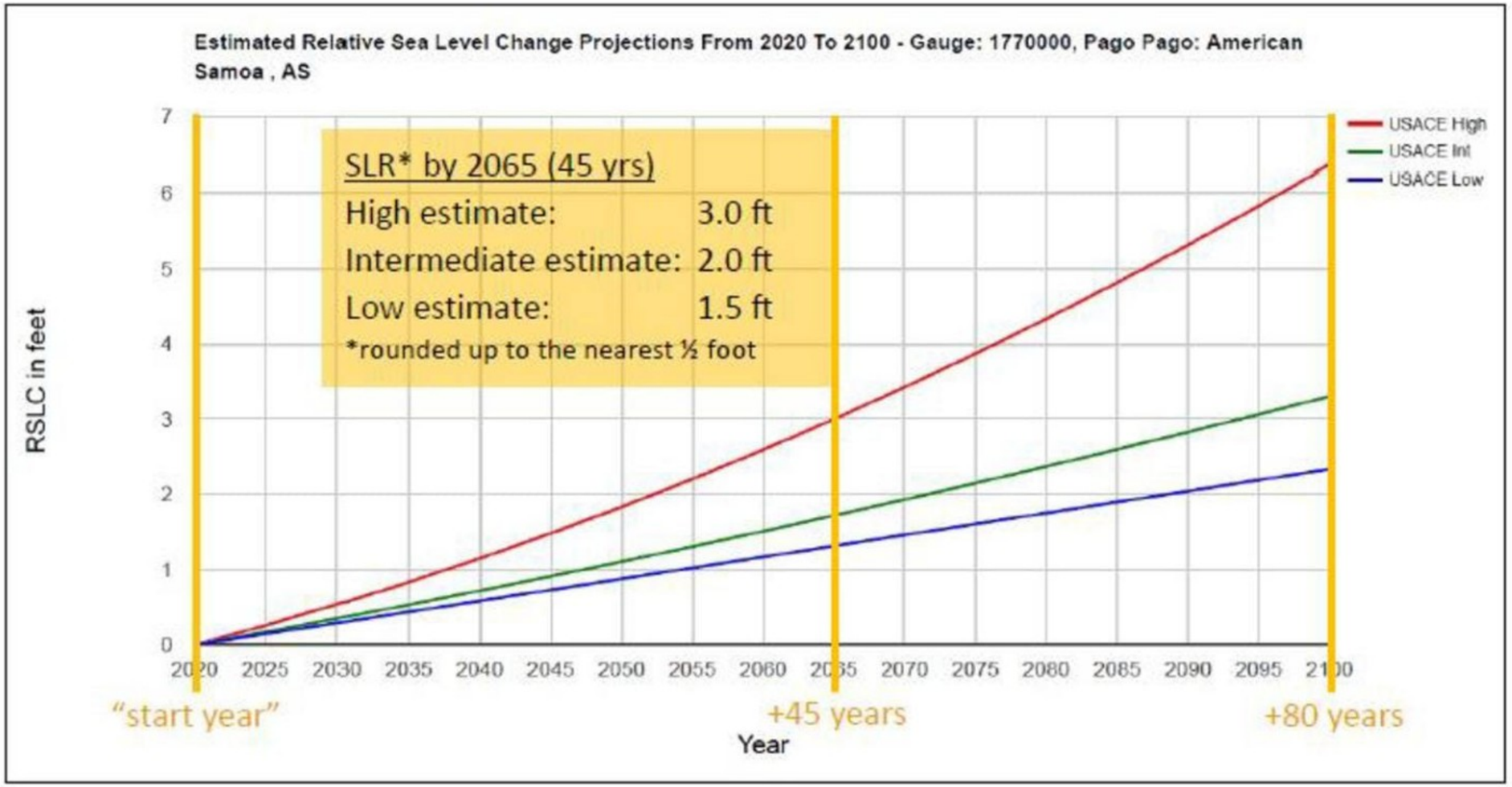
USACE Climate Related Vulnerability Assessment (2020) – Sea Level Rise Estimates



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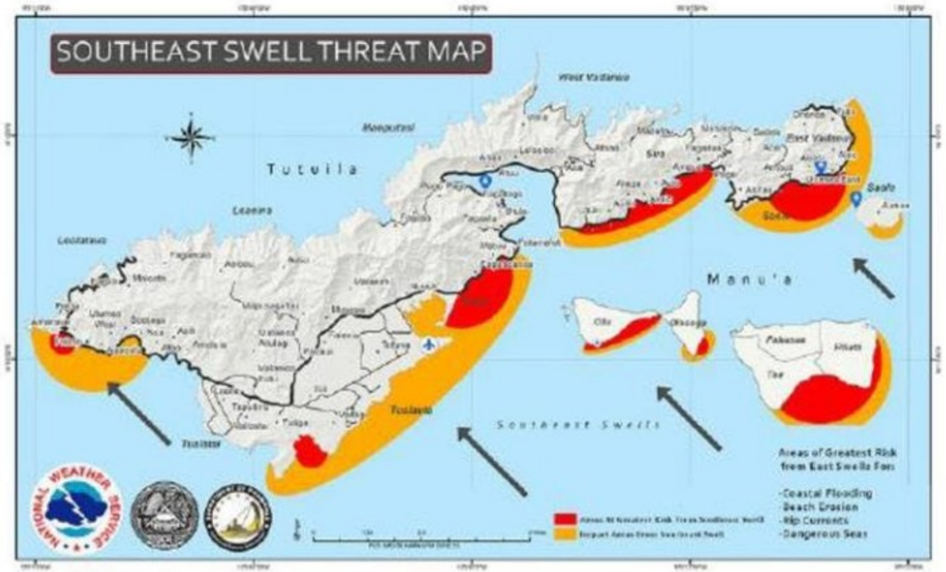
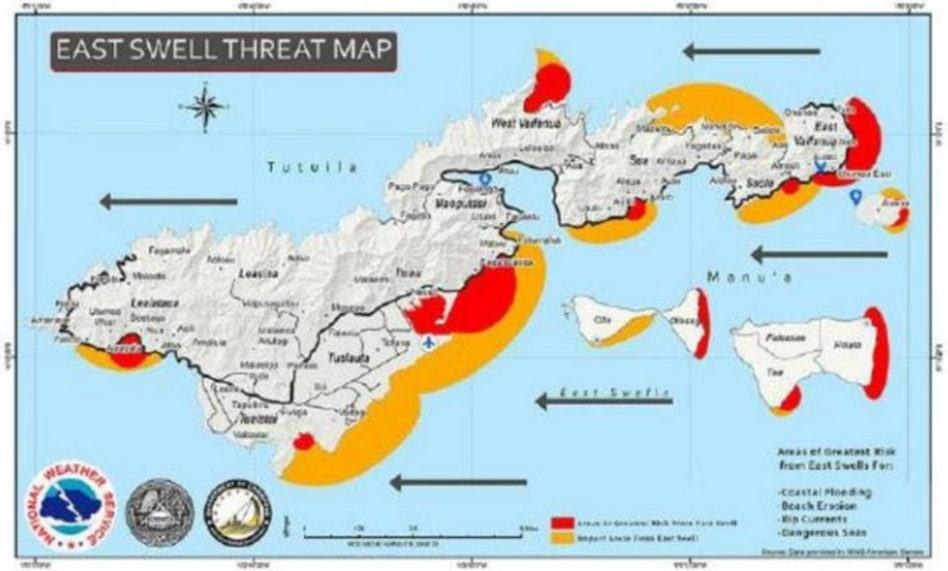
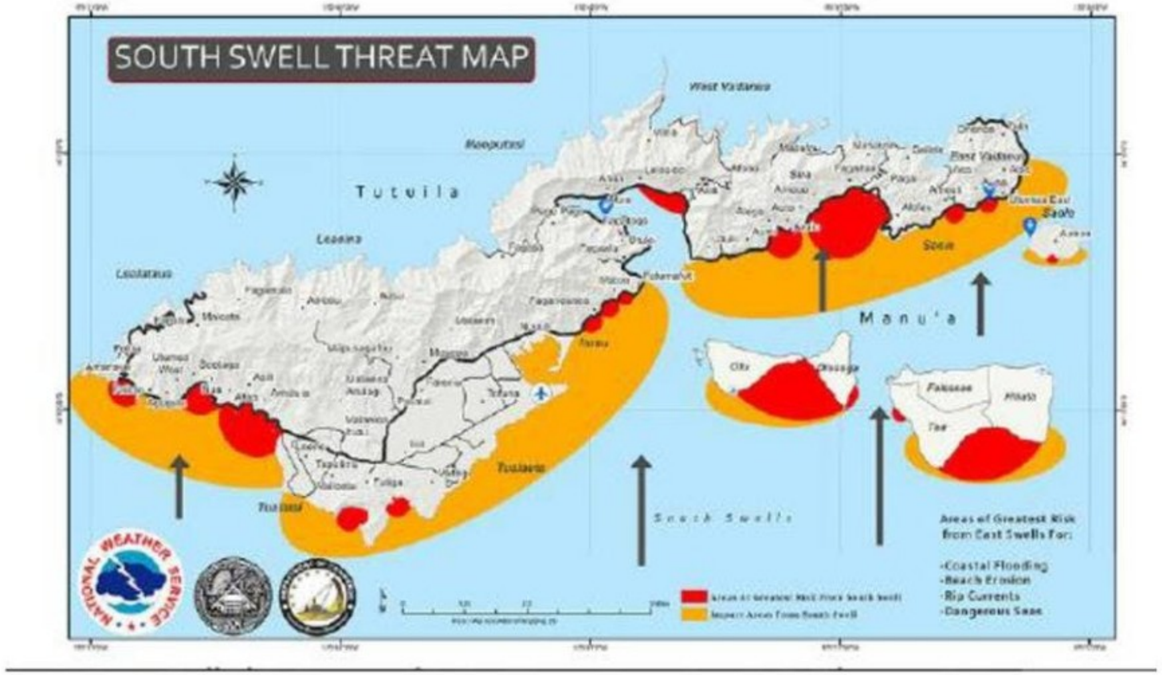
USACE Climate Related Vulnerability Assessment (2020) – Swell Threat Maps (NWS)

Legend
- Greatest Risk
- Impacted Area







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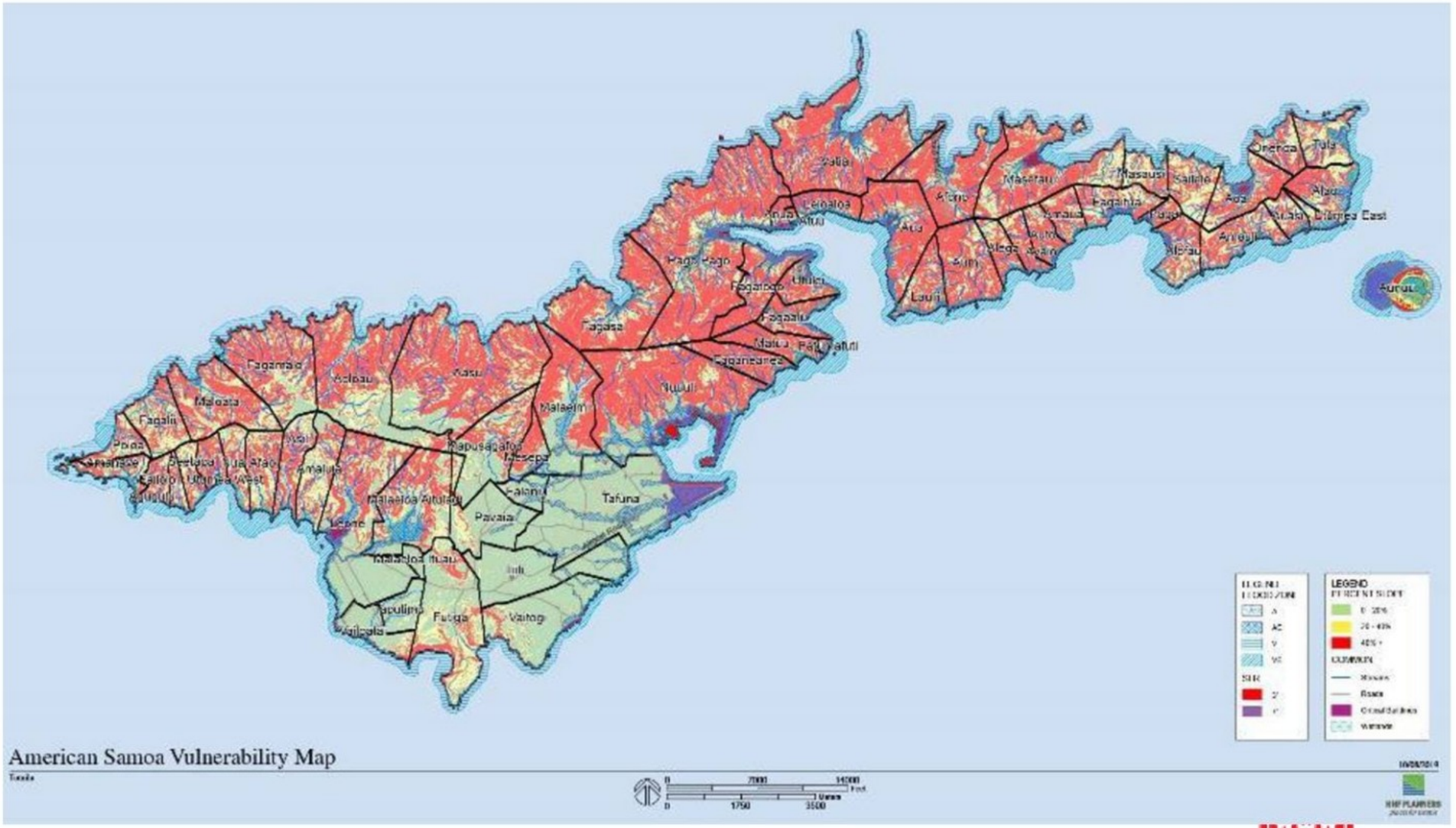
USACE Climate Related Vulnerability Assessment (2020) – GIS Data and SLR Inundation Data



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American Samoa Post-Disaster Watershed Assessment

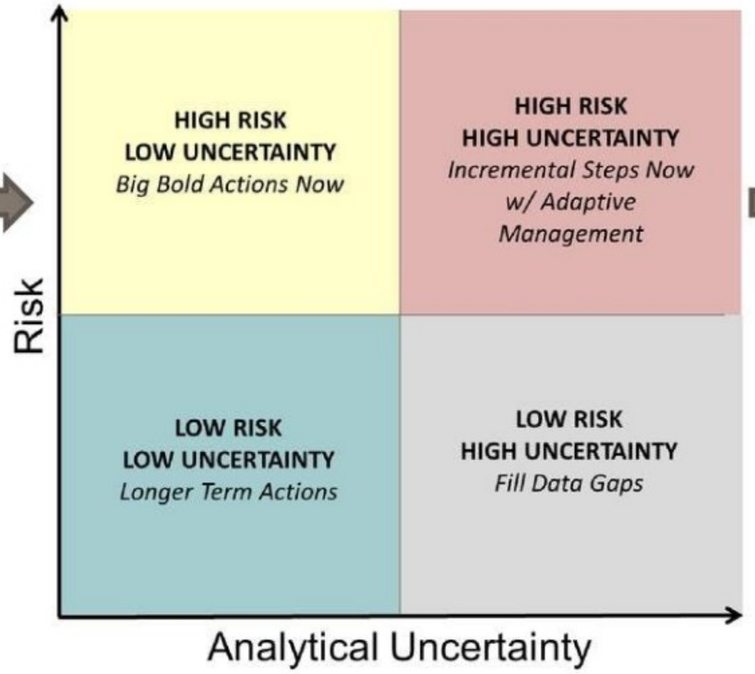
- **Authorized by:**
  - Section 729 WRDA 1986 - Watershed Studies
  - Supplemental Appropriations for Disaster Relief Act of 2019 (P.L. 116-20)
- **Initiated following Tropical Cyclone Gita (2018)**
- **USACE Charge:**
- "watershed studies should inform multiple audiences and decision makers at all levels of government, and provide a ***strategic roadmap*** to ***inform future investment decisions*** by ***multiple agencies***"
- **Draft Report available January 2022**

American Samoa Post-Disaster Watershed Assessment

Study Process:

Partner Input

Risk and Uncertainty Analysis



Recommendations

Prioritized recommendations + implementation strategy

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Challenges to NBS Applications

- High Wave Exposure Areas
- Areas with Narrow Coastal Plain
- Critical Coastal Infrastructure

The road side in Aua [photo by AF]

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Opportunities for NBS in American Samoa

- **Utulei Beach Park – Beach Restoration (Regional Sediment Management Study 2016)**

Figure 4. Failing concrete rubble from the American Samoa Shoreline Inventory masonry seawall protecting the park and fales in Reach B2. (USACE 2006, rev.2012).

ERDC/TN RSM-18-5
March 2018

Potential RSM Projects;
Utulei Beach Region, American Samoa

by Thomas D. Smith

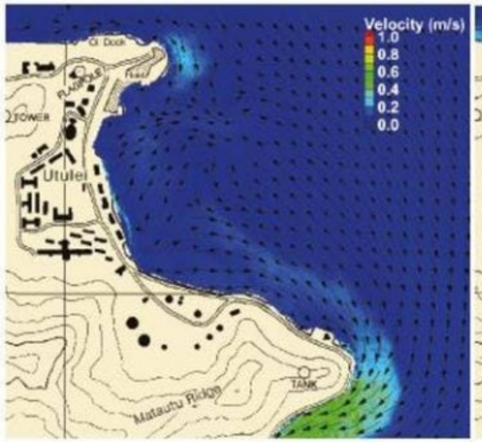

Figure 10. CMS-Flow results during 1 yr south-southeast event on 6 September 2010 at 0730. Alongshore current to the north while tidally ebb-driven flow is to the south during ebb tide.

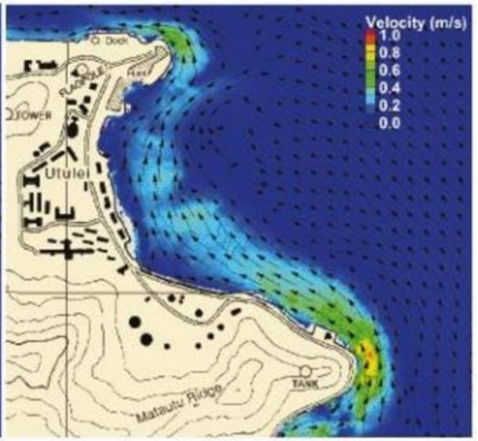

Figure 11. CMS-Flow results during trade wind wave event on 21 September 2009 at 2200. Nearshore flow is more complex during ebb tide.

January 2018

American Samoa RSM: Numerical Modeling of Waves and Currents in the Utulei Beach Region

by Lauren K. Molina and Jessica H. Podoski

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Opportunities for NBS in American Samoa

- **Pala Lagoon – Mangrove Planting and/or Reef Balls**

Figure 10-1 - Reef ball installation photos (Reef Ball Foundation, 2018)

Table 10-4 - Cost estimate breakdown for manufacture and boom deployment of 60 reef balls

Estimate with crane deployment	Qty	Unit cost (2007$)	Estimate (2007$)	Escalated (2020$)
Manufacture - Pallet Ball	60	$200	$12,000	$16,937
Mold purchase	1	$7,000	$7,000	$9,880
Mold Shipping	1	$3,000	$3,000	$4,234
Deployment: labor (unit cost per day)	10	$300	$3,000	$4,234
Loading (unit cost/hour)	80	$150		$12,000
Interisland shipping of reef balls	0	$10,000	$0	$0
Lift bags for placement (+$500 for shipping)	6	$250		$2,000
Placement (unit cost/day)	10	$1,500		$15,000
Pre-Deployment Survey (unit cost/day)	3	$500	$1,500	$2,117
Post-Deployment Monitoring (unit cost/day)	3	$500	$1,500	$2,117
			Total	**$68,521**
			Per mile	**$1.2M**

* Blue text: local cost estimate; current dollars

Table 10-5 - ROM costs for planting for shore protection (2020 dollars)

Planting Cost Components	Quantity	Unit Cost	Total
Plants (includes labor for planting)	1500	$5	$7,500
Cover mulch	31.5 cubic yards	$115	$3,620
Soil Amendment (optional)	31.5 cubic yards	$180	$5,667
Erosion Control Sheet material (optional)	5,000 square feet	Estimate by area	$600
Erosion Control Sheet installation (optional)	5,000 square feet	Estimate by area	$3,150
		Total	**$20,537**

American Samoa Community College's Land Grant Program works with local communities on out-planting from their nurseries to support environmental restoration efforts and may be able to assist with the provision of plants and labor.

CONTACT INFORMATION

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Nuisance flooding at Coconut Point in American Samoa; a glimpse of future everyday water levels

US Army Corps of Engineers

U.S.ARMY

Instructions

Based on what you learned in this presentation, what kind of nature-based solution do you think is most applicable in American Samoa?

Beach/Dune Restoration

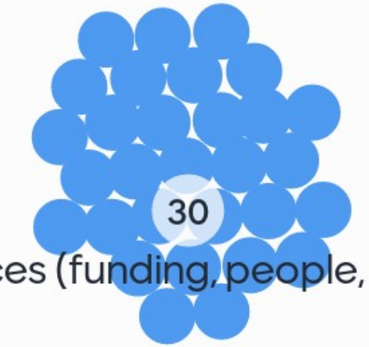
Submerged Breakwaters/Reef Balls

Mangroves

Stream Stabilization

What do you see as the biggest challenge or impediment to using nature-based solutions in American Samoa?

Wave Climate



Resources (funding, people, interest)

Sea Level Rise

Environmental Hurdles (permitting)

JAMIE CAPLAN CONSULTING LLC
Emergency Management Services

Nature-Based Solutions Workshop for Hazard Mitigation

American Samoa

August 25, 2021, via Zoom