



Solar farm at Port Allen, Hanapēpē-'Ele'ele District

## SECTOR: VIII. ENERGY SUSTAINABILITY & CLIMATE CHANGE MITIGATION

**Energy is a critical part of progressing the goals of resilience and sustainability. So long as the majority of our energy sources are imported, Kaua'i will contribute to fossil fuel-related emissions and remain vulnerable to global fluctuations in price and supply. Kaua'i must continue to set an example of energy sustainability and global citizenship through emissions reduction and renewable energy targets.**

### Progressing Toward Energy Independence and a Carbon-Neutral Future

Kaua'i has become a leader in energy conservation and renewable energy projects. In 2016, our ratepayer-owned electric utility, the Kaua'i Island Utility Cooperative (KIUC), generated approximately 40 percent of its energy from renewable sources. KIUC aims to increase this percentage to 70 percent by 2030 through a mix of new biomass, solar, and hydroelectric projects. In 2017, Tesla partnered with KIUC to construct a solar farm on Kaua'i; outfitted with

Tesla Powerpacks, this facility will reduce fossil fuel consumption by approximately 1.6 million gallons per year. This will bring Kaua'i closer to the ambitious target of 100 percent local energy sustainability set by both the State and the Kaua'i Energy Sustainability Plan (2010). The General Plan also sets a target for reduction of all greenhouse gas emissions so Kaua'i can do its part to mitigate climate change.

The objectives and actions for Energy Sustainability are intended to support the efforts of KIUC and renewable energy providers in reaching the goal of energy independence, and to provide enough flexibility so that strategies can adjust based on the

best available information. Climate change mitigation efforts to increase energy conservation and reduce greenhouse gas emissions are also supported.

## Energy Efficiency and Conservation

Energy conservation and efficiency measures are equally as important as renewable generation in moving Kaua'i toward a clean energy transformation. Innovations in several areas will help to reduce our energy load:

**1. Building Efficiency:** Buildings can become 40-70 percent more efficient with implementation of supportive codes and standards between now and 2050.<sup>48</sup> This applies to existing and new buildings. The County can lead by example by investing in Leadership in Energy and Environmental Design (LEED) certified buildings, helping the local building industry to catch up with the rest of the Country in making LEED a standard practice.

**2. Energy Storage:** Bulk storage of electricity is needed to allow the utility to shift energy from periods of high production to periods of high demand. At the time of this plan, two approaches to bulk storage are under development by KIUC. They are (a) utility scale chemical batteries, and (b) pumped storage hydro. The industry is rapidly evolving, and other approaches, such as distributed storage or integration of electric vehicles, may become commercially viable in the near future.

**3. Responsive Electric Loads:** Electric utilities have traditionally provided electricity to customers whenever there is demand. In a 100 percent clean energy grid, customer demand itself will become a tool to manage the integration of variable sources of clean energy. Both price signals (time of use pricing) and demand response control at the equipment/system level will aid utilities in managing the grid.

The County has significant roles and opportunities to increase energy conservation and efficiency through code requirements, planning, incentives, and education to encourage behavioral changes by individuals and businesses.

## 1. ENERGY SUSTAINABILITY

**Objective: To increase energy sustainability and maintain a reliable, resilient, and cost-efficient energy system.**



### 1.1 Conserving Energy and Becoming Sustainable

Kaua'i's energy profile has evolved significantly in recent years. A combination of solar, hydro, and biomass generation projects accounted for only 13 percent of KIUC's energy sales in 2014, but rose to over 36 percent in 2015. Renewable resources can meet an average of 77 percent of Kaua'i's energy demand during peak solar hours, spiking to as much as 90 percent.<sup>49</sup>

KIUC has adopted an ambitious goal for renewable resources to generate at least 70 percent of Kaua'i's energy by 2030, surpassing the State's goal of 40 percent.<sup>50</sup> Future progress on renewables will allow Kaua'i to become more energy self-reliant in a manner that is more environmentally sound and economically sustainable than reliance upon fossil fuels.

Renewable energy projects that integrate additional benefits besides power production are also valuable. Solar arrays that are integrated with agricultural production are one example, as are water management projects that incorporate hydropower production. Landfill sites present opportunities for methane gas production, which can be stored and used for buses on Kaua'i.

Increasing Kaua'i's renewable energy production capacity also represents a potentially significant contribution towards reducing the island's greenhouse gas emissions to help mitigate climate change.

While much of renewable energy production depends on KIUC and private sector initiatives, the County can assist with the transition to renewable energy through

48 Roadmap to Zero Emissions, Architecture 2030

49 *Kaua'i Utility Reaches 90% Renewable Energy Utilization, 2016*  
50 KIUC Strategic Plan 2017



various means including land use planning, economic development, transportation planning, and County government operations.

Efforts to reduce energy consumption are just as important as power generation, particularly during nighttime hours when solar power generation is not available. Energy conservation begins at home, and technologies such as “smart meters” are available to KIUC customers to allow them to better manage their energy use. These and other measures have helped Kaua’i residents reduce their electricity consumption by an average of ten percent from 2007 levels. Kaua’i’s average household electricity use of 465 kilowatt-hours per month was the lowest of any County in the State in 2013. As more renewable sources come online from public and private sources, and as more residents use smart meters, greater energy conservation and lower monthly energy bills will benefit residents and businesses.

## **1.2 Green Buildings and Structures**

The energy efficiency of buildings has a great impact on total emissions. Green buildings are sited, designed, constructed, and operated to be environmentally responsible and resource efficient. The U.S. Green Building Council estimates that green buildings reduce per person emissions by over 50 percent, especially if that building is located in a walkable environment. The most widely used benchmark for sustainable buildings is the LEED rating system. Currently, LEED certification is voluntary and often encouraged for major projects through conditions imposed by the Planning Commission. There is an opportunity to encourage increasing the number of LEED buildings through requirements and/or incentives.

### **A. PERMITTING AND CODE CHANGES**

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1. Promote increased energy conservation and renewable energy production.
2. Optimize the mix of energy crops that can provide fuel for power production on Kaua’i.
3. Streamline and expedite planning and permitting processes involving renewable energy facilities.
4. Require new buildings to incorporate economically feasible design and equipment for energy sustainability, including but not limited to: solar hot water capacity and proper insulation.

5. Conduct an audit of the County’s development standards to identify regulations that are obstacles to, or could be altered to better encourage or require, green building practices.

### **B. PLANS AND STUDIES**

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1. Work with the University of Hawai’i to conduct an islandwide study of energy crop production, and determine how much energy production comes from locally grown crops.

### **C. PROJECTS AND PROGRAMS**

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1. Install more solar energy systems on County facilities.
2. Pursue green energy conservation, including but not limited to: groundskeeping and farming equipment/machinery, and ground transportation, by:
  - a. Installing more, and regularly maintaining and repairing, electric vehicle charging stations.
  - b. Introducing residential and commercial incentives to transition to electric groundskeeping and farming equipment/machinery.
  - c. County transition from fuel-powered to electric vehicles, machinery, and equipment, where feasible.
3. Conduct regular reviews of County operations to identify ways to conserve energy, particularly during nighttime hours.

### **D. PARTNERSHIP NEEDS**

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1. Support the Kaua’i Island Utility Cooperative (KIUC) and private initiatives for solar, biomass, hydro, and other clean energy production types.
2. Identify sites where new renewable energy facilities might be co-located with other land uses.
3. Continue regular monitoring of the amount of Kaua’i’s energy production that is from fuel produced on the island.
4. Support State and Federal efforts to price carbon, such as a carbon tax or fee and dividend programs.

## 2. REDUCTION OF GREENHOUSE GAS EMISSIONS

**As a leader in renewable energy, Kaua'i is transitioning from the use of fossil fuels for power generation. But we should not stop there. Doing our part to reduce carbon emissions from buildings, transportation, and other sources is our kuleana as global citizens.**

**Objective: To expand strategies and mechanisms to reduce greenhouse gas emissions on Kaua'i.**



### 2.1 Acknowledging the Paramount Challenge of Climate Change

Since the 2000 General Plan, the impacts of climate change have become more apparent. They include coastal erosion, coral bleaching, higher temperatures, more frequent wildfires, reduced trade winds, increased frequency of tropical storms, and other impacts. The severity of these impacts over time will depend in large part upon the success of the global effort to reduce greenhouse gas emissions. On one extreme is business as usual, where global average temperatures could increase more than four degrees Celsius by the year 2100, bringing much greater severity of all the aforementioned impacts and an unstable climate for centuries into the future. On the other extreme, an aggressive global effort to reduce greenhouse gas emissions could prevent average temperatures from increasing more than two degrees Celsius relative to pre-industrial levels, and could help to stabilize the climate.

Other sections of this document address the specific concerns that arise when planning for sea level rise and related impacts of climate change. This section outlines Kaua'i's commitment to be part of the solution to mitigating one of the factors that causes and exacerbates climate change; that is, reducing and ultimately eliminating our emissions, primarily from the burning of fossil fuels.

### 2.2 Setting an Example and Goal for Emissions Reductions

Policy makers at local and State levels have identified the need to reduce our dependence on fossil fuels for numerous reasons. In 1998, the State of Hawai'i completed a climate change action plan, which states: "Hawai'i can and should play a role in reducing its greenhouse gas emissions that contribute to climate change." In 2007, Act 234 was signed into law, and required the State to reduce greenhouse gas emissions to 1990 levels by 2020. This milestone has already been achieved well ahead of schedule. However, much greater levels of emissions reductions are now in order.

In 2014, the State adopted the Hawai'i Climate Change Adaptation Initiative (Act 83) to address the impacts of climate change on the State's economy, environment, and way of life. It established an Interagency Climate Adaptation Committee to develop a *Sea Level Rise Vulnerability and Adaptation Report* and *Statewide Climate Adaptation Plan*.

In 2015, 195 countries signed on to the Paris Climate Agreement, which set a goal of limiting global temperature rise to within two degrees Celsius. To achieve this, the Agreement calls for rapid emissions reductions and full decarbonization by the second half of the century. Though the United States has signaled that they will pull out of the agreement, Hawai'i is a member of the United States Climate Alliance which is a coalition of states committed to upholding the Paris Climate Agreement by "achieving the U.S. goal of reducing emissions 26-28 percent from 2005 levels" by 2025. In support of achieving these goals, SB 559 was signed into law in 2017 which "requires the State to expand strategies and mechanisms to reduce greenhouse gas emissions statewide in alignment with the principles and goals adopted in the Paris Agreement."

As discussed in previous sections, Kaua'i is already making progress in the renewable energy sector. In the ground transportation sector, Kaua'i County has laid the foundation for similar gains. The County has retooled its roadway planning and is beginning to build and rebuild streets with increased attention to pedestrians, bicyclists, and transit. The local bus service has also continued to grow over the past decade and will be an essential component of a low-carbon ground transportation system.

The behavior and actions of individuals are critical to making these shifts happen. Like most U.S. residents,



people on Kaua'i emit more than double the per capita world average greenhouse gas emissions per year. It is everyone's kuleana to look at ways they can reduce their personal carbon footprint, in keeping with the spirit of Kaua'i Kākou.

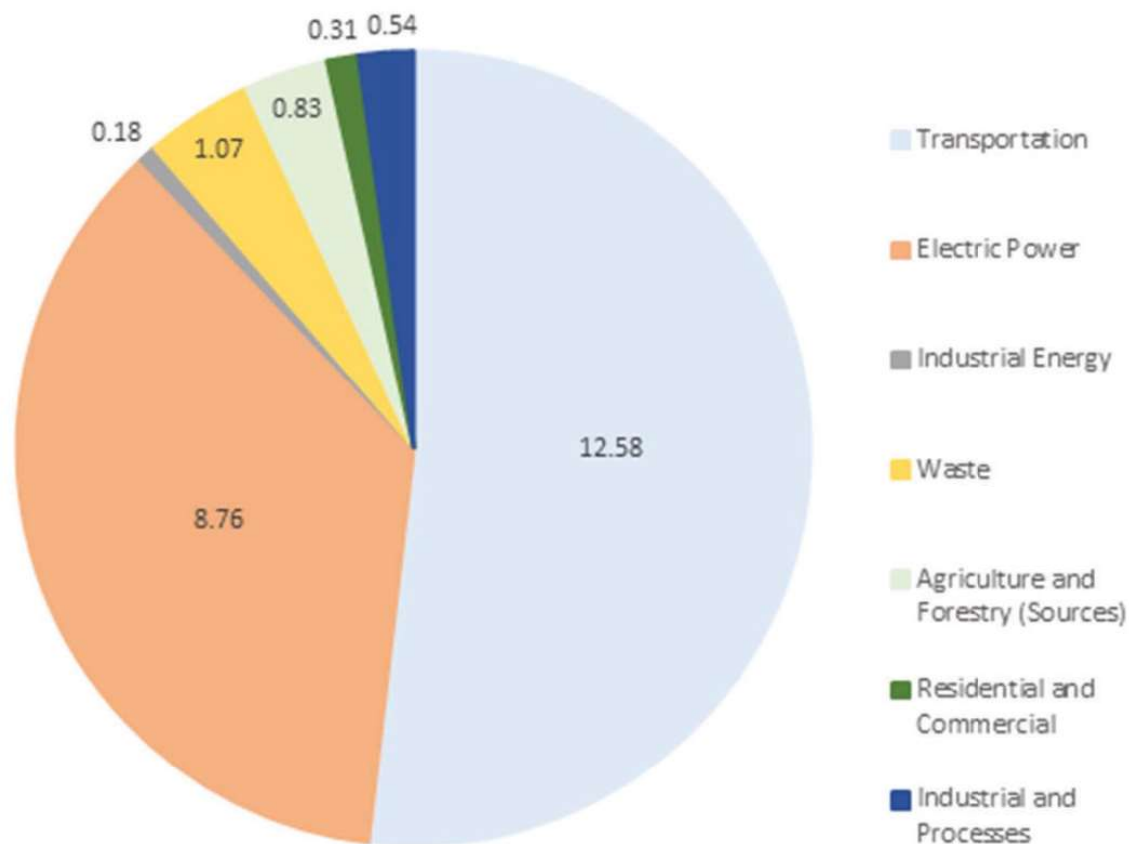
In alignment with SB 559 and Hawai'i's pledge to the United States Climate Alliance, the General Plan's policy is to reduce islandwide greenhouse gas emissions by at least 26-28 percent from 2005 levels by 2025, and 80 percent by 2050. Because those targets are lower than those deemed necessary by the Intergovernmental Panel on Climate Change and the Paris Climate Agreement to keep temperature change below 2 degrees Celsius, the County should aim for the higher benchmark of 40 percent reductions by 2030. Statewide emissions for the year 2007 are shown in Figure 3-19.

Achieving an 80 percent reduction in carbon dioxide (CO<sub>2</sub>) emissions will require a wholesale transformation of our electricity and transportation systems, and will have far-reaching implications for other sectors such as tourism, agriculture, and consumption of imported goods. These systems have

evolved over a century of increasing access to and growth in the use of fossil fuels. By achieving this level of emissions reductions, we will do our part to prevent global average temperatures from increasing.

### 2.3 Addressing Air Travel and Transportation

While we have progressed with renewable energy production for electricity, we must address and find ways to reduce or offset the fossil fuel consumption of the transportation sector. Due to the rapid adoption of renewable energy by KIUC, 2015 marked the first year on Kaua'i where greenhouse gas emissions from ground transportation were higher than from electricity production. In order to support the General Plan's greenhouse gas reduction policy, Kaua'i must reduce ground transportation emissions by 100% by 2045, with county vehicles reaching that goal by 2035. Using 2045 as a goal aligns the transportation sector with the electricity sector, which is currently mandated by HRS Section 269-92 to reach 100% renewable energy by 2045. Technological breakthroughs in electric vehicles and alternative fuels support emissions reductions, but until those technologies take hold and become affordable, reductions to



**Figure 3-19 Composition of Hawai'i GHG Emissions**

(Excluding Sinks, Including Aviation), 2007 (MMT CO<sub>2</sub> Eq)

fossil fuel consumption for transportation will largely depend on individuals changing personal travel patterns and behaviors. The airlines and visitor industry can also promote alternative fuels and carbon offset programs. Emissions from air travel to support both resident and visitor travel accounted for an approximately equal share of petroleum use compared to ground transportation and electricity in 2013. The State's 1998 climate change action plan noted: "...the difficulty Hawai'i faces in making significant reductions in its emissions. Jet fuel is essential to Hawai'i's tourism-based economy and the wellbeing of its people."

Since that time, the airline industry has made considerable strides in improving per passenger efficiency through both aircraft technology and seat management. However, growth in tourism has offset much of these gains and aviation emissions remains a critical challenge. This is particularly true in Hawai'i due to our much greater dependence on air travel than in less isolated communities.

Although local government influence over airline emissions is very limited, the County, with help from the State, can regularly track these emissions and assure that the industry is meeting the commitments it has laid out to fit into a low-carbon society in the coming decades.

## 2.4 Inventorying Greenhouse Gases

According to the *State of Hawai'i Greenhouse Gas Inventory* of 1990 and 2007, Kaua'i contributed 1.2 million metric tons of carbon dioxide equivalent gases in 2007. These emissions were primarily from the combustion of fossil fuels for electricity, ground transportation, and air transportation.

Maintaining an accurate greenhouse gas inventory will be critical to tracking progress as we move towards our goals. The State Department of Health is completing its third sector-based statewide greenhouse gas inventory. Future efforts should include building an inventory tool that automatically updates from various data sources, as opposed to the current practice of periodic, static reporting. Sector based emissions tracking is relatively straightforward, with data already available from multiple sources, and several well-established protocols existing for municipalities that are accepted on an international level.

Notably, current inventories do not reflect the greenhouse gas emissions embodied in the significant volume of consumer goods imported to Kaua'i every

year. Portland, Oregon, and Oakland, California, two of the first jurisdictions to analyze consumption-based emissions in their community, found that emissions from consumer goods accounted for approximately twice the amount of greenhouse gas produced by other sectors. In order to effectively manage our emissions, tracking and managing the embodied emissions associated with the manufacture, production, and delivery of imported goods we use will be an important component of our efforts.

## 2.5 Planning for Climate Action

A community-led climate action planning process is needed to maintain progress toward the long-term emissions reduction goal. Such a process will need to be maintained with an ongoing commitment both by the County and by community partners. Focus on key sectors and their interrelationships will be necessary to continue progress in emissions reductions. Key sectors include infrastructure, ground transportation, tourism, consumption and materials management, food and agriculture, and natural resource management.

The process should seek to continually integrate climate change mitigation and adaptation goals to a greater and greater extent with existing planning processes including the General Plan, Community Plans, and individual sector plans as they are revisited.

Finally, successful climate action planning will hinge on continuous engagement across the community. The majority of Kaua'i's greenhouse gas emissions are the result of individual choices over the short and long term by Kaua'i residents and businesses. Engaging the people in our community and encouraging them to take ownership of the process will be key to gaining the support and collaboration needed for long-term success.

## 2.6 Transformation as Opportunity

Kaua'i's extensive fossil fuel dependence means that there is a large task ahead to transform, and ultimately decarbonize, Kaua'i's economy. There will be many benefits to making this transformation. Clean energy in the electricity sector already provides local jobs, helps stabilize electricity costs, and reduces dependence on imported fossil fuels. Transforming the ground transportation sector will encourage healthier living, revitalize neighborhoods and downtown business areas, and allow those with limited mobility more options for getting where they need to go. Addressing tourism and air travel will be very challenging, but



Kaua'i's commitment to sustainability will resonate with the values of modern travelers.

We must analyze our island energy facilities and infrastructure to identify practices and system upgrades that work toward reducing fossil fuel consumption. This will involve researching and integrating new technologies, as well as finding ways to increase efficiency or use less fuel. For example, in ground transportation, Kaua'i can make headway through broader adoption of electric vehicles. It will also be essential to reduce vehicle miles traveled through mode shift. We also need to work toward land use patterns that create higher density communities that are less auto-dependent over the long term. The General Plan actions for Climate Change Mitigation support these goals.

## **A. PERMITTING AND CODE CHANGES**

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1. Promote higher density residential development near job centers and amenities, while strongly discouraging development that will require residents to commute via automobile to jobs in other areas of the island.
2. Reduce the carbon footprint of both new and existing buildings and infrastructure by maximizing energy efficiency and minimizing the use of fossil fuel resources on the grid.
3. Accelerate the transition to alternative, carbon-free fuels in the ground transportation sector with regulations and policies that support electric vehicle adoption and other alternative fuel infrastructure, and support electric groundskeeping and farming equipment/machinery.
4. Require large new developments and infrastructure projects to include a project carbon footprint analysis estimating the anticipated change in emissions resultant from the proposed project and documenting the emissions reduction strategies deployed by the project to minimize its emissions.
5. Support continued reductions in emissions from local energy production.

## **B. PLANS AND STUDIES**

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1. Develop a climate plan that focuses on key sectors and their interrelationships with respect to emissions reductions, to be updated every

five years. Include intermediate year emissions reductions for all major sectors.

2. Accelerate "zero waste" strategies, including policies and actions that encourage island residents to move towards lower levels of consumption, and to reuse materials to the maximum extent possible.
3. Conduct a greenhouse gas emissions inventory for the County.

## **C. PROJECTS AND PROGRAMS**

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1. Establish capture and containment of methane at all landfills and County waste facilities.
2. Adopt a county-wide zero-waste strategy, including but not limited to: recycling pick-up at households and public locations and events, and building and maintaining a materials recovery facility with staff assigned to locate markets for recycled material.
3. Support the expansion of electric vehicle charging station infrastructure at County facilities.

## **D. PARTNERSHIP NEEDS**

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1. Share best practices regarding climate planning, including support for system-wide carbon fees or taxes at the state or national level.
2. Meet emissions reductions goals through partnerships within the electricity, transportation, tourism, agriculture, waste, and small business sectors. Collaborate to establish short term, intermediate, and long term (2050) emissions reduction targets in ground transportation, electricity, air transportation/tourism, and consumption and materials management.
3. Increase the availability of information about buildings that are energy-efficient (e.g., with solar hot water, green building designs and materials, and KIUC's household energy audit) around the island for both the residential and commercial sectors.
4. Support the expansion of electric vehicle charging station infrastructure at strategically accessible locations along the main highway and other major thoroughfares.