HIPA
HAWAII INSTITUTE FOR PUBLIC AFFAIRS

# Report on the State of Physical Infrastructure in Hawaii

*Final Report to the Economic Development Administration U.S. Department of Commerce*

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## Contents



* Note: This report as well as a more detailed summary of infrastructure data can be viewed on the HIPA website at www.hipaonline.com

## I. Why Infrastructure is Important

Physical infrastructure is more than the placement of pipes, roads and dams. It plays an important role in determining the extent and location of growth, keeps our environment clean and safe, and affords us the comfort and convenience of inter-state and global travel. Physical infrastructure also plays an integral part in business and industry, provides for our family recreation and safety, and is intertwined with virtually all aspects of our life.

Hawaii's infrastructure too often goes unnoticed. It is like the heart and veins pumping and carrying blood throughout our body. We pay little attention to them but count on them to keep us alive and operating at peak efficiency. This is also the case with infrastructure. Roads and highways enable us to transport ourselves as well as goods and services. Airports and harbors connect our islands, and link us with the rest of the country and the world. Sewage, waste management and water systems – essential to living in a modern society – provide us with clean drinking water, flushing toilets, and garbage disposal. Infrastructure also includes parks and recreational facilities, affording us an enhanced quality of life and opportunities to interact and socialize with one another. The average citizen takes it for granted, until something fails, or when a natural disaster strikes and there is no electricity or running water.

Despite its importance, Hawaii's physical infrastructure is old and failing, requiring billions of dollars for repairs, maintenance and upgrades. For example, in the McCully-Moilili area – a place ideal for redevelopment and urban renewal – the City and County of Honolulu cannot accommodate future growth because of the lack of sewage capacity.

In West Oahu, a clogged freeway system results in thousands of area residents waking up at 4:30 a.m. to get ready for their 5:30 a.m. morning commute, with their children sleeping in the back seats of their cars. Leaving home for downtown Honolulu any later would mean sitting in traffic for an hour and a half.

Whether it is aging sewer lines resulting in dumping millions of gallons of raw sewage into the Ala Wai Canal, or clogged and overburdened roadways in all counties, addressing Hawaii's infrastructure needs is paramount for the long-term sustainability of our state.

It is important to note that physical infrastructure also includes the development and maintenance of public facilities, including lower and higher educational facilities. Hawaii's public schools and the University of Hawaii System are facing a significant backlog in repair and maintenance. At the same time, they need new school and physical facilities to accommodate the state's growing student population. Access to Internet and telecommunications on campus is also critical for Hawaii's students to be linked to data, information and networks throughout the world. Because the state of physical facilities has a direct correlation to student learning and achievement, we must make every effort to ensure that our educational facilities are conducive to learning.

## II. Lack of Statewide Information & Planning

***Twenty different county and state agencies oversee the state's infrastructure. Efforts are piece-meal and uncoordinated.***

Hawaii has been without statewide data and information on this important and crucial aspect of society. For decades, Hawaii has approached infrastructure planning and reporting on a piece-meal basis.

For example, at the state government level, four major departments have their own respective capital improvement budgets: Department of Accounting and General Services (DAGS), Department of Transportation (DOT), Department of Education (DOE)[1] and the University of Hawaii System (UH)[2]. Their CIP budgets and repair and maintenance schedules are managed separately. At the county level, all four counties – Honolulu, Maui, Kauai and Hawaii – have their own budgets and timelines. This does not include the Honolulu Board of Water Supply, which is an independently managed entity separate and apart from the City and County of Honolulu's executive branch, as well as public utilities such as Hawaiian Telcom, Oceanic Cable, Hawaiian Electric Company, Maui Electric Company, Kauai Island Utility Cooperative, and Hawaii Electric Light Company, which provide for the state's telecommunications and energy needs.

In total, Hawaii has at least twenty major state and county governmental entities that oversee the planning, construction, repair and maintenance of Hawaii's major physical infrastructure, without a consolidated inventory of what each agency is doing, their short- and long-terms plans, and how much everything is going to cost. For all intents and purposes, Hawaii's infrastructure planning mechanisms operate with very little coordination, collaboration and integration at the state and county levels.

[1] Includes the Hawaii State Library System.

[2] The University of Hawaii System includes all university and community college campuses statewide.

## III. Purpose of the Infrastructure Project

### *Statewide summary of infrastructure projects is first step in identifying urgent needs and costs.*

The purpose of this report is to provide substantive research, data and information on Hawaii's statewide physical infrastructure needs. In particular, the report provides a statewide summary of state and county infrastructure projects planned for the next six years. Currently, there is no consolidated or comprehensive source of information that lawmakers, government agencies and decision-makers can consult to help them make informed decisions about Hawaii's infrastructure needs. Without such data, decision-makers are left with only bits and pieces of information about infrastructure requirements.

A comprehensive study is the first basic step in adequately addressing short- and long-term infrastructure needs. The study provides a uniform inventory of state and county infrastructure expenditures, and a summary of funding requirements to maintain and/or improve them.

A key goal of this report is to enhance the level of awareness, and to focus greater attention on the role and importance of physical infrastructure in Hawaii. Too often, we only become aware of its importance when a disaster strikes or when a problem arises. We tend to put aside long-term planning for replacement, upgrades and new projects because the cost of public infrastructure is significant. We hope that this report will contribute to a more coordinated and forward-thinking approach to community and economic development.

This report is the first of two phases. Phase I addresses existing and short-term infrastructure requirements, creating an inventory of short-term repair, maintenance and planned improvements and upgrades. Phase II will address major infrastructure issues, including: long-range infrastructure planning, infrastructure needed to meet planned and future growth, and infrastructure required to stimulate future development in designated areas. Phase II will also examine issues such as land use and funding policies that impact infrastructure development. The Hawaii Institute for Public Affairs (HIPA) is currently exploring additional funding sources for Phase II.

The report presents infrastructure expenditures over a six-year period delineated by categories, locations and agencies. These expenditures are further segmented into capital improvement projects (CIP) expenditures comprised of new projects, infrastructure upgrades and repair and maintenance for planning and design (P&D), and construction.

This report also examines Hawaii's infrastructure resiliency in the face of natural hazards. Earthquakes, hurricanes, tsunamis, storms and floods pose regular threats to our state. When a natural disaster actually strikes, damage to infrastructure can result in severe threat to life, economic stability and community wellbeing in the short- and long-term. One can easily point to Hurricane Katrina in 2005 ravaging the Louisiana Coast with 125 mph winds, leaving 1,825 dead and estimated damage of $125 billion. Hawaii is no stranger to similar disasters, with Hurricanes Iwa and Iniki hitting the island of Kauai, causing $250 million and $2.0 billion in damages, respectively.

# IV. How to Use this Report

## *Report is consolidated summary of planned statewide projects by category, type and cost*

This report provides a consolidated summary of projected infrastructure projects at the state and county levels. It gives lawmakers, government officials, the private sector, and concerned citizens an overview and better understanding of Hawaii's physical infrastructure needs. Projected costs are identified on a statewide level, as well as by category, responsible agency, and type of construction.

Baseline information is an important starting point for discussion on how significant the state's infrastructure needs really are, in what categories, and on what islands. Further, the report reveals what categories of infrastructure can and should be addressed, and what types of funding may be available. Infrastructure repair, maintenance and development can be funded by a variety of local, state, federal and private funding sources. Infrastructure data displayed in this report can also be used to educate lawmakers as well as the general public, and to provide the basis for comprehensive long-range planning.

The bottom line, however, is that addressing most infrastructure projects hinge on the availability of funding. Short-term and long-range planning based on sound data and information can give decision-makers greater confidence and understanding as to the importance of maintaining and improving our infrastructure, and hopefully provide greater awareness and commitment to ultimately addressing the state's infrastructure needs. Completion of this report is a first and important step in this process.

## V. Why this Report is Relevant Now

### *Findings can be key to securing funding for infrastructure projects*

Hawaii currently faces one of its most challenging economic times since statehood in 1959. The state has suffered the consequences of a meltdown of the nation's financial industry in 2008 and of a lagging U.S. economy. In 2010, the State Legislature grappled with a $1.2 billion deficit, furloughing government workers, cutting programs, deferring payments to vendors, and cutting public school instructional days to balance the budget. The unemployment rate soared to eight percent with visitor arrivals and construction, the state's top economic drivers, dropping significantly over the past two years. While there are signs of economic recovery, it is still speculative as to when Hawaii's economy will rebound.

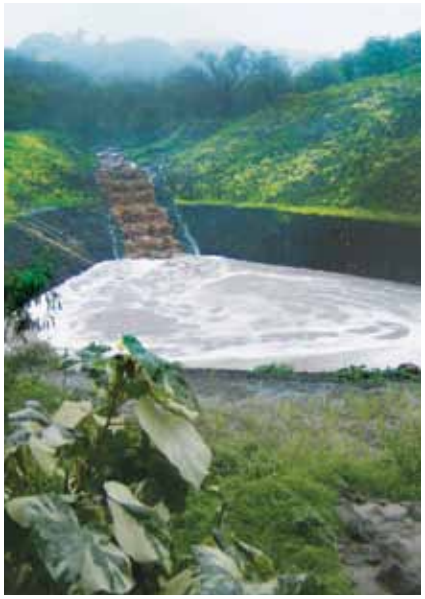
The federal government has invested billions in economic stimulus monies to create and retain jobs. The American Recovery and Reinvestment Act of 2009 ("ARRA") provides a variety of measures to stimulate the U.S. economy, including funding for shovel-ready infrastructure projects. A proven practice to stimulate the economy is for federal, state and municipal governments to invest in public infrastructure. This creates jobs and keeps workers employed. To date, Hawaii received over $1.29 billion in ARRA awards, and as of March 2010, had expended $585 million, creating or saving 2,566 jobs. Additionally, approximately 23 percent of the state's $1.4 billion capital budget in FY2009 is funded by the federal government.

The findings of this report can be used as state and county governments apply for federal funds or to appropriate funds for infrastructure projects during these challenging economic times. We must make every effort to ensure that jobs are created and Hawaii's infrastructure is maintained, upgraded and developed to meet our social, economic and long-term needs.

## VI. Study Methodology and Criteria

### *Report spans six-year period to determine current and short-term needs*

This report consolidates the projected infrastructure costs during the fiscal years 2010 to 2015. A six-year period was intentionally selected to provide a better understanding of the current and short-term infrastructure needs for the state, rather than long-range projects, which will be covered in Phase II of this study.



The cost of infrastructure projects is divided into three categories: 1) capital improvement projects (CIP) for new projects, repair and maintenance and infrastructure upgrades; 2) in-house improvement projects; and 3) operation and maintenance costs. Project costs were aggregated on a statewide basis as well as for each of the four counties in the following categories:

### Water and Environment

- Dams and Water Irrigation Systems
- Drinking Water
- Solid and Hazardous Waste
- Wastewater

### Transportation

- Airports
- Harbors
- Highways and Roads
- Bridges
- Mass Transit (Buses and Rail)

### Public Facilities

- Public Buildings
- Public Parks and Recreation
- Schools and Libraries (UH, DOE, and Library System)

### Energy[3]

- Energy upgrades associated with state and county agencies

### Disaster Resiliency Associated Costs

- Projected costs relating to state and county agencies

An inventory survey was created and submitted to every state and county agency, with a brief description of each infrastructure category. Each agency then determined which projects best fit within each category, including amounts associated with CIP, R&M, operational and upgrades. The information received from each agency was analyzed and incorporated into various tables. The data is presented in full on the HIPA website at www.hipaonline.com.

[3] Does not include any costs directly incurred by privately-owned energy utilities.

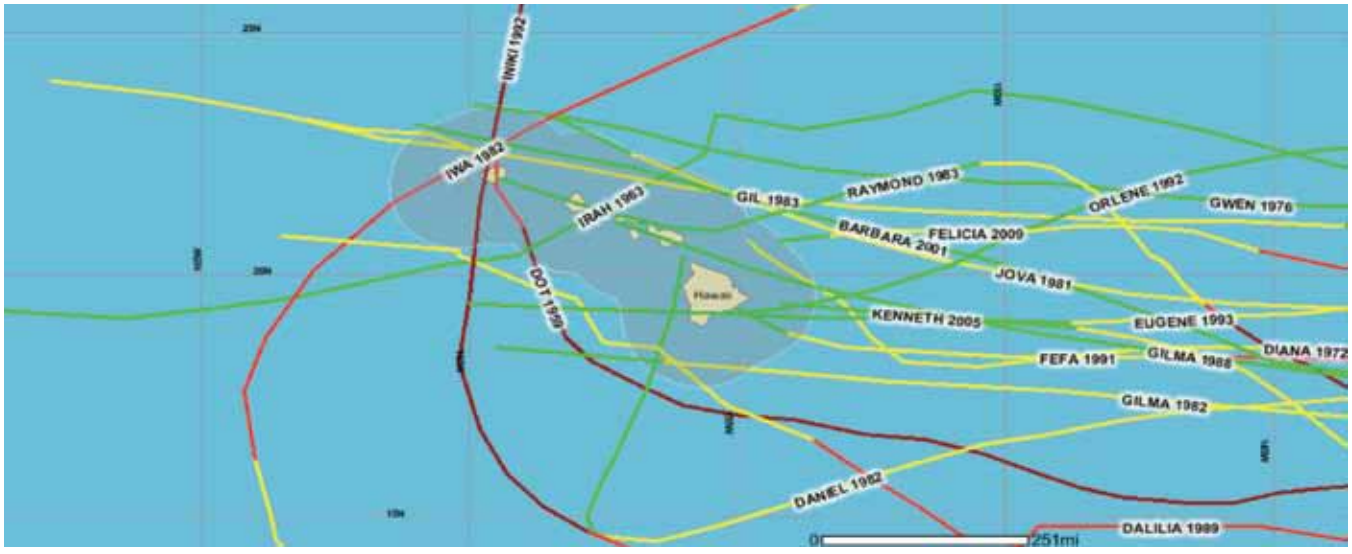
# VII. Building Infrastructure Resiliency to Natural Hazards

### *Lack of redundancy puts transportation and energy infrastructure systems at risk*

The state of Hawaii is dependent on airports and harbors for virtually all commodities, as approximately 80 percent of its food and 95 percent of its fuel is imported. Any significant disruption of the transportation system will produce statewide effects. Hawaii lacks redundant infrastructure, and the critical infrastructure at power plants and refineries result in single points of failure.

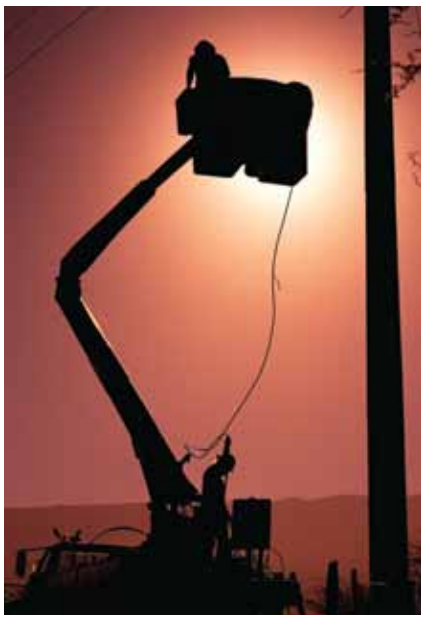
**Hurricane.** The Hawaiian Islands have recorded three destructive storms since 1959. Hurricane Dot passed directly over Kauai in August 1959 packing 130 mile per hour winds. Hurricane Iwa came within 30 miles west of Kauai over Thanksgiving 1982 with winds up to 80 miles per hour. Hurricane Iniki passed directly over Kauai on September 11, 1992. It was the most destructive storm to ever hit the islands resulting in more than $2.7 billion in disaster assistance costs. Hurricane Daniel barely missed the islands in July 2000. Hurricane Jimena passed 60 miles south of the island of Hawaii in September 2003. In August 2007, Hurricane Flossie threatened the state as a Category 2 hurricane before dissipating 100 miles south of the Big Island. In August 2009, Hurricane Felicia was downgraded from a Category 4 hurricane to a Category 2 hurricane as it moved west-northwest toward Hilo, Hawaii, at 13 mph. Felicia's maximum sustained winds registered at 140 mph, making it the most intense Eastern Pacific storm since 2006's Hurricane Daniel. Hurricanes and tropical storms have also caused millions of dollars in damage along our coastlines with the advance of storm-driven surf and storm surge.

*Tropical Systems within 75 Miles of Hawaii from 1959 - 2009*



According to the 2006 census, the population estimate for the state of Hawaii is approximately 1,285,498 residents, plus an estimated daily visitor count of 160,000. As a result, the total number of people vulnerable to hurricane hazard in Hawaii is 1,444,498 people on any given day. There are currently 256 shelter locations in the state that provide public emergency shelter facilities. These shelter locations offer about 429,000 emergency shelter spaces protecting 30 percent of Hawaii's population against Category 1 to 2 hurricane force winds (Saffir Simpson Scale). The estimated cost to increase emergency shelter capacity to support 60 percent of the population through the retrofit of government facilities i.e., strengthening doors and windows is about $256 million.

The cost to build a new State Emergency Operating Center facility with a capacity to conduct and coordinate multi-agency operations and with capabilities to withstand a Category 4 hurricane is about $100 million. (The design of a new State Emergency Operating Center is about 60 percent complete. Any delay in completion of the design and construction of this center is subject to an annual inflationary increase of 10-15 percent.)



In the aftermath of a hurricane strike, essential facilities in Hawaii such as hospitals, airports, harbors, water supply points, and fuel refineries will rely heavily on the sustainability and immediate recovery of electrical power companies. As illustrated in the Hawaii Catastrophic Hurricane Operations Plan published in July 2009, a direct impact of a Category 4 hurricane on Oahu will cause power outages for at least 30-45 days and perhaps longer.

As outlined in the November 2003 report "Oahu Utilities Under-Grounding and Visual Impact Mitigation Studies," overhead utility lines are susceptible to being damaged and can also cause damage when downed as a result of hurricane winds. Where it is practical to do so, existing lines should be moved underground to mitigate the effect of hurricane force winds on utility poles. Based on the 2003 report, the cost to replace Oahu overhead transmission lines with underground electrical cable systems is estimated at between $8.2 and $11.3 billion.

Additional information from the 2009 Hawaii Catastrophic Hurricane Operations Plan also shows that significant structural damage is expected to be residential, which constitutes over 80 percent of the buildings on Oahu. Most residential housing is of single-wall construction that will not withstand winds over 130 mph.

Table 1

## Building Exposure by Occupancy Type for Oahu

| Occupancy | Exposure ($ Amount) | Percent of Total |
|---|---|---|
| Residential | 62,267,574,000 | 81.90% |
| Commercial | 10,628,443,000 | 13.30% |
| Industrial | 1,318,260,000 | 1.70% |
| Agricultural | 281,972,000 | 0.40% |
| Religious | 885,560,000 | 1.10% |
| Government | 578,137,000 | 0.70% |
| Education | 756,293,000 | 0.90% |

According to the 2009 Hawaii Catastrophic Hurricane Operations Plan, total building loss from flooding for the impacted areas on Oahu is an estimated $2.9 billion.

The combined effects of wind, rain and storm inundation will have a devastating impact on the critical infrastructure on Oahu. The same plan shows that most if not all of Honolulu International Airport and Hickam Air Force Base will be inundated. The velocity of storm surge will degrade the reef runway substructure and its functionality. Due to deep, fast moving water, the bridge to Sand Island will be severely damaged or destroyed, isolating Sand Island.

Significant damage is expected at Campbell Industrial Park and Kalaeloa (formerly Barbers Point). These areas store a significant percentage of fuels, produce a considerable amount of the electricity, and house several manufacturing facilities.

**Earthquake.** Thousands of earthquakes occur in Hawaii each year. Fortunately, the majority of them are too small to be felt except by highly sensitive instruments. Hawaii County ranks among the highest earthquake hazard locations with earthquake occurrence rates as high as those near the most hazardous fault areas on the mainland United States. Strong earthquakes in Hawaii's past have claimed lives, destroyed buildings and infrastructure, and disrupted water, sewer, and utility lines.

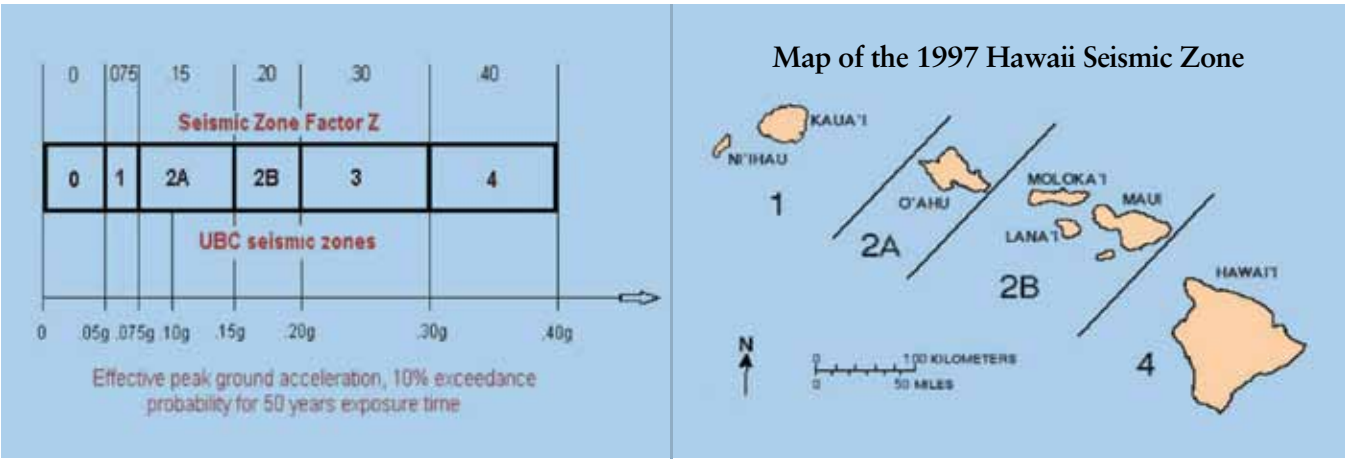
Unlike many other areas where a shift in tectonic plates is the sole cause of an earthquake, 95 percent of the earthquakes in Hawaii are linked to volcanic activity. These earthquakes can occur before or during eruptions, or as magma (molten rock) travels underground. The earthquakes directly associated with the movement of magma are concentrated on the southern part of the island of Hawaii and along its Kona coast beneath two of the island's active volcanoes, Kilauea and Mauna Loa. Kilauea is one of the world's most active volcanoes and most of the earthquakes are associated with incremental movement of the volcano's flank towards the sea. A few of the island's earthquakes are less directly related to volcanism; these earthquakes originate in zones of structural weakness at the base of the volcanoes or deep within the earth beneath the islands.

Since 1952 there have been 34 eruptions, and eruptive activity has been continuous along Kilauea's east rift zone since January 1983. Very shallow earthquakes frequently precede or accompany an eruption. Hundreds of such earthquakes make up swarms that commonly occur over a period of several hours or days before an eruption as magma forces its way into a new area. These earthquakes are seldom large enough to cause widespread damage, but they may produce extensive ground fracturing close to the potential eruption site. Once an eruption begins, the earthquakes usually diminish.

The most recent and significant earthquake in the state occurred off the northwest coast of Kiholo, Hawaii in October 2006. Categorized as a 6.7 magnitude event, the costs for repair and restoration of critical infrastructure following the Kiholo Bay Earthquake are $100 million. Estimated damage to infrastructure for the same event is more than $120 million.

Engineers, seismologists, architects, and planners have carefully evaluated seismic hazards related to building construction. They have devised a system of classifying seismic hazards on the basis of the expected strength of ground shaking and the probability of the shaking actually occurring within a specified time. The results are included in the Uniform Building Code (UBC) seismic provisions.

The UBC seismic provisions contain six seismic zones, ranging from 0 (no chance of severe ground shaking) to 4 (10 percent chance of severe shaking in a 50-year interval). The shaking is quantified in terms of g-force, the earth's gravitational acceleration. The diagrams on the following page depict seismic zonation.




Strong local and shallow earthquakes (less than 20 kilometers or 12 miles deep), especially along the west coast of the island of Hawaii, have the potential to generate a tsunami which may impact the state within minutes. The Pacific Tsunami Warning Center will assess and issue tsunami information bulletins and warnings, as required.

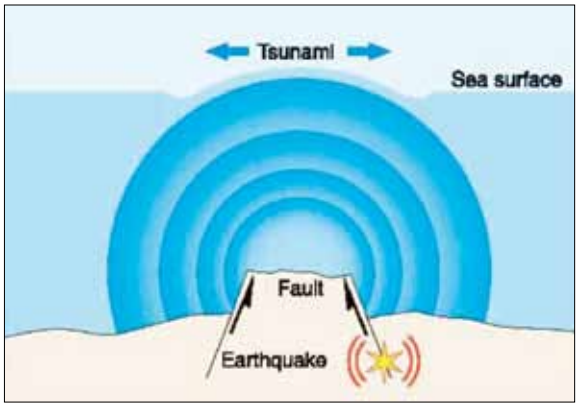
**Tsunami.** A tsunami is a 365 day threat to the Hawaiian Islands and results from large-scale seafloor displacements associated with large earthquakes, major submarine slides, or catastrophic volcanic eruptions. Although landslides and volcanoes cause some tsunamis, probably 95 percent of the tsunamis result from earthquakes under the ocean floor or beneath the coast. The collapse of a large lava shelf on the coastline of the Big Island could also generate a destructive tsunami which may affect the entire state within minutes.

While tsunami events are not common, they have been responsible for some of the worst disasters experienced in our islands. Tsunamis account for more lost lives than the total of all other local disasters. Since 1837, 291 people have been killed by tsunamis in Hawaii with most of the deaths occurring on the Big Island as a result of the 1946 and 1960 tsunamis.

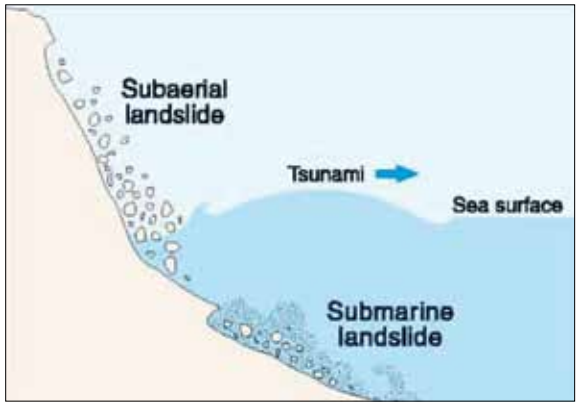
Tsunamis are characterized as shallow-water waves and are different from wind-generated surf waves. Wind-generated waves usually have a period (time between two successional waves) of five to twenty seconds and a wavelength (distance between two successional waves) of about 300 to 600 ft. A tsunami can have a period in the range of five minutes to two hours and a wavelength in excess of 300 miles.

A tsunami's effect at the shoreline can be considerably different within very short distances. The only general rule is that run-up heights tend to be greatest near where the offshore bathymetry is steeper. Along gentle-sloping coasts, wave energy is dissipated upon shoaling. Even so, inundation can be significant and is usually greatest along low-lying coastal plains. A large, shallow earthquake originating beneath the ocean floor has the potential to generate a tsunami.

Due to the topography of the islands, the majority of the people in the state either live in, work, or commute through low-lying tsunami evacuation zones. Most of our hotels, business districts, transportation networks, critical resources, and critical infrastructure such as wastewater treatment plants are in identified tsunami inundation zones.

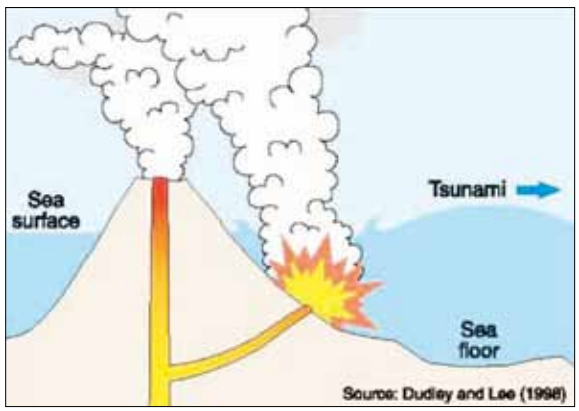


Faulting of the ocean floor may produce a tsunami.



Subaerial or submarine landslides may produce a tsunami.

The wrap-around effect and refraction of wave energy may affect all low lying coastal areas throughout the State and have significant impacts on critical infrastructure and industries. There will be substantial debris and structural damage throughout the State. There may be major damage to utilities and transportation networks, hazardous



A submarine volcanic explosion may produce a tsunami.

material spills, contamination of fuel, food and water supplies, and many residents and visitors will be displaced and in need of shelter and food. Potential damage to airports, harbors, and their surrounding facilities may limit response between islands and limit outside support until transportation infrastructure is restored.

The risk of future tsunami disasters places the state of Hawaii at risk for property losses that could exceed hundreds of millions of dollars.

## VIII. Qualifications to this Report

### *Report is a first attempt and is not all-inclusive; costs are significantly understated*

This report is a first attempt to consolidate all infrastructure activity in the state. While it is the most comprehensive infrastructure study to date, it is not all-inclusive. With data from 20 governmental agencies, and varying interpretations and reporting mechanisms for each department, gathering uniform data was extremely difficult. The consultants requested data and information on projected planning and design, CIP (current projects, new projects and upgrades), and operating and maintenance (O&M) expenditures. While all agencies provided data on P&D and construction expenditures for CIP, only one out of 20 agencies provided the requested O&M data. O&M consists of the annual operating expenditures of each agency and includes both in-house and services contracted to third-party vendors. The consultants then sought to obtain O&M data from financial and budgetary data from the Department of Budget & Finance (for state agencies), and other reports generated from the counties, but were unable to ascertain with a reliable degree of certainty the amounts of departmental costs relating to O&M for physical infrastructure.

For example, the Department of Accounting and General Services (DAGS) has five core functions, including the construction, repair and maintenance of state government physical facilities. They include: fiscal management, voting rights and elections, culture and recreation, information services and communication, construction and maintenance, and other general services. Without making significant assumptions about what portions of the department's total operating budget related to physical infrastructure, an accurate reporting of O&M was not achievable based on the time, resources, and data provided by the various agencies. Therefore, it is essential to note that this report deals primarily with CIP expenditures.

Furthermore, the University of Hawaii System data was available only for 2010 and 2011. Information from DAGS was not available for 2014 and 2015. These two governmental agencies account for a substantial amount of infrastructure activity for the state, which is unreported here. Also, the data provided from the agencies were the most reliable for the most current years -- 2010 and 2011. Many of the anticipated expenditures actually remained the same or declined in the years 2012 to 2016 probably due to the difficulty in projecting costs beyond the upcoming fiscal biennium. Our project leadership group, which consisted of experts and practitioners in the field, duly noted that budgets in the later years should actually increase based on current trends and practicable experience.

Therefore, the amounts cited by the various agencies are likely to be significantly under-reported, primarily due to the lack of O&M and reliable budget projects in the later years.

Further clarifications to the report include:

- This report does not include federal, military and private-sector expenditures for infrastructure.
- The data reported is only what is planned at this time and does not include additional and unanticipated expenditures and adjustments that may occur in future years.
- The data is reported in current dollars. It does not include inflationary and monetary adjustments that may occur over time.
- Land acquisition costs are not included in any of the figures in this report.
- The projected amounts were those determined by each agency. They have not necessarily been "appropriated" by the respective legislative branches e.g., state legislature and/or county councils.
- Projected expenditures relating to energy are those only associated with state and county agencies, which may include projects and upgrades to facilities and infrastructure. Those figures do not include infrastructure projects funded by privately-owned companies such as Hawaiian Electric Company, Kauai Island Utility Cooperative, Hawaii Electric Light Company, and Maui Electric Company.

In summary, with the prior-mentioned caveats, the amounts reported for infrastructure expenditures are significantly understated. Nonetheless, the report is a first attempt at consolidating statewide infrastructure data that previously did not exist.

# IX. Report Findings

***Findings focus on CIP data, and exclude operating and maintenance costs, as methods of data collection are not uniform.***

Twenty state and county governmental agencies participated in this study. This involved a time-consuming and tedious process undertaken by each agency in identifying planning, design and construction costs for current and new projects within a six-year period. Data collection occurred during an eight-month period (June 2009 to February 2010).

As previously mentioned, this report focuses primarily on CIP data because only one agency provided information on in-house improvements and operational and maintenance costs.

## Projected CIP Expenditures for Physical Infrastructure

This statewide survey reveals that about $14.3 billion of CIP infrastructure is planned for the next six years. Approximately $1.8 billion is

**About the Data**

Please read Section VIII very carefully. On Table 2, you will notice a decline in the amount of expenditures from 2010 and beyond. Gaps in reporting and lack of information for future years account for the decline in expenditures in future years. While the data is reported directly from each agency, it is (again) important to note the following:

- Data from the UH System was available only for 2010 and 2011.
- Information from DAGS was not available for 2014 and 2015.
- Projected expenditures provided from the agencies are probably more reliable in the current years due to the difficulty in projecting costs beyond the upcoming fiscal biennium.

## Statewide Inventory by Year

Table 2

**Fiscal Years 2010 to 2015** (In Thousands of Dollars)

| Year | Planning & Design | Construction | Total | Percent |
|---|---|---|---|---|
| 2010 | $662,773 | $2,816,440 | $3,479,213 | 24% |
| 2011 | $282,480 | $2,479,083 | $2,761,563 | 19% |
| 2012 | $236,614 | $2,462,952 | $2,699,566 | 19% |
| 2013 | $222,742 | $1,766,126 | $1,988,868 | 14% |
| 2014 | $188,085 | $1,415,190 | $1,603,275 | 11% |
| 2015 | $200,610 | $1,585,163 | $1,785,773 | 12% |
| **Total** | **$1,793,304** | **$12,524,954** | **$14,318,258** | **100%** |

projected for planning and design and $12.5 billion for actual construction for upgrades and projects. The reported amount does not include regular and routine operating and maintenance costs associated with each department. As discussed in Section VIII, the $14.3 billion is understated.

Of the total CIP expenditure, new projects consisted of 53 percent of all projects, followed by infrastructure upgrades (27 percent) and repair and maintenance (20 percent). The largest planned expenditure is in 2010 totaling approximately $3.5 billion. The lowest expenditure is in 2014 totaling approximately $1.6 billion. The slight downward trend from 2010 to 2015 does not reflect declining infrastructure needs but reflects the impact of ARRA stimulus spending in 2010 and the lack of a forward budget for the University of Hawaii System for FY 2012-2015. It is reasonable to assume that as project needs are realized, and more needs and information are compiled, expenditures in future years may increase.

The categories considered in this report are: 1) Water and Environment, 2) Transportation, 3) Public Facilities, 4) Energy, and 5) Disaster Resiliency Associated Costs. These categories are further delineated into subcategories. The largest P&D and construction expenditure category were for transportation purposes, with $7.85 billion or 55 percent of the expenditure of all categories combined. Of the $7.85 billion, approximately $6 billion is for road, highway and mass transit purposes. Projects associated with fixed rail totals $3.2 billion, making it the largest of all planned infrastructure projects in the state over the next six years. The agency with the largest planned expenditure is the State Department of Transportation, followed by the City and County of Honolulu's Department of Transportation Services.

Table 3

## Statewide Inventory by County

**Fiscal Years 2010 to 2015** (In Thousands of Dollars)

| County | Planning & Design | Construction | Total | Percent |
|---|---|---|---|---|
| Oahu | $908,627 | $9,448,566 | $10,357,193 | 73% |
| Maui | $608,979 | $1,154,577 | $1,763,556 | 12% |
| Hawaii | $146,402 | $1,192,224 | $1,338,626 | 9% |
| Kauai | $72,408 | $617,475 | $689,883 | 5% |
| **Total** | **$1,736,416** | **$12,412,842** | **$14,149,258** | **100%** |

## Projected CIP Expenditures by Geography

Infrastructure requirements for the island of Oahu account for 73 percent of current projects, or approximately $10.3 billion of planning and construction costs. With approximately 80 percent of the state's population, major airports, harbors, sewage systems, the city's High Speed Rapid Transit Project, and the University of Hawaii at Manoa, Oahu by far has the lion's share of infrastructure funds statewide.

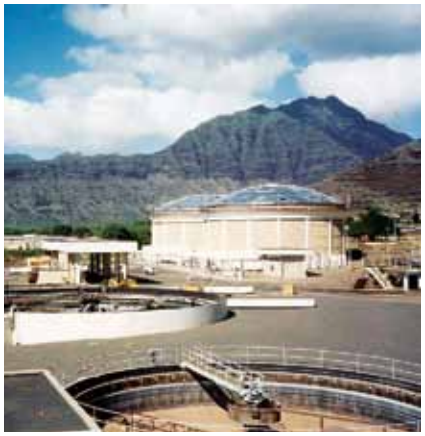
The counties of Maui, including the islands of Lanai and Molokai (12 percent), Hawaii (nine percent) and Kauai (five percent) followed in order. Perhaps the increased population and development on the island of Maui explains the infrastructure demand, which outpaced the Big Island. About $1.8 billion in infrastructure costs are planned for Maui, followed by $1.3 billion and $689 million on Hawaii and Kauai, respectively. The island with the least planned expenditure is Kauai, with approximately $690 million or five percent of the total statewide expenditure.

Table 4

## Statewide Inventory by Category

**Fiscal Years 2010 to 2015** (In Thousands of Dollars)

| | Planning & Design | Construction | Total | Percent |
|---|---|---|---|---|
| Water | $483,435 | $2,157,539 | $2,640,974 | 18% |
| Transportation | $809,430 | $7,037,375 | $7,846,805 | 55% |
| Public Facilities | $466,516 | $3,252,776 | $3,719,292 | 26% |
| Energy | $8,188 | $47,629 | $55,817 | <1% |
| Disaster | $25,735 | $29,635 | $55,370 | <1% |
| **TOTAL** | **$1,793,304** | **$12,524,954** | **$14,318,258** | **100%** |



## Projected CIP Expenditure by Category

For the purposes of this report, infrastructure expenditures fall within five major categories: Water and Environment, Transportation, Public Facilities, Energy, and Disaster Resiliency.

The subcategories of water and environment include: 1) dams and water irrigation systems, most of which are owned and operated primarily by the state or various municipal water departments; 2) drinking water, which includes municipal potable water lines, storage reservoirs, treatment facilities, pump stations, and supporting facilities; 3) solid and hazardous waste, which includes collection and disposal (transfer stations, H-Power, and sanitary landfills) of refuse and hazardous waste by various municipalities; and 4) wastewater systems, which includes collection (gravity sewers, pump stations and force mains) and wastewater treatment and disposal facilities.

# Proposed Statewide CIP Expenditures by Categories

Table 5

**Fiscal Years 2010 to 2015** (In Thousands of Dollars)

| Category | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | TOTAL |
|---|---|---|---|---|---|---|---|
| **WATER AND ENVIRONMENT** | | | | | | | |
| a. Dams and Water Irrigation Systems | $57,879 | $63,015 | $46,207 | $44,735 | $34,545 | $25,650 | $272,031 |
| b. Drinking Water | $47,879 | $64,194 | $66,844 | $72,267 | $78,114 | $84,840 | $414,139 |
| c. Solid and Hazardous Waste | $173,540 | $185,449 | $25,481 | $70,394 | $42,500 | $13,160 | $510,524 |
| d. Wastewater | $239,941 | $387,561 | $314,836 | $262,594 | $170,467 | $68,882 | $1,444,281 |
| Subtotal | $519,239 | $700,219 | $453,368 | $449,990 | $325,626 | $192,532 | $2,640,975 |
| **TRANSPORTATION** | | | | | | | |
| a. Airports | $375,823 | $325,970 | $31,977 | $30,183 | $49,020 | $86,501 | $899,474 |
| b. Harbors* | $51,217 | $95,783 | $42,812 | $36,712 | $13,562 | $164,812 | $404,898 |
| c. Highways and Roads* | $617,086 | $499,448 | $446,680 | $378,322 | $493,049 | $385,371 | $2,819,956 |
| d. Bridges* | $143,821 | $76,895 | $100,352 | $120,102 | $55,053 | $36,625 | $532,848 |
| e. Mass Transit (Buses & Rail) | $1,032,504 | $350,507 | $980,156 | $319,108 | $193,525 | $313,830 | $3,189,629 |
| Subtotal | $2,220,451 | $1,348,603 | $1,601,977 | $884,427 | $804,209 | $987,139 | $7,846,805 |
| **PUBLIC FACILITIES** | | | | | | | |
| a. Public Buildings*** | $124,277 | $262,765 | $236,831 | $213,251 | $87,036 | $71,413 | $995,573 |
| b. Public Parks and Recreation | $80,119 | $86,253 | $81,717 | $70,867 | $63,251 | $72,526 | $454,733 |
| c. Schools (UH**, DOE) & Libraries | $526,972 | $323,283 | $307,960 | $352,620 | $309,070 | $449,080 | $2,268,985 |
| Subtotal | $731,368 | $672,301 | $626,508 | $636,738 | $459,357 | $593,019 | $3,719,291 |
| Energy*** | $5,700 | $29,017 | $7,340 | $7,340 | $3,710 | $2,710 | $55,817 |
| Disaster Resiliency Associated Costs | $2,460 | $11,422 | $10,372 | $10,372 | $10,372 | $10,372 | $55,370 |
| **Total** | **$3,479,218** | **$2,761,562** | **$2,699,565** | **$1,988,867** | **$1,603,274** | **$1,785,772** | **$14,318,258** |

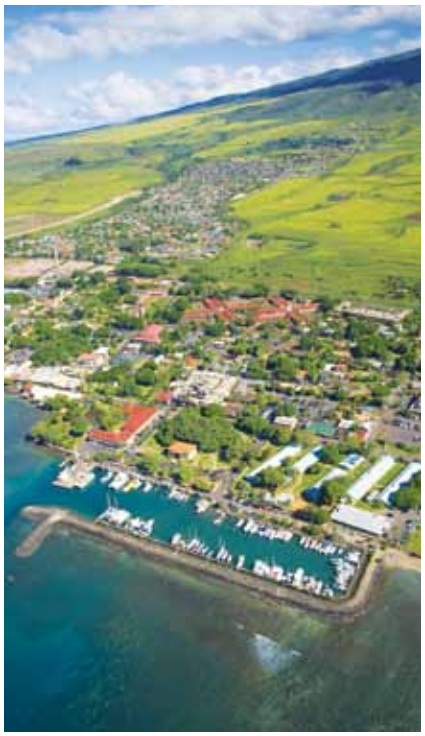
Notes: *Land cost not included **UH data available for 2010 & 2011 only ***DAGS data not available for 2014 & 2015

Table 6

## Statewide Inventory by Type of CIP

**Fiscal Years 2010 to 2015** (In Thousands of Dollars)

| Type | New | Upgrades | R&M | Total | Percent |
|---|---|---|---|---|---|
| 2010 | $1,918,389 | $894,088 | $666,744 | $3,479,221 | 24% |
| 2011 | $1,287,865 | $913,631 | $560,066 | $2,761,562 | 19% |
| 2012 | $1,483,242 | $704,502 | $511,818 | $2,699,562 | 19% |
| 2013 | $1,049,313 | $387,572 | $551,982 | $1,988,867 | 14% |
| 2014 | $720,820 | $576,866 | $305,588 | $1,603,274 | 11% |
| 2015 | $1,097,768 | $380,333 | $307,671 | $1,785,772 | 12% |
| **Total** | **$7,557,397** | **$3,856,992** | **$2,903,869** | **$14,318,258** | **100%** |
| **Percent** | **53%** | **27%** | **20%** | | **100%** |



About 55 percent or $7.9 billion in transportation infrastructure accounts for the largest expenditure in the state. Its subcategories include: expenses related to airports (runways, taxiways, hardstands, terminals, and all support facilities); harbors (piers, terminals and all harbor support facilities); highways and roads (state highways, tunnels, freeways, municipal streets, traffic lights, street lights, and all supporting infrastructure and facilities); bridges (both state and municipal); and mass transit which includes both bus facilities and fixed rail (cost of land, equipment, fixed guide-way, support facilities, and buildings). The third category is public facilities, which includes schools, libraries, parks, recreational facilities, government buildings, and related supporting infrastructure. The final two categories are expenditures relating to energy and disaster resiliency.

About 26 percent or $3.7 billion of projected infrastructure costs are for public facilities, which include school improvements and upgrades at the University of Hawaii System, Department of Education and state libraries. Water-related infrastructure, which includes dams, irrigation systems, drinking water, solid waste, and wastewater systems, accounted for 18 percent of current projects, or $2.6 billion of expenditures. Energy- and disaster-management related infrastructure accounted for less than one percent each of public infrastructure projects, totaling approximately $55 million each during the next six years.

## Projected CIP Statewide Expenditure by Inventory Type

Of the $14.3 billion in infrastructure costs, $2.9 billion (20 percent) was for repair and maintenance, $3.9 billion for upgrades (27 percent), and $7.5 billion (53 percent) for new construction. These amounts, however, are to maintain the existing level of service that current infrastructure provides and do not constitute long-range infrastructure development. Annual operation and maintenance costs are not included in these figures.

## Projected CIP Statewide Expenditures by Government Agencies

State and county agencies are tasked with overseeing and managing the state's infrastructure. To meet Hawaii's infrastructure needs, the executive and legislative branches of government will need to exercise strong leadership and commitment towards funding this endeavor. Because transportation and mass transit were the largest categories of public infrastructure, the Hawaii Department of Transportation

# Proposed CIP Statewide Expenditures by Agencies

Table 7

**Fiscal Years 2010 to 2015** (In Thousands of Dollars)

| Agency | Planning & Design | Construction | Total |
|---|---|---|---|
| State Department of Transportation (DOT) | | | |
| a. Harbors Division* | $77,666 | $320,232 | $397,898 |
| b. Highways Division* | $251,432 | $1,875,375 | $2,126,807 |
| c. Airports Division* | $41,963 | $857,511 | $899,474 |
| Subtotal | $371,061 | $3,053,118 | $3,424,179 |
| State Department of Accounting and General Services (DAGS)**** | $28,919 | $288,739 | $317,658 |
| State Department of Education (DOE) | $138,118 | $1,632,844 | $1,770,962 |
| University of Hawaii System (UH)*** | $75,403 | $422,620 | $498,023 |
| Hawaii Department of Business, Economic Development and Tourism (DBEDT)** | 0 | 0 | 0 |
| State Department of Natural Resources (DLNR)** | 0 | 0 | 0 |
| State Department of Hawaiian Homeland (DHHL)** | 0 | 0 | 0 |
| State Department of Agriculture (DOA)** | 0 | 0 | 0 |
| CCH Department of Design and Construction (DDC) | $73,886 | $745,694 | $819,580 |
| CCH Department of Environmental Services (DES) | $145,833 | $1,295,981 | $1,441,814 |
| CCH Department of Parks and Recreation (DPR) | $31,596 | $204,541 | $236,137 |
| CCH Department of Transportation Services (DTS) | $257,005 | $3,305,775 | $3,562,780 |
| CCH Board of Water Supply (BWS) | $9,633 | $218,155 | $227,788 |
| COH Department of Public Works (HDPW) | $51,925 | $380,361 | $432,286 |
| COM Department of Public Works | $565,119 | $565,119 | $1,130,237 |
| COK Department of Public Works (KDPW) | $44,806 | $412,008 | $456,814 |
| COK Department of Water Supply (KDWS)** | 0 | 0 | 0 |
| **Total** | **$1,793,304** | **$12,524,955** | **$14,318,258** |

* Land cost not included

** Information not provided

*** UH data available for 2010 & 2011 only

**** DAGS data not available for 2014 & 2015

Note: COH and COM Department of Water Supply CIP budget are included in their respective DPW budgets

and the City and County of Honolulu Department of Transportation Services will be responsible for expending $3.4 billion and $3.6 billion for infrastructure cost, respectively. The Department of Education and University of Hawaii System, which provide for the educational needs of the state, account for nearly $2.0 billion of infrastructure costs, followed by $1.4 billion from the City and County of Honolulu's Department of Environmental Services, which is responsible for solid waste, sewer and waste water treatment facilities.

## X. A Final Note

### *The report is a good start to creating a uniform method of reporting*

Obtaining data from 20 governmental agencies was extremely time-consuming and difficult. Our project team would like to pay special thanks to the department heads and staff who poured over significant amounts of data to obtain information required for this first statewide report on physical infrastructure. While HIPA requested information in certain formats, the various agencies do not necessarily report their data in those forms. Furthermore, it was revealed that some agencies do not have specific budgetary projections that go beyond the current biennium. Nonetheless, we reported only what was submitted in order to avoid making assumptions about missing data, particularly O&M and expenditures in the later years.

We believe that proper and regular reporting of Hawaii's physical infrastructure is an important activity that benefits the public. Without accurate data and information, policy-makers are unable to understand the impact and requirements needed to maintain and improve one of Hawaii's most important and costly governmental functions. Furthermore, without accurate data, long-range planning is impaired. Periodic updates to this report are therefore strongly recommended. This report is a good start to creating a uniform method of reporting which can be used in future years and studies.

# XI. Appendix

## About the Project Coordinator

### Hawaii Institute for Public Affairs

Founded in 2000, the Hawaii Institute for Public Affairs ("HIPA") is Hawaii's first independent non-partisan and non-governmental public policy institute that conducts research and analysis on Hawaii issues, and provides a collaborative and neutral forum where issues can be thoughtfully discussed and acted upon. HIPA's initiatives include the integration of sound public policy analysis, critical thinking and facilitation/mediation techniques to foster policy action and results.

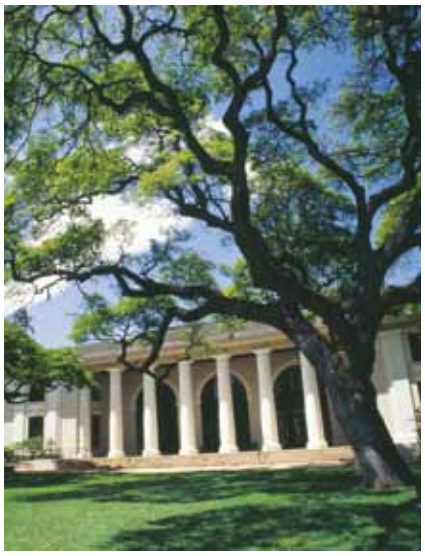
## Infrastructure Leadership Group

To assist HIPA in this project, a "leadership group" was formed. The purpose of this advisory board was to provide the project team with practicable and varied perspectives on infrastructure. The group met several times to provide guidance and feedback on the project scope, approach, methodology, and findings of the study. More so, the leadership group, which is comprised of key state and local government representatives, provided access and resources required to complete the inventory survey.

### Leadership Group Members

Jeanne Schultz Afuvai, Hawaii Institute for Public Affairs (Co-Chair)
Michael Hunnemann, American Society of Civil Engineers, Hawaii Section (Co-Chair)

Larry Agena, Belt Collins
Mark Anderson, Hawaii Department of Business and Economic Development and Tourism
Alan Arakawa, Alexander and Baldwin
David Arakawa, Land Use Research Foundation
Jim Bell, American Planning Association
Tom Dinell, Urban Land Institute
Russell Figueiroa, R.M. Towill Corporation
Lester Fukuda, American Public Works Association
Riley Hakoda, Honolulu Board of Realtors
William Kaneko, Hawaii Institute for Public Affairs
Karl Kim, U.H. Department of Urban and Regional Planning
Collins Lam, Honolulu Mayor's Representative, Department of Design and Construction
Warren Lee, Hawaii Mayor's Representative, Department of Public Works



Joshua Magno, Pacific Resource Partnership
Abbey Mayer, Hawaii Office of Planning
Wayne Melnyk, Nordic PCL
Brian Minaai, University of Hawaii System
Randy Moore, Hawaii Department of Education
Brennon Morioka, Hawaii Department of Transportation
Karen Nakamura, Building Industry Association of Hawaii
Tad Ono, Parson Brinkerhoff Quade Douglas
Mark Oto, Honolulu Mayor's Representative,
Department of Budget and Fiscal Services
Russell Saito, Hawaii Department of Accounting and General Services
Speaker Calvin Say, House of Representative
Cheryl Soon, SSFM International
Garrett Sullivan, General Contractors Association
Jiro Sumada, Hawaii Department of Transportation, Highways Division
Joan Takano, Hawaii Government Employee Association
Dave Taylor, Maui Mayor's Representative,
Department of Environmental Management
Ken Teshima, Kauai Mayor's Representative, Department of Public Works
Ed Teixeira, Hawaii Department of Civil Defense
James Tollefson, Chamber of Commerce of Hawaii
Senator Shan Tsutsui, Hawaii State Senate
Robert (Bo) Wheeler III, Bank of Hawaii
Bill Wilson, Hawaiian Dredging Company
Josh Wisch, Office of U.S. Representative Mazie Hirono

In addition to the leadership group, the following individuals and agencies provided resources, consultation and assistance:

Greg Arakaki, Kennedy/Jenks
Kathleen Chu, CH2MHill
Westley Chun, CH2MHill
Gail Fujita, U.S. Department of Commerce
Jeffrey Kalani, Yogi Kwong Engineers, LLC
Owen Miyamoto, Honolulu Community College
Irene Takizawa, Hawaii Institute for Public Affairs
Roy Tsutsui, R.M. Towill Corporation
Lydia Yee, R.M. Towill Corporation

Thank you to R.M. Towill Corporation for serving as the project consultant, responsible for the data gathering, analysis and reporting of the findings of this report.

## Participating Agencies

The following governmental agencies participated in this study, which included research, data analysis, and submission of information in the requested format.

City and County of Honolulu Department of Design and Construction (DDC)
City and County of Honolulu Department of Environmental Services (ENV)
City and County of Honolulu Department of Parks and Recreation (DPR)
City and County of Honolulu Department of Transportation Services (DTS)
City and County of Honolulu Board of Water Supply (BWS)
County of Hawaii Department of Public Works (DPW)
County of Hawaii Department of Water Supply (DWS)
County of Kauai Department of Public Works (KDPW)
County of Kauai Department of Water Supply (KDWS)
County of Maui Department of Public Works (MDPW)
County of Maui Department of Water Supply (MDWS)
Hawaii Department of Accounting and General Service (DAGS)
Hawaii Department of Agriculture (DOA)
Hawaii Department of Business, Economic Development and Tourism (DBEDT) (Various offices)
Hawaii Department of Education (DOE)
Hawaii Department of Hawaiian Home Lands (DHHL)
Hawaii Department of Land and Natural Resources (DLNR)
Hawaii Department of Transportation (DOT)
University of Hawaii System (UH)

## Project Funding Sources and Sponsors

This report is sponsored by a variety of public and private entities. A special thank you to the following for their generosity, vision and dedication in addressing Hawaii's infrastructure needs.

**Primary Funder**

Funded in part by a grant from the
Economic Development Administration, U.S. Department of Commerce

**Project Sponsors & Funders**

Bank of Hawaii
Alexander & Baldwin
Honolulu Board of Realtors
Pacific Resource Partnership
R.M. Towill Corporation
Russell Figueiroa
Jayar Construction, Inc.
Hawaiian Dredging Construction Company, Inc.
Delta Construction Corporation
Koga Engineering & Construction, Inc.
MK Engineers, Ltd.
The Limtiaco Consulting Group
Nordic PCL Construction Services, Inc.
American Council of Engineering Companies of Hawaii
Okahara and Associates, Inc.
BIA Hawaii

## For more information:

Hawaii Institute for Public Affairs
1001 Bishop Street, Suite 1132
Honolulu, Hawaii 96813
Tel: 808-585-7931
Fax: 808-585-7932
Website: www.hipaonline.com


Hawaii Institute for Public Affairs
1001 Bishop Street
Suite 1132
Honolulu, Hawaii 96813

Tel: 808-585-7931
Fax: 808-585-7932

Website: www.hipaonline.com