CAR.Committee

From: Tamara Sherrill <tamara@mnbg.org>
Sent: Monday, February 24, 2020 12:31 PM
To: CAR.Committee
Subject: CAR-1(4) Presentation for the 2/25 CAR Committee Meeting
Attachments: CAR_2.25.20_presentation_MNBG.pdf

Aloha mai kākou,
Maui Nui Botanical Gardens' PowerPoint file for CAR Committee Meeting presentation tomorrow is on at Dropbox at:
https://www.dropbox.com/sh/mjjctce6uj81111/AACsEiTFGePpDyL0B7rGSQt8a?dl=0
It was too big to attach by email. PDF of same presentation also attached.
Mahalo,
Tamara Sherrill, Executive Director
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How our work addresses climate change and resiliency in Maui

A presentation for the County of Maui Climate Action, Sustainability, and Resilience Committee 2/25/2020

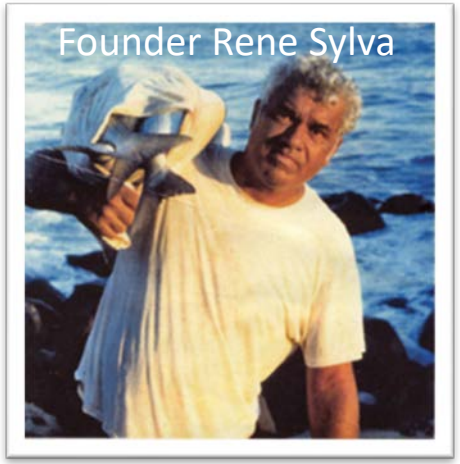
- What we do
  - Currently funded projects
    - Future plans

MAUI NUI BOTANICAL GARDENS

A green space in central Maui

- Remnant coastal dune
- Native plant landscape since 1976

- 150 Kanaloa Ave., Kahului (former zoo)
- Long-term lease with Department of Parks and Recreation
- Open 6 days a week to public
- Audio tours, interpretive signs



MAUI NUI BOTANICAL GARDENS

- Saturday cultural workshops
- Docent tours
- Annual events

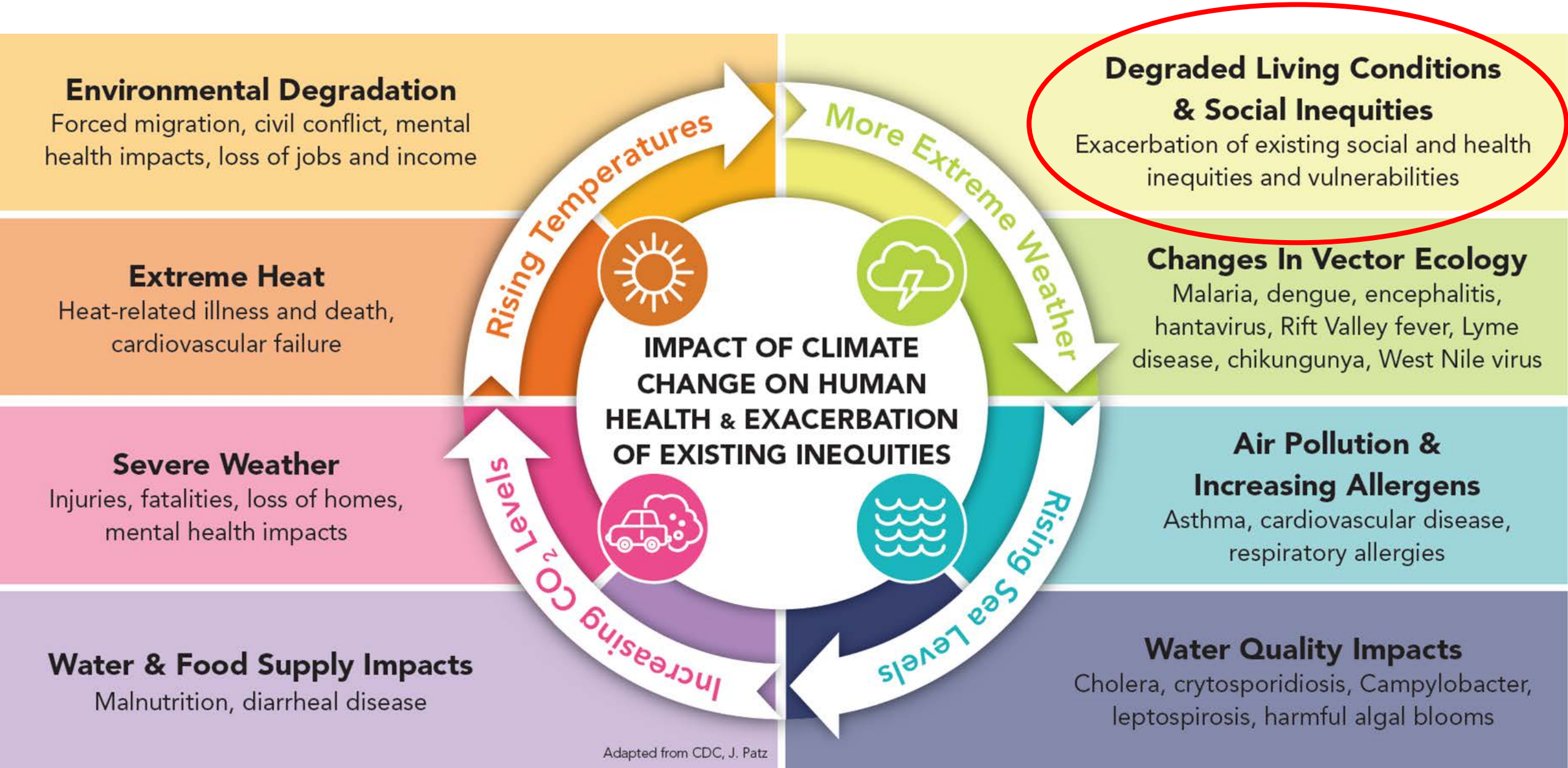
Community education center for native plants

MAUI NUI BOTANICAL GARDENS

Pride of place

- Maui as unique destination and landscape
- Hawaiian cultural uses

Climate Change is more than just sea-level rise



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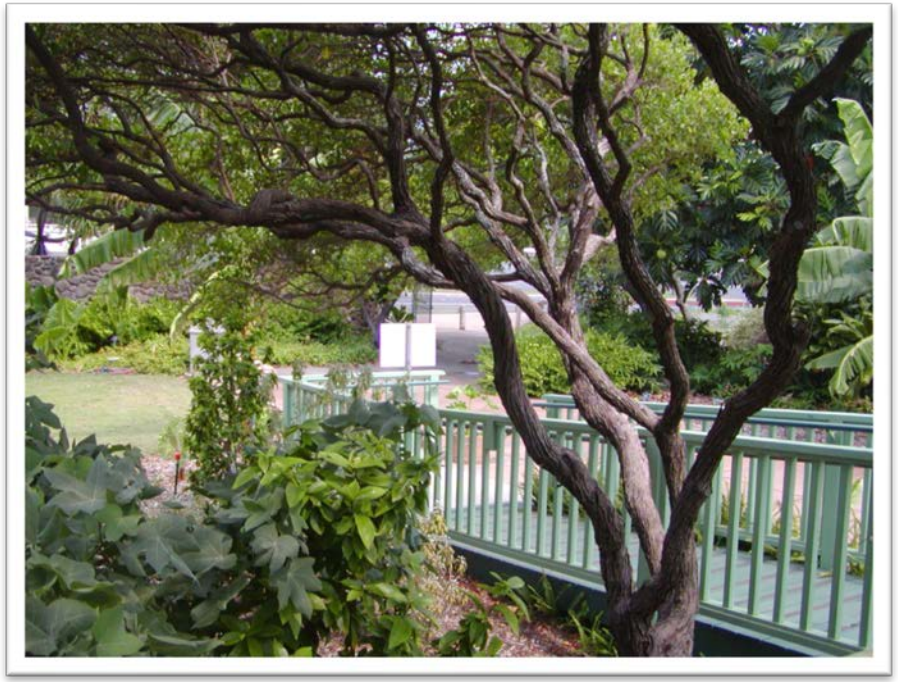
Native plant landscaping



Saves water and prevents erosion

(when done right!)

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Grows public support:

Native ecosystems provide better ecosystem services

LAND DEGRADATION & DEVELOPMENT
Land Degrad. Develop. (2013)
Published online in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/ldr.2200

EROSION POTENTIAL UNDER *MICONIA CALVESCENS* STANDS ON THE ISLAND OF HAWAI'I

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ABSTRACT

This study provides evidence that *Miconia calvescens* has the potential to accelerate surface erosion in stands where it invades by (i) reducing under-canopy light levels, thereby reducing the establishment of ground cover vegetation, and (ii) producing highly erosive throughfall drops on large leaves in a single-layer canopy. The throughfall energy in a stand of invasive miconia on the Island of Hawai'i (USA), assessed by measuring the drop size and drop velocity distributions with a laser disdrometer, was significantly higher than that in a stand of native **'ōhi'a** (*Metrosideros polymorpha*) and ambient rainfall. Median throughfall drop size for miconia (3·83 mm) was twice that of ambient rainfall (1·62 mm). Highly erosive throughfall resulted from large drops forming on large miconia leaves and relatively high fall velocities associated with the single-story miconia canopy. In contrast, multi-storied natural **'ōhi'a** had a larger median drop size; however, a lower fall height reduced throughfall effective kinetic energy. Furthermore, the effective kinetic energy for miconia was high because large drops (> 3·8 mm) with high kinetic energy accounted for 60 per cent of the total energy (versus 30–40 per cent for other vegetation types). Consequently, unit kinetic energy of throughfall was 28 J m^{-2} mm^{-1} under miconia, compared with <24 J m^{-2} mm^{-1} for rainfall and <20 J m^{-2} mm^{-1} under **'ōhi'a**. These data, combined with the observation of limited protective ground cover under miconia, show the potential for accelerated erosion occurring on forest floors in stands of invasive miconia. Copyright © 2012 John Wiley & Sons, Ltd.

KEY WORDS: alien plant invasion; splash detachment; accelerated erosion; throughfall

INTRODUCTION

Introduced plants and animals have severely damaged native species and terrestrial ecosystems on tropical oceanic islands, including Hawai'i (Denslow, 2003; Meyer, 2004;

in part by the efforts of local invasive species committees attempting to eradicate miconia. Nevertheless, miconia remains highly invasive in native forests with annual precipitation exceeding 1800 mm.

In addition to the ecological consequences of miconia

Seminar Sponsored by:
Water Resources Research Center and 'Ike Wai
University of Hawai'i at Mānoa

Tuesday, November 5, 2019 | Noon | ITC 105B

Information Technology Center, 2520 Correa RD

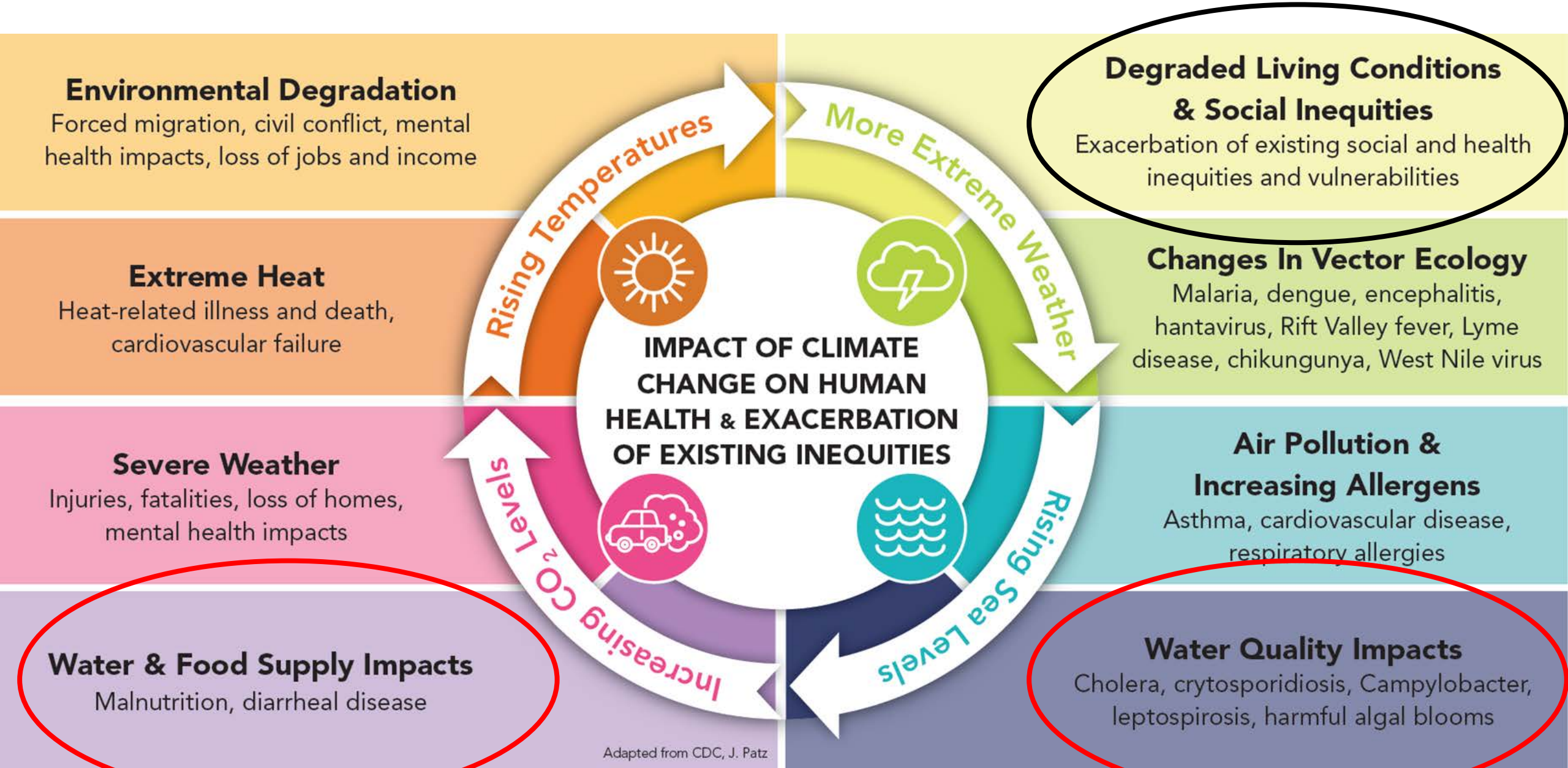
Water Impacts of Invasive Plants in Hawai'i

Dr. Tom Giambelluca

Replacement of native plants by non-native invasive species can affect water processes and impact water resources in several ways. Perhaps the most important effect of invasion is the possible increase in transpiration by fast-growing invasive plants, leading to a greater proportion of water input being lost to the atmosphere as evapotranspiration. Invasive plants in Hawai'i are widely believed to use more water (i.e., to have higher transpiration rates) than the native plants they replace. If true, this would mean that the widespread invasion of Hawai'i's ecosystems by non-native plants is having a big negative impact on our water resources by reducing streamflow and groundwater recharge. However, the research to demonstrate the effect of invasion on evapotranspiration is still relatively limited. In this presentation, I will discuss the reasons why invasive plants might be big water users and show the results of our field observations of transpiration and total evaporative water loss in native- and non-native-dominated ecosystems.

Dr. Tom Giambelluca was recently appointed the Director of the Water Resources Research Center, and has been a professor of Geography (renamed Geography and Environment) for 33 years. He has published more than 130 peer-reviewed papers on topics related to the climate, hydrology, and ecohydrology of tropical environments. He maintains an extensive network of field stations in Hawai'i, and developed and maintains widely used online climate data and mapping platforms including the Rainfall Atlas of Hawai'i. Dr. Giambelluca's research is focused on land-atmosphere interaction under changing land cover and changing global climate. In Hawai'i, his work aims to improve understanding of Hawai'i's climate, how it has changed in the past and is likely to change in the future, and how the changes have and will affect hydrological processes and terrestrial ecosystems. He also studies the hydrology of tropical montane cloud forests and the effects of biological invasions particularly by alien tree species in Hawai'i's forests, on water, soils, and carbon storage.

Climate Change is more than just sea-level rise



MAUI NUI BOTANICAL GARDENS

Promote actions that cool our cities and withstand drought

- Arbor Day Tree Give-Away – since 2003
  - 15,000 trees planted
  - Healthy, diverse urban forest
  - Kaulunani Urban and Community Forestry, MECO
- Features conservation organizations
  - Working to protect native forest

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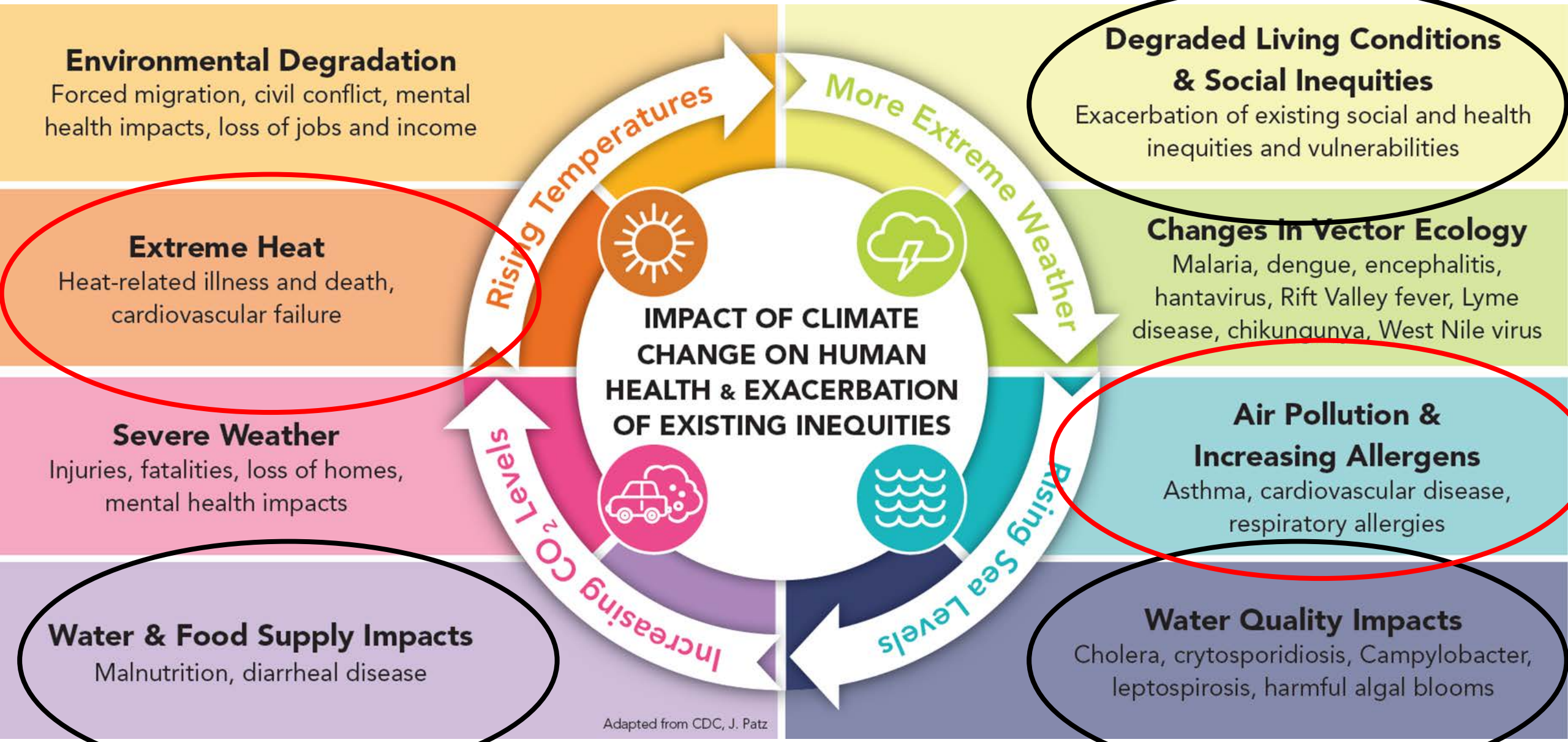

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Heritage cultivars for farmers and home growers

- Lā ʻUlu Breadfruit festival promotes changes in local food culture
- More diverse local food sources
- Unique varieties at risk of extinction -“banking” living cultivars

Crop	Est. original cultivar richness in Hawaii	Est. remaining Hawaiian cultivars
Taro	300-800	58-60
Sweet potato	150-250	unknwn
Banana	40	19
Kava	35	13
Sugarcane	50-60	35

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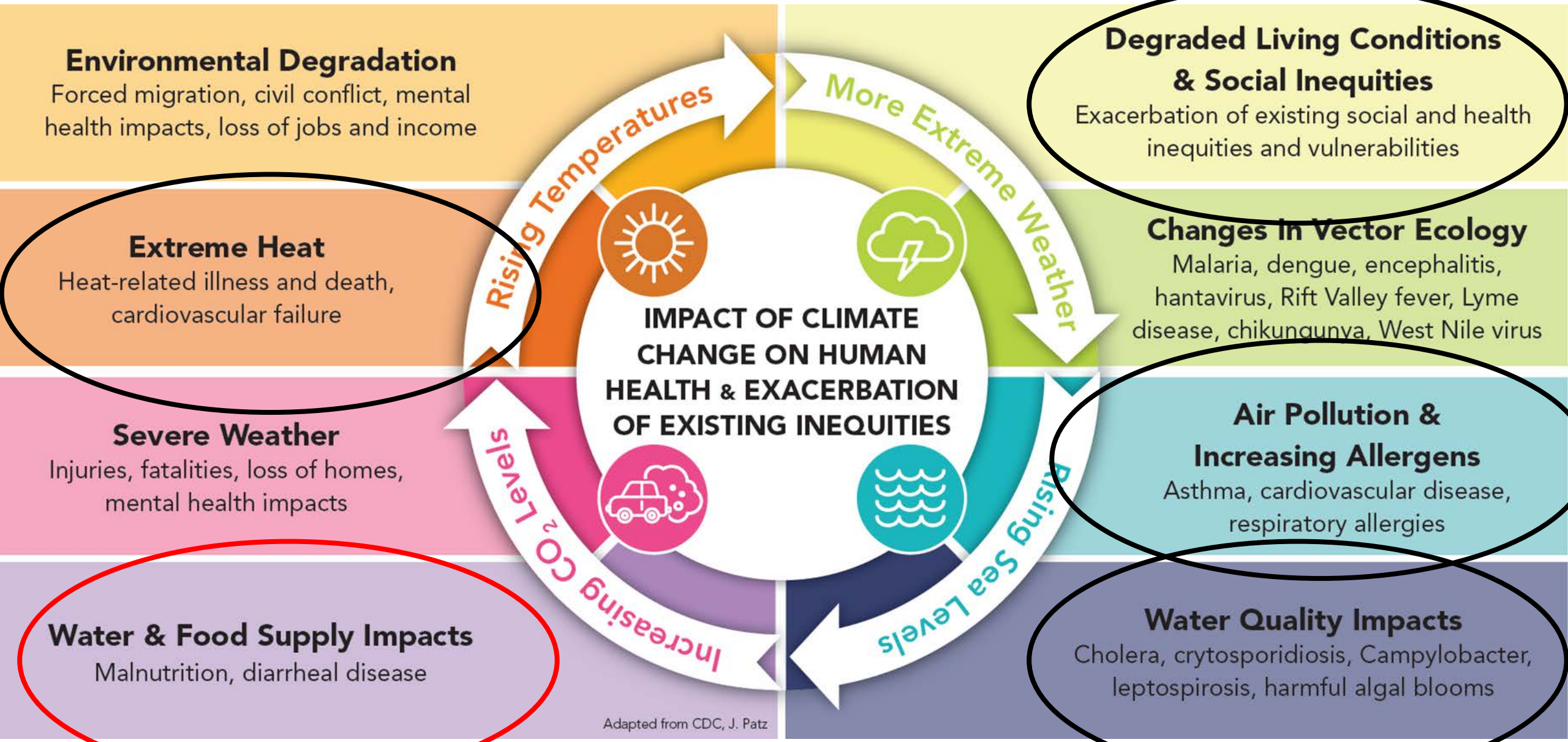

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Prevent plant extinction

- Wild seed storage since 2015

  Effective and economical way to conserve native plant diversity

- MNBG focus - coastal native plants and ʻōhia

  Buys managers time to address threats

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Maui land managers storing native seeds at MNBG

- Kahoʻolawe Island Reserve Commission (KIRC)
- Plant Extinction Prevention Program (PEPP
- Native Ecosystems Protection and Management, Department of Forestry and Wildlife (DLNR)
- Maui Forest Bird Recovery Project
- Maui Nui Seabird Recovery Project
- Pūlama Lānaʻi
- Leeward Halealakalā Watershed Partnership
- Hawaiʻi Association of Watershed Partnerships
- Skyline Eco-Adventures Conservation
- Haleakalā National Park
- Mauna Kahalawai Watershed Partnership

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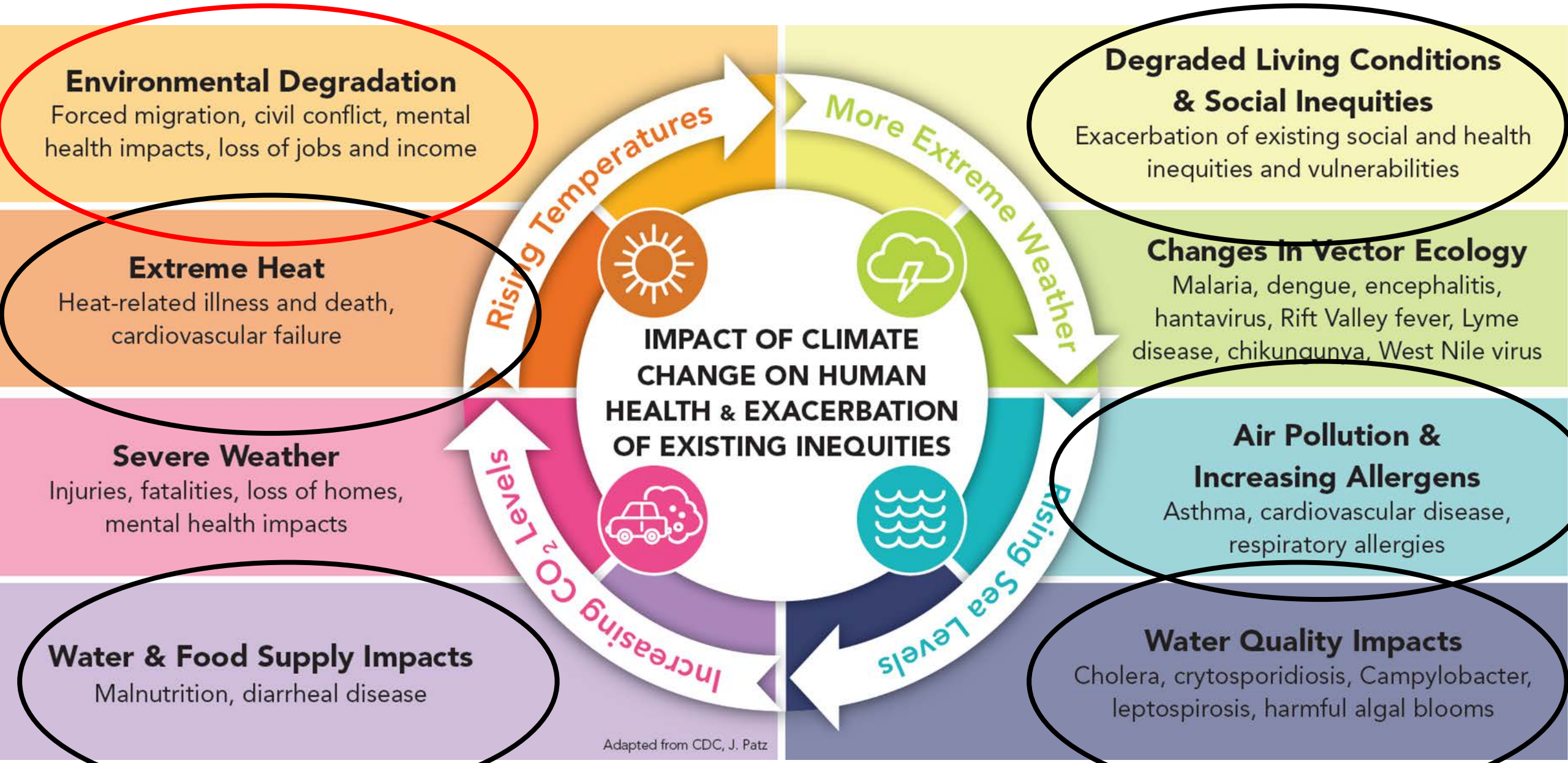
Seed storage plans for 2020

- Dedicated staff member provided by Hawai‘i Tourism
- Wild seed collection trips with interns to conservation partner sites
- MNBG partnering with University of Hawai‘i Sea Grant College Program “*Vulnerability of Coastal Ecosystems to Increased Salinity from Climate Change*”

Climate Change is more than just sea-level rise



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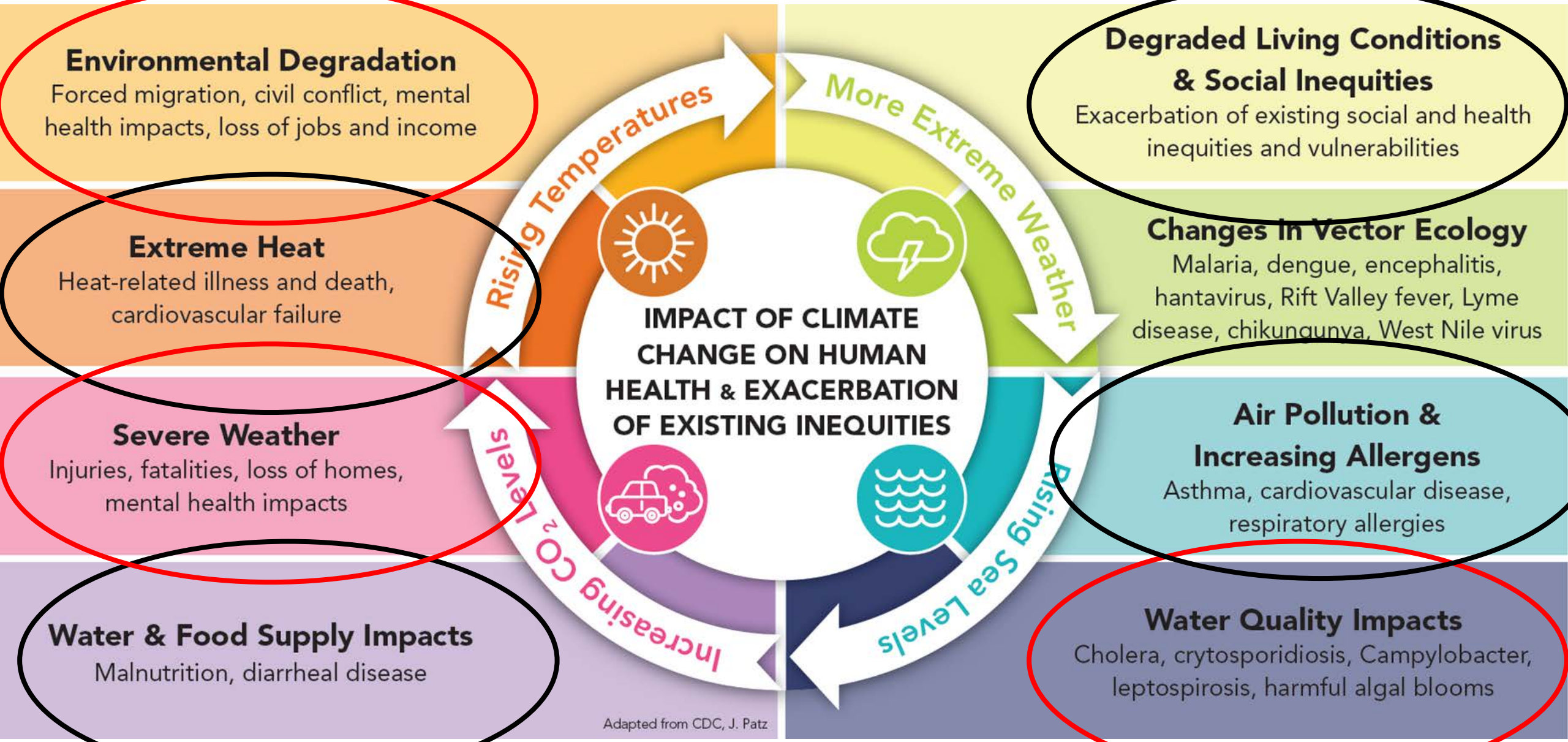

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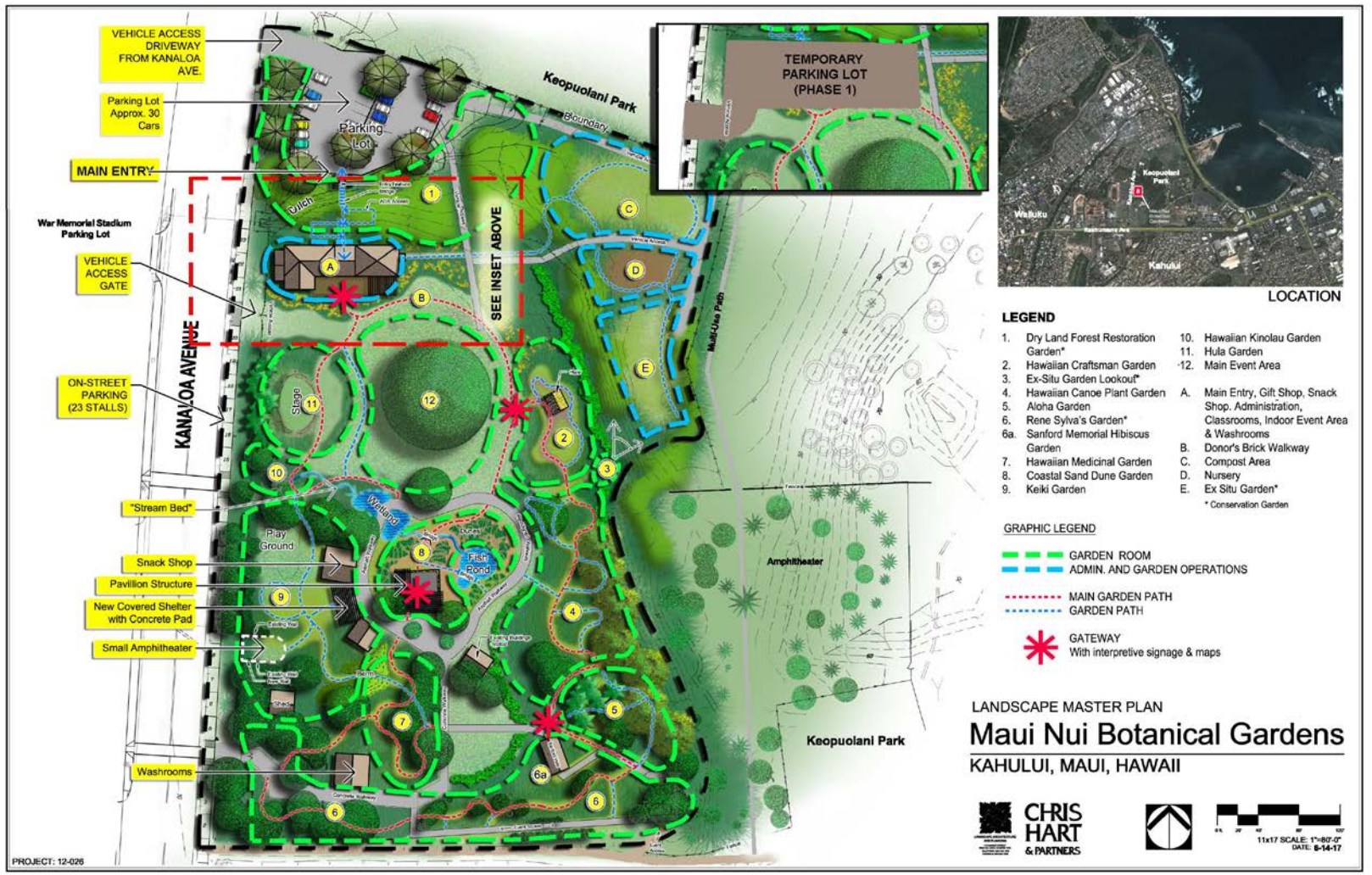
Future needs

- Seeking support to create seed storage infrastructure
  - New work area and nursery construction completion by Feb. 2021
  - *Small building needed to house staff and equipment*



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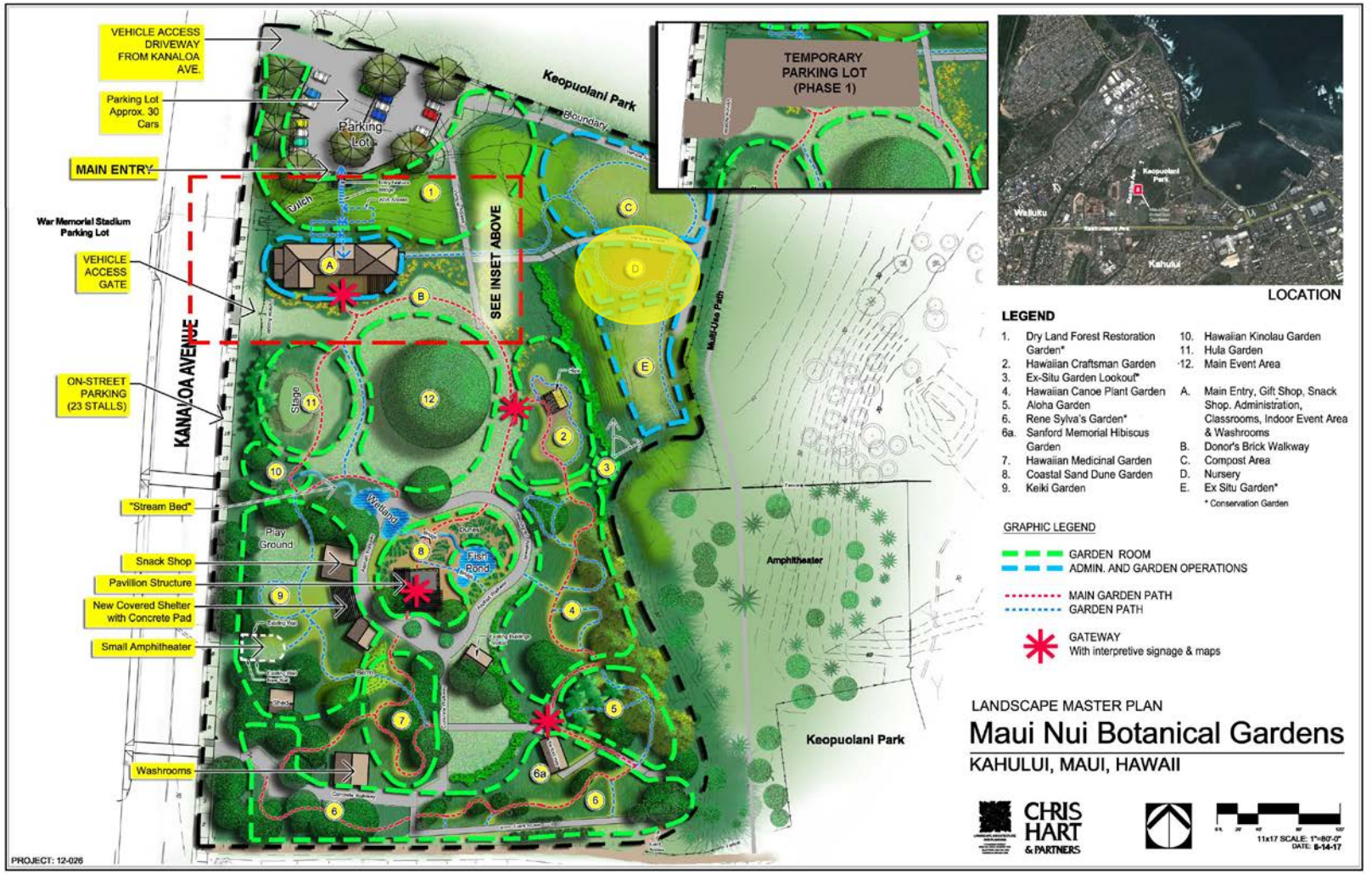

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Resources

1. Maui Nui Botanical Gardens online: www.mnbg.org; Instagram/Twitter/Facebook: @mauinuibg; Hawaiian Plant of the Day: www.facebook.com/pg/mauinuibg/photos; Arbor Day 2020: arbordayexpo.com/.
2. Ainsworth, A. and Drake, D. *Classifying Hawaiian plant species along a habitat generalist-specialist continuum: Implications for species conservation under climate change.* PLoS ONE 15 (2): e0228573.
3. Giambelluca, T. *Water impacts of invasive plants in Hawai'i.* Seminar presented 11/5/2019 University of Hawaii at Manoa. Lab page accessible at https://sites.google.com/a/hawaii.edu/ecohydrology_lab/.
4. Weisenburger, L. and Kier, M. *A statewide assessment of ex situ status, capacity, and needs for the conservation of Hawaiian plants*. A project for NTBG, Lyon Arboretum, and U.S.F.W.S. 8/20/2012.
5. Chau, M. *et al*. *Seed freeze sensitivity and ex situ longevity of 295 species in the native Hawaiian flora*. American Journal of Botany 6/24/2019.
6. http://laukahi.org/ Hawai'i Seed Bank Partnership; ROD ʻŌhia seed collection initiative
7. https://cms.ctahr.hawaii.edu/rod/ ROD Rapid ʻŌhia Death
8. Lum, T. and Barton, K. *Ontogenetic variation in salinity tolerance and ecophysiology of coastal dune plants*. Annals of Botany 125: 301–314, 2020.

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