Building Strong Collaborative Relationships for a Sustainable Water Resources Future:

STATE OF HAWAII

SUMMARY OF STATE WATER PLANNING

U.S. Army Corps of Engineers
Civil Works Directorate
441 G Street NW
Washington, DC 20314-1000

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The findings contained in this report are based on the information collected from the literature search and interviews for this initiative and should not be construed as an official Department of the Army position, policy or decision unless so designated by other official documentation.

STATE OF HAWAII

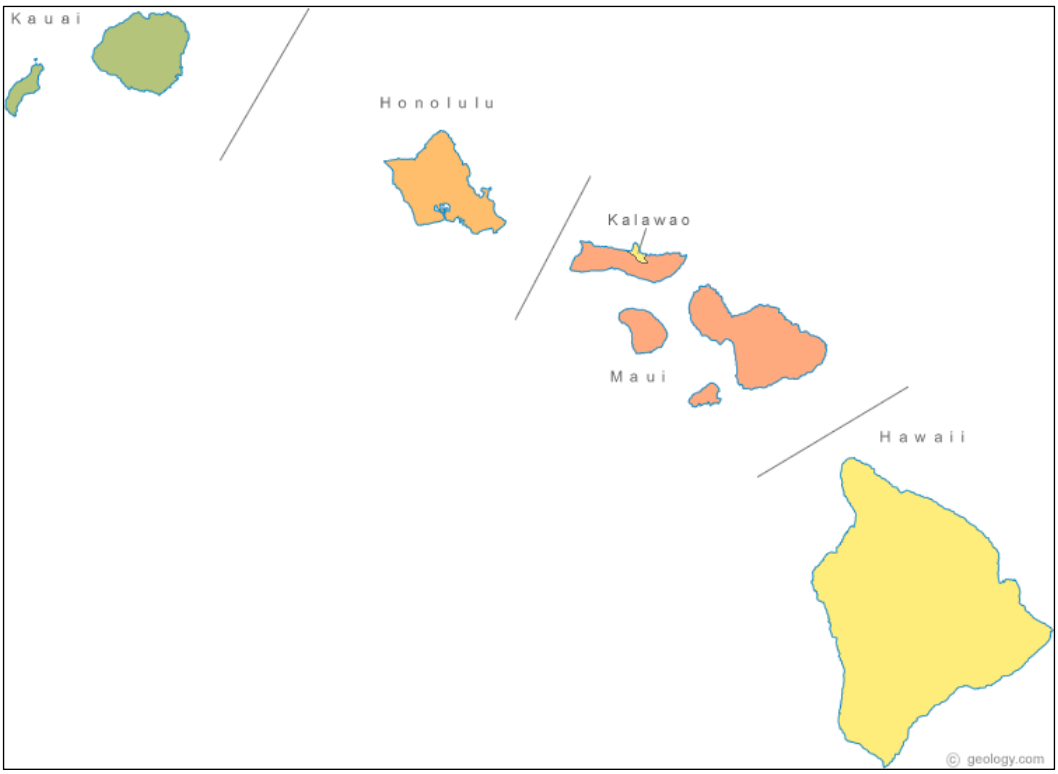

Figure 1. Counties of Hawaii (Geology.com, 2008)

1. RESPONSIBLE STATE AGENCIES/REGIONAL ENTITIES

The Department of Land and Natural Resources' (DLNR) - Commission on Water Resource Management (CWRM) is the state's trustee of water resources under the State Water Code [Chapter 174C, Hawaii Revised Statutes (HRS)]. CWRM has jurisdiction over land-based surface and groundwater resources excluding coastal waters. In general, CWRM is responsible for addressing water quantity issues while the Department of Health (DOH) is responsible for addressing water quality issues.

The mission of CWRM is "to protect and enhance the water resources of the State of Hawaii through wise and responsible management (WRPP)." The CWRM comprises seven members including the director of DLNR, who serves as the chairperson, and the director of DOH. Under the direction of CWRM, the Deputy Director of Water Resources Management administers and implements the State Water Code. Four branches compose the CWRM staff: Survey, Planning, Ground Water Regulation, and Stream Protection and Management.

Ken C. Kawahara, P.E., Deputy Director
Commission on Water Resource Management
P.O. Box 621
Honolulu, HI 96809
(808) 587-0214
http://hawaii.gov/dlnr/cwrm/aboutus_commission.htm

The designated POC is:

Lenore Ohye, Chief
Planning Branch
Commission on Water Resource Management
P.O. Box 621
Honolulu, HI 96809
(808) 587-0216
lenore.n.ohye@hawaii.gov

DOH's Environmental Protection Office (EPO) administers the Water Quality Management Program, which is responsible for setting the state's water quality standards, and monitoring, assessment, and long-range planning for surface water quality (DOH, 2008(b)).

Kelvin Sunada, Chief
Environmental Planning Office
Department of Health
919 Ala Moana Blvd., Room 312
Honolulu, HI 96814-4920
(808) 586-4337
http://hawaii.gov/health/environmental/env-planning/index.html

The Marine and Coastal Zone Advocacy Council (MACZAC) serves as a public advisory body to CZM. The council comprises twelve members who are recruited from Kauai, Oahu, Maui, Molokai, Lanai, and Hawaii and represent the diverse backgrounds and interests of the state.

Doug Tom, Program Manager
Coastal Zone Management Program
Department of Business, Economic Development & Tourism
P.O. Box 2359
Honolulu, HI 96804
808-587-2875
dtom@dbedt.hawaii.gov

2. STATE/REGIONAL WATER PLANNING STATUS

The Hawaii Water Plan (HWP) is the state's comprehensive water resources plan. Initially, the HWP was formally adopted by CWRM in 1990. In 2000, CWRM published the *Statewide Framework for Updating the Hawaii Water Plan* (Framework), as a way to guide future plan

updates and implement a more comprehensive water resources plan. This planning framework called for more integration and coordination between the various components of the HWP (Figure 2):

- Water Resource Protection Plan (WRPP), prepared by CWRM
- Water Quality Plan (WQP), prepared by DOH
- State Water Projects Plan (SWPP), prepared by DLNR's Engineering Division
- Agricultural Water Use and Development Plan (AWUDP), prepared by the Department of Agriculture (DOA)
- County Water Use and Development Plans (WUDPs), prepared by each county [County of Kauai (1990), County of Maui (1990), County of Hawaii (1989), and the City & County of Honolulu (1990)]

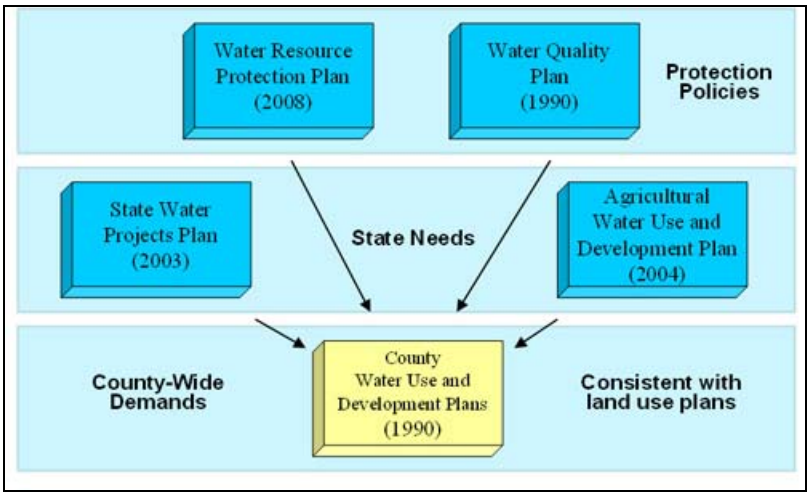

Figure 2. Components of the Hawaii Water Plan (CWRM, 2008)

The State Water Code provides for continual review and updating of the HWP components to incorporate new and better information and changes in land use designations, plans and policies. The CWRM's Framework recommends five-year updates for each component plan. In general, the HWP components have 20-year planning horizons. However, because the various components are updated independently, the ends of the planning horizons do not coincide. For example, the WRPP extends to 2030 while the SWPP has a horizon that extends only to 2020. County plans have projections to 2010.

Since the publication of the Framework, several components of the HWP have been updated. The SWPP was updated in 2003, the AWUDP 2004, and the WRPP in 2008. The City & County of Honolulu is currently developing regional *watershed management plans*, which would together comprise the Oahu Water Management Plan and serve as the County's WUDP. A draft copy of the Hawaii WUDP was made available for public review in 2007 (County of Hawaii Department of Water Supply), and the Maui WUDP update is underway. Scopes of work for the Kauai WUDP and WQP have been developed and contract negotiations are underway.

Planning and management of Hawaii's coastal waters is the responsibility of the Department of Business, Economic Development & Tourism's (DBEDT) Coastal Zone Management (CZM)

Program (CZM, 2009). With cooperation from federal and local agencies, CZM uses a variety of regulatory and non-regulatory techniques to address coastal issues and comply with environmental laws. CZM prepares and implements a statewide plan for managing marine and coastal issues, the Ocean Resources Management Plan (ORMP) (CZM, 2006).

3. WATER MANAGEMENT VISION AND GOALS

The mission of CWRM is "to protect and enhance the water resources of the State of Hawaii through wise and responsible management (WRPP)."

CWRM's goals are (WRPP):

- *To protect the water resources of the State and provide for the maximum beneficial use of water by present and future generations*
- *To develop sound management policies and a regulatory framework to facilitate decisions that are:*
  (a) proactive and timely
  (b) based on best available information and sound science
  (c) focused on the long-term protection and reasonable and beneficial use of both ground and surface water resources
  (d) protective of water rights and public trust purposes
- *To achieve sound water-resource planning, extensive baseline and current data collection for ground and surface water, and statewide compliance with the State Water Code*

CWRM's objectives are (WRPP):

- *Fulfill the State's responsibility, as trustee of water resources, to set policies, protect resources, define uses, establish priorities while assuring rights and uses, and establish regulatory procedures through the implementation and administration of the State Water Code*
- *Seek legislative support, budget appropriations, federal funding, and grants to execute CWRM policies, goals, objectives, and programs, as they are defined and implied by the State Water Code and its directives for interpretation included in HRS §174C-2*
- *Seek maximum beneficial use of the waters of the State with adequate provisions for the protection of public interest objectives, as declared in HRS §174C-2*
- *Foster comprehensive water-resource planning for the development, use, protection, and conservation of water via implementing and updating the HWP, in accordance with the HWP requirements and objectives, as declared in the State Water Code and associated HAR* [Hawaii Administrative Rules]
- *Fulfill the specific duties for research, resource protection, instream use protection, interagency cooperation, public education, program coordination, resource inventory and assessment, and determination of appurtenant rights, as declared in HRS §174C-5*
- *Provide the regulatory and internal framework, including best use of information technology, for efficient ground and surface water management*
- *Develop the best available information on water resources, including current and future water use monitoring and data collection, modeling activities, surface and ground water*

quality (chloride levels) and availability, stream flow, stream biota, and watershed health to make wise decisions about reasonable and beneficial use and protection of the resource
- *Support community-based management of water resources and develop short and long-range plans to avoid judicial and quasi-judicial disputes*
- *Enhance and improve current stream protection and ground water protection programs for the benefit of future generations*
- *Carefully consider the requirements of public trust uses, as determined by the Supreme Court's use of the Public Trust Doctrine to inform the Court's interpretation of the State Water Code*
- *Administer and amend, as necessary, water use regulation programs to permit reasonable-beneficial uses of water in such a manner as to protect instream flows and maintain sustainable yields of ground water, as defined in the State Water Code*
- *Execute, in conjunction with appropriate public, federal, State, and county agency consultation, CWRM's responsibility to designate areas of the State for the purpose of establishing administrative control where water resources may be threatened by existing or proposed withdrawals, diversions, or water use*
- *Strive to protect and improve the quality of the waters of the State through the administration of ground and surface water protection programs, in conjunction with the DOH*

DOH's *Strategic Plan Update for Hawaii's Environmental Protection Programs* (2001) lists the following as its goals:

- Land goal— *To protect Hawaii's land from pollutants that endanger people and the environment, and to rehabilitate contaminated lands*
- Groundwater goal— *To protect Hawaii's groundwater from contamination for drinking, irrigation and other appropriate uses*
- Inland water goal—*To protect and restore the quality of Hawaii's streams, wetlands, estuaries and other inland waters for fish and wildlife, recreation, aesthetic enjoyment and other appropriate uses*
- Coastal water goal—*To ensure that Hawaii's coastal waters are safe and healthy for people, plants and animals*

The ORMP is guided by three overarching perspectives (CZM 2006):

1. Connecting Land and Sea—*Careful and appropriate use of the land is required to maintain the diverse array of ecological, social, cultural, and economic benefits we derive from sea*
2. Preserving Our Ocean Heritage—*A vibrant and healthy ocean environment is the foundation for the quality of life valued in Hawaii and the well-being of its people, now and for generations to come*
3. Promoting Collaboration and Stewardship—*Working together and sharing knowledge, experience, and resources will improve and sustain our efforts to care for the land and sea*

CZM's goals and strategic actions for ocean resources management are based on the above mentioned principles, and include:

Connecting Land and Sea:

- Improve coastal water quality by reducing land-based sources of pollution and restoring natural habitats
  - Reduce soil erosion from upland forest ecosystems and conservation lands
  - Reduce pollutant loads from residual, agricultural, and commercial land uses in priority watersheds
  - Restore and protect wetlands, streams, and estuaries
- Protect beaches, wetlands, and coastal communities from shoreline erosion and other coastal hazards
  - Develop and implement a comprehensive and integrated shoreline policy that addresses the impacts of chronic and episodic coastal hazards
  - Develop a Hawaii beach and shoreline management plan with specific management measures to address coastal erosion and other hazards in priority coastal areas
  - Encourage appropriate coastal-dependent development that reduces risks from coastal hazards and protects coastal and cultural resources
- Improve and ensure maintenance and appropriate use of environmental infrastructure
  - Inspect and maintain sewer collection systems including the detection of leaks
  - Reduce the number of individual wastewater systems and improve the operation of existing systems in the coastal environment
  - Reduce illegal stormwater discharges to the wastewater system

Preserving our Ocean Heritage:

- Improve coastal water quality by reducing marine sources of pollution
  - Minimize the introduction and spread of marine alien and invasive species
  - Establish wastewater-discharge restricted zones and conditions for commercial vessels in archipelagic waters
  - Provide appropriate waste management infrastructure to support commercial and recreational marine facilities
- Improve the health of coastal and ocean resources for sustainable traditional, subsistence, recreational, and commercial uses
  - Strengthen and expand marine protected area management
  - Develop ecosystem-based approaches for nearshore fisheries management
  - Establish and institutionalize approaches for restoring, operating, and preserving ancient Hawaiian coastal fishponds and salt ponds
  - Improve enforcement capacity and voluntary compliance with existing rules and regulation for ocean resource protection
  - Enhance the conservation of Hawaii's marine protected species, unique habitats and biological diversity
- Enhance public access and appropriate coastal dependent uses of the shoreline
  - Enhance and restore existing public shoreline areas and scenic vistas
  - Establish new shoreline areas for public and appropriate coastal dependent uses
- Promote appropriate and responsible ocean recreation and tourism that provide culturally informed and environmentally sustainable uses for visitors and residents

  - Develop community-based frameworks and practices for identifying and mitigating ocean recreational use conflicts
  - Promote responsible and sustainable ocean-based tourism
- Encourage cutting edge and appropriate ocean science and technology with safeguards for ocean resource protection
  - Promote alternative ocean energy sources
  - Plan and develop sustainable commercial aquaculture in coastal areas and ocean waters
  - Expand ocean science and technology

Promoting Collaboration and Stewardship:

- Apply integrated and place-based approaches to the management of natural and cultural resources
  - Develop integrated natural and cultural resources planning process and standardized tools
  - Build capacity for community participation in natural and cultural resources management
- Institutionalize integrated natural and cultural resources management
  - Develop legislative and administrative proposal to improve management of natural resources
  - Monitor and evaluate ORMP implementation

4. SCOPE OF WATER RESOURCES PLANNING AND MANAGEMENT

Hawaii is divided into four main counties that roughly correspond to the different islands (Figure 1): County of Kauai (Kauai and Niihau), County of Maui[1] (Molokai, Lanai, Maui, and Kahoolawe), County of Hawaii (Hawaii), and the City & County of Honolulu (Oahu).

In addition to planning at the county level, the state also conducts planning at the watershed level. Traditionally, Native Hawaiians had a land system comprised of various subdivisions of land: *mokupuni* (island), *moku* (district), and *ahupuaa* (division of land generally running from the mountain to the ocean). The WRPP describes the traditional *ahupuaa* management system in detail (Section 9).

DOH assists in watershed planning for water quality (e.g., development of TMDLs, etc.). Priority watersheds include Nawiliwili Bay (Kauai), Hanalei Bay (Kauai), Ala Wai (Oahu), Koolaupoko (Oahu), West Maui, and Hilo Bay (Hawaii) (DOH, 2008(a)).

The WRPP and WQP are the two critical HWP components that determine water usage and strategies for developing water resources. These documents outline regulations, standards, and resource management policies. The WRPP also quantifies the amount of surface and groundwater resources that can be withdrawn sustainably. Both the WRPP and WQP guide the development of the SWPP, AWUDP and WUDPs.

[1] Note: Although the majority of Kalawao County is part of Kalaupapa National Historic Park, Kalawao County is also incorporated into the HWP. DOH administers the county.

The WRPP includes an inventory of all groundwater and surface water hydrologic units in the six main Hawaiian Islands (Oahu, Hawaii, Maui, Kauai, Lanai, and Molokai); the remaining islands (Kahoolawe and Niihau) are unpopulated or very sparsely populated. The majority of the islands' freshwater supply comes from groundwater. Projected water demands for each county by type of use and estimates of sustainable yield for all aquifers are also listed in the WRPP (Figures 3a-c).

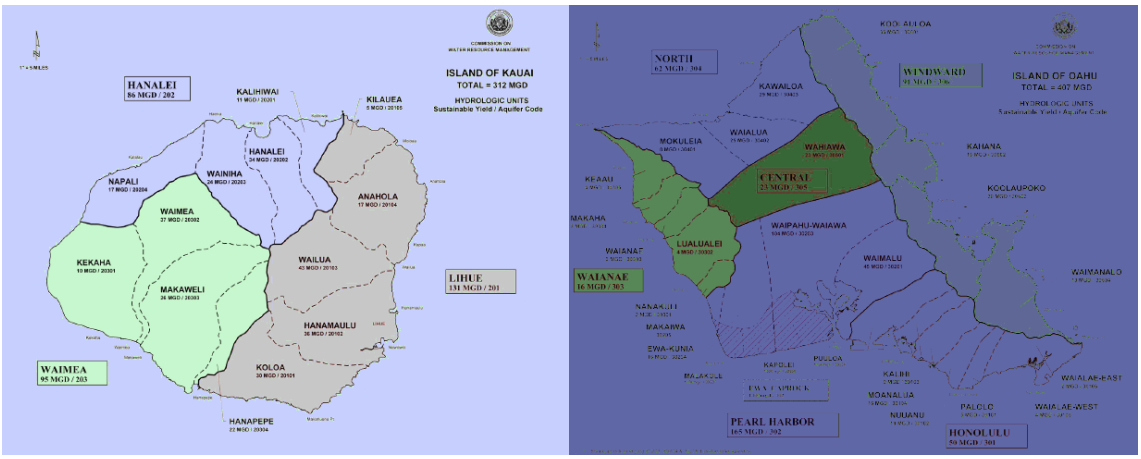

Figure 3a. Groundwater Hydrologic Units and Sustainable Yields for 2008—Kauai and Oahu (WRPP).

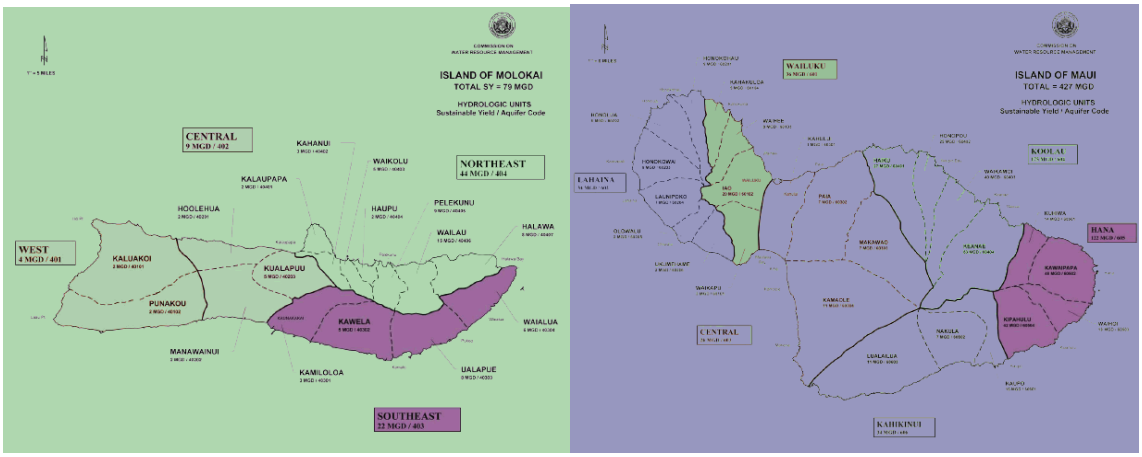

Figure 3b. Groundwater Hydrologic Units and Sustainable Yields for 2008—Molokai and Maui (WRPP).

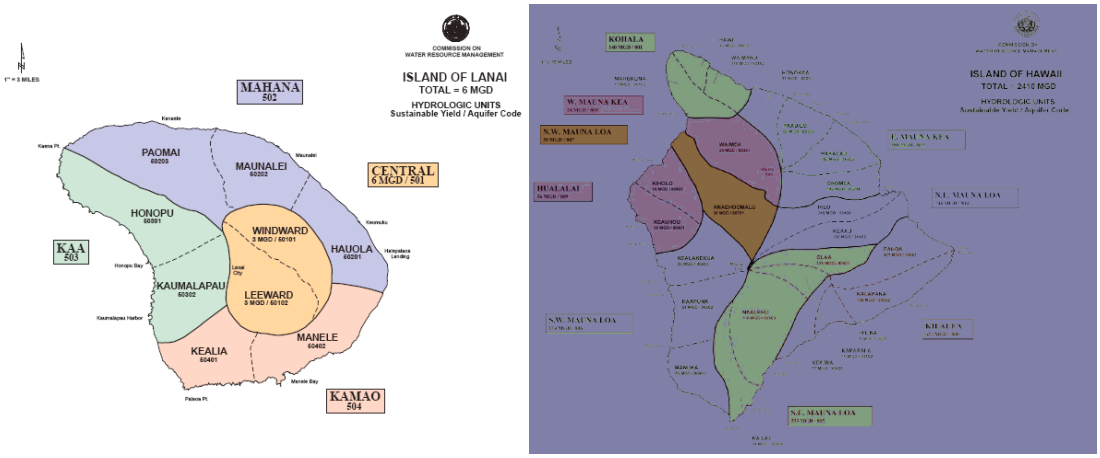

Figure 3c. Groundwater Hydrologic Units and Sustainable Yields for 2008—Lanai and Hawaii (WRPP).

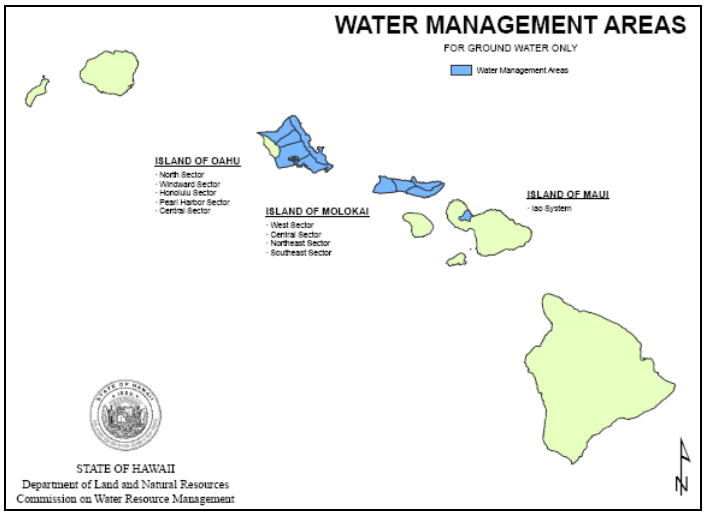

Figure 4. Groundwater Management Areas (CWRM, 2005)

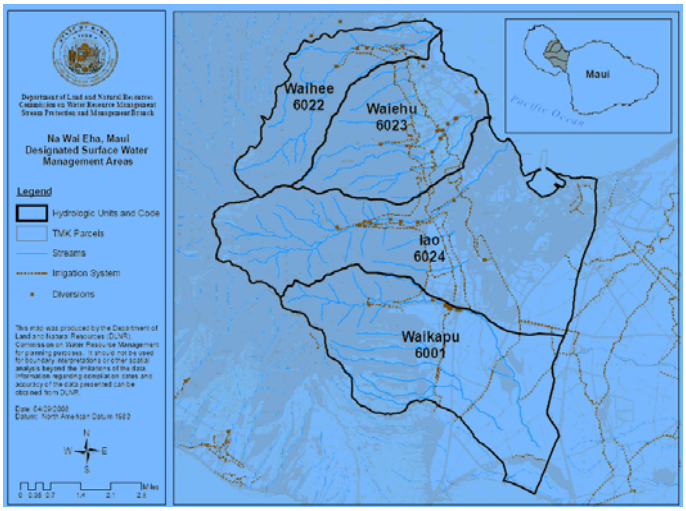

Figure 5. Surface Water Management Areas (CWRM, 2008)

Statewide, CWRM regulates via a permit system the construction of wells, the installation of well pumps, the construction of stream diversion works, and alterations to stream channels. CWRM also collects hydrologic data to refine assessments and identify areas where additional monitoring or regulatory controls may be needed.

For, "hydrologic areas where water resources are being threatened by existing or proposed withdrawals or diversions of water, water quality problems, or serious disputes (WRPP)," CWRM has the authority to designate these areas as water management areas (WMAs). Currently, there are WMAs for groundwater on Oahu, Maui, and Molokai (Figure 4), and one WMA for surface water on Maui (Figure 5). In WMAs, the CWRM provides additional regulation by requiring owners or operators of water sources (i.e., wells or stream diversions) to obtain water use permits that limit the type, quantity, and location of water use. Individual WMAs typically coincide with hydrologic units (i.e., watersheds or aquifers).

On Maui, the surface water WMA and groundwater WMAs overlap. The surface water WMA, Na Wai Eha or *The Four Streams*, covers the Waihee, Waiehu, Iao, and Waikapu streams in the Wailuku District (CWRM, 2009).

The WRPP states that there are "issues such as growing conflicts between agricultural uses of surface water and instream uses, 'surface and ground water' interrelationships, and the effects of growing water demands on traditional and cultural uses of water." The plan encourages future programs to be integrated at the watershed level to address surface water conflicts.

Conservation and water augmentation, such as wastewater reuse, are promoted as viable management strategies in the WRPP. The WRPP advocates the development of a statewide water augmentation program:

> *To meet future water demands throughout the State, alternative water sources should be developed to augment naturally occurring water supplies. The order in which to pursue development of alternative sources is influenced by local and county-level needs and constraints. In some areas of the state, water availability is limited by the extent and capacity of the pump and distribution system, rather than a scarcity of surface and ground water resources. In other areas, increasing water demands may only be met by augmentation and alternative water sources.*

Currently, every county has some form of augmentation program in place.

The WRPP also discusses the development of a state water conservation program and the various conservation measures that could be included in the program. This statewide program would consolidate and coordinate the water conservation plans of the various counties and water providers, many of which already have water conservation plans/programs.

For the development of a statewide conservation framework, the WRPP makes the following recommendations:

- *DLNR should implement the site-specific recommendations of the DLNR Water Conservation Plan. Funds should be sought from the Legislature and DAGS (Department of Accounting and General Services), and other financing options should be pursued, such as rebate programs, performance contracting, and public/private partnerships.*
- *Government agencies should pursue public/private partnerships to contribute funds, implement and promote water conservation efforts, and increase public awareness.*
- *The State should encourage water conservation planning efforts in all State agencies, as the State is one of the largest water users across all counties. State agencies should be encouraged to apply the water conservation planning method described in the DLNR Water Conservation Plan and follow through with plan implementation.*
- *Existing and developing State agency conservation efforts should be identified in the next update of the SWPP. The SWPP should also suggest specific agency conservation goals and actions.*
- *Military installations should be encouraged to develop site/facility-specific water conservation plans that expand on the existing general conservation policies of the Army, Navy, and Air Force. Site/facility-specific military conservation plans should delineate conservation goals and present implementation schedules for these measures. The military should undertake conservation planning efforts with sensitivity to local, regional, and statewide water resource management issues and incorporate extensive personnel and public outreach programs to encourage a conservation and stewardship ethic in the context of Hawaii's particular water concerns.*
- *Water purveyors should encourage large industrial, commercial, agricultural, and institutional users to develop operational water conservation plans and introduce financial incentives to reward users who implement conservation measures and demonstrate reduced consumption.*
- *The State, as trustee of water resources, should promote and coordinate ongoing water conservation efforts across the state, to provide guidance for businesses lacking conservation programs. Cooperative efforts between the State and counties can enhance program development and expand program application.*
- *The State Water Conservation Coordinator should manage water conservation plans and initiatives at the State level, including encouraging the designation of a project manager for each facility/site and working with the project manager to develop and implement a plan for each facility.*

In January 2008, the state Sustainability Task Force released *Hawaii 2050 Sustainability Plan: Charting a Course for Hawaii's Sustainable Future (Sustainability Task Force, 2008).* The Task Force consists of 25 members appointed by the Governor, the State Auditor, the Director of the State Office of Planning, the Speaker of the House, the Senate President, and mayors of the counties of Hawaii, Kauai, Maui, and Honolulu, and the President of the University of Hawaii. Hawaii 2050 incorporates water resources conservation principles and promotes the use of renewable energy, including the usage of solar water heaters. One of Hawaii 2050's strategic actions is:

Conserve water and ensure adequate water supply

We consume the most water per capita in the United States, 18 percent higher than the national average. The decline in agriculture gives our aquifers temporary relief, but with projected

development and the use of agricultural lands for fuel production, usage will increase dramatically. A projected population increase of 300,000 residents by 2030 and increased demand for water from all sectors will further tax this precious resource. We must care for and manage our watersheds, uphold water quality standards, and support adequate infrastructure for residential, commercial and agricultural use.

- *Reduce water consumption by means of education and incentives.*
- *Encourage greater production and use of recycled water.*
- *Continually review water-conserving technologies for possible incorporation in county building codes.*
- *Encourage price structures for water use that furthers conservation.*
- *Require water conservation plans from large private users.*

Climate change is not considered in the HWP, but the WRPP suggests that CWRM should seek legislative funding to support the following investigative actions:

- *Conduct research on the impacts of global climate change to long-term precipitation patterns in Hawaii.*
- *Conduct research on how global climate change would impact Hawaii's hydrologic budget and water resources.*
- *Conduct research on how global climate change would impact Hawaii's potable and non-potable water demands.*
- *Develop improved El Niño forecasting tools.*
- *Together with the county water departments, design and implement mitigation measures to address the range of potential impacts to Hawaii's water resources due to global climate change; identify critical water sources and design mitigation alternatives that may include actions such as partial backfilling of deep wells, construction of hydraulic barriers, and relocation of wells further inland.*
- *Encourage sustainable water supply practices.*

Drought planning, mitigation, and response are also considered in the HWP. The Hawaii Drought Plan (CWRM, 2008), which is incorporated into the HWP by reference, outlines drought-related emergency response and actions to mitigate future drought occurrences. Both the original Hawaii Drought Plan, developed in 2000, and its 2005 update were developed by CWRM with assistance from the U.S. Bureau of Reclamation (CWRM, 2008(a)). In 2004, each county formed a drought committee that developed a drought mitigation strategy for their county. Each mitigation strategy focuses on drought mitigation projects and is incorporated, by reference, in the Hawaii Drought Plan.

The State of Hawaii Multi-Hazard Mitigation Plan (2007) developed by the Hawaii Statewide Hazard Mitigation Forum also considers droughts in addition to hurricanes, tsunamis, floods, earthquakes, volcanic hazards, wildfires, landslides, and erosion. The Mitigation Plan identifies the sources of hazard risk, includes a risk and vulnerability assessment, and describes current mitigation activities and potential mitigation strategies.

5. PARTNERSHIPS, STAKEHOLDER, AND PUBLIC INVOLVEMENT

Hawaii currently partners with several federal, state and local agencies and organizations to develop and execute water resources planning and management. Hawaii collaborates with U.S. Army Corps of Engineers, U.S. Geological Survey, U.S. Department of Agriculture-Natural Resource Conservation Service, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, and the National Park Service. Within the state, DLNR and DOH partner with DOA, the Department of Business, Economic Development and Tourism, the Hawaii Drought Council, county water boards, and many other State and county agencies, community groups and non-governmental organizations. The state also works with the numerous watershed partnerships including the Hawaii Association of Watershed Partnerships, Kauai Watershed Alliance, Koolau Mountains Watershed Partnership, East Molokai Watershed Partnership, Lanai Forest and Watershed Partnership, West Maui Mountain Watershed Partnership, East Maui Watershed Partnership, Leeward Haleakala Watershed Restoration Partnership, Kohala Watershed Partnership, Olaa Kilauea Partnership, Ala Wai Watershed Association, and Hanalei Watershed Hui.

Public participation in the state's planning process is mandated by the State Water Code, primarily in the form of public hearings. How the public's involvement is incorporated into the HWP framework is shown in Figure 6.

In the Framework, each agency is encouraged to utilize an integrated resource planning approach, which includes a stakeholder and public involvement process that would be used in their respective HWP component's development. Public involvement is especially critical in the development of the County WUDP updates. The Framework recommends that the WUDP process incorporate the following elements:

1. Stakeholder and public involvement—*Substantial and credible stakeholder and public involvement (SPI) is critical to the success of the County WUDP. While the precise form of the SPI effort will vary, each county should conclusively demonstrate that the public and identified stakeholders were sufficiently informed about the progress of the plan and that they had adequate opportunity to provide input. The WUDP should discuss how such input was incorporated into the development and evaluation of resource strategy alternatives. At the start of its WUDP process, each county should develop a detailed SPI strategy that reasonably conforms to the following guidelines. Counties are encouraged to conduct greater efforts to inform and involve the public and stakeholders.*

- *Essential stakeholders should be identified. These stakeholders should be kept informed about plan progress and their input at critical stages of the plan development should be solicited.*
- *Sufficient information on important community values with respect to water resources and water supply should be systematically gathered, analyzed, and disseminated.*
- *A group of key individuals may be created and effectively used in an advisory capacity throughout the development of the plan.*

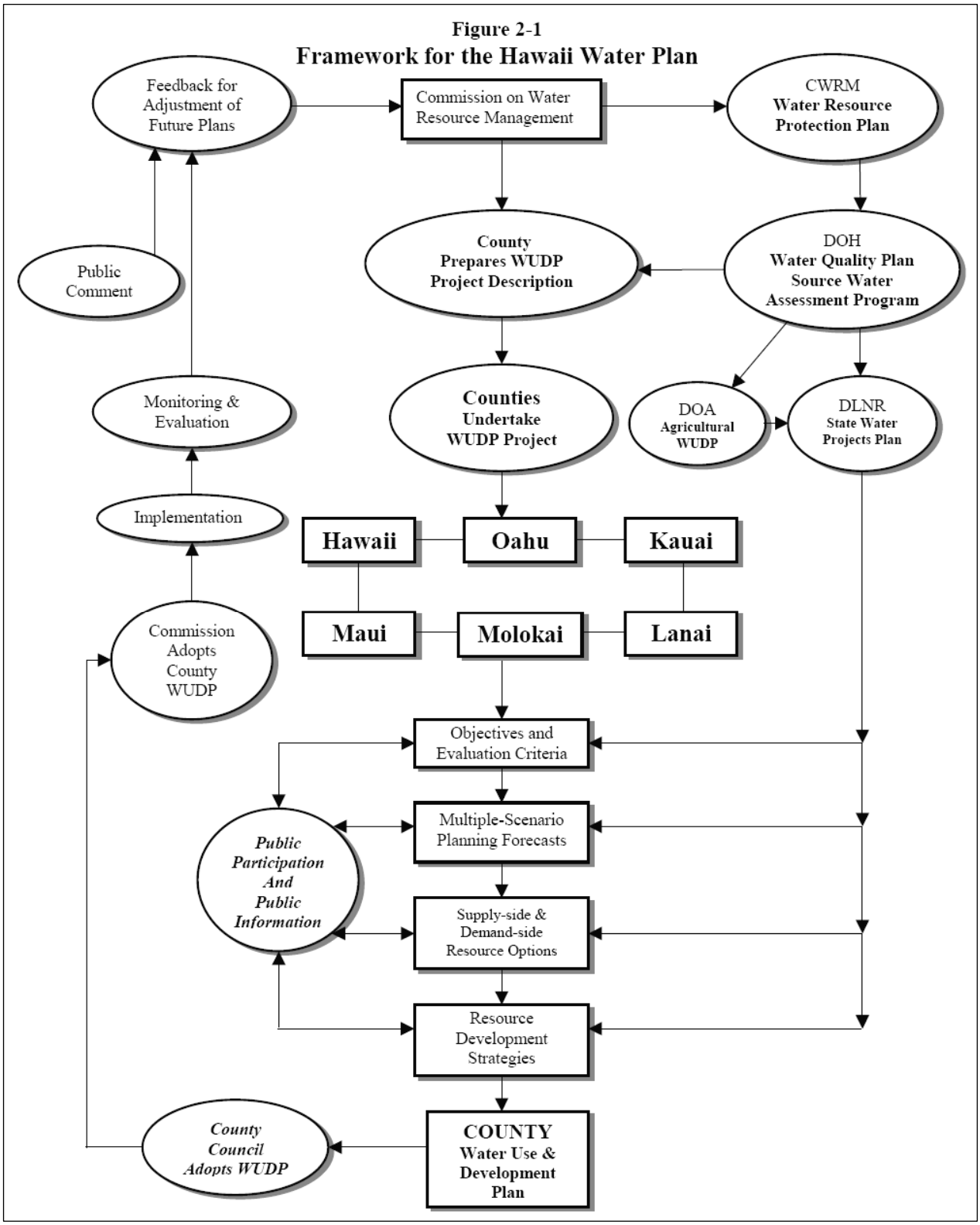

Figure 6. Framework for the Hawaii Water

- *Other special-purpose groups (e.g. technical advisory committees, focus groups, community teams, etc.) may be convened to provide input and assistance in particular plan phases.*
- *Public forums of some type should, at minimum, be held at each of the following points of plan development:*

Developing planning objectives
Screening resource options
Developing and evaluating resource strategies

The county should use multiple vehicles to inform the public at large in advance about these forums. Information at these forums should be presented in a nontechnical manner designed to facilitate public understanding and participation.

- *The incorporation of the results of the foregoing activities into the plan must be clearly demonstrated.*

2. Defining the county public participation process—*A critical cornerstone of the integrated resource planning process is the use of an effective public participation process to identify and evaluate issues, objectives, options and strategies that are of concern to the public and entities with a stake in the outcome of the planning process. Each county should set forth the specific activities that will be undertaken to inform and involve the public and specific stakeholders in the WUDP planning process. Possible activities include, but are not limited to:*

- *Well-publicized public workshops, meetings, or hearings*
- *Individual organizations and stakeholder interviews*
- *Surveys and questionnaires*
- *Focus groups*
- *Formal or informal presentations to community groups*
- *Newsletters*
- *Utility bill inserts*
- *Fact sheets*
- *Slide shows or videos*
- *Local press coverage*
- *Information provided on web pages*

The public participation strategy developed by each county shall be adequately described and incorporated into the county's WUDP Project Description.

6. PLAN IMPLEMENTATION STRATEGY

The state implements actions primarily through regulatory and preventative programs – administered by CWRM, DOH, DLNR, CZM, and other state and county agencies. The WRPP identifies three priority recommendations for CWRM programs (these correspond to the "three general areas in need of CWRM program development and expansion"). The recommendations and suggested supporting actions are (WRPP, 2008):

1. *Statewide water resource monitoring and data collection program development: An integrated, statewide CWRM resource monitoring and data collection program should be developed with equal emphasis on surface and ground water.*

Ground water resource monitoring actions

- *Increase funding for the CWRM-USGS Cooperative Monitoring Program*
- *Evaluate existing monitoring well network*
- *Resurvey all measuring points for deep monitor wells and water-level observation wells*
- *Conduct additional synoptic water-level surveys*
- *Drill new deep monitor wells and improve spatial coverage*
- *Drill new water-level observation wells*
- *Improve existing data collection sites*
- *Collect data on additional groundwater parameters*
- *Map water-level data in GIS format*
- *Well pumpage, water-level, and chloride monitoring actions*
- *Complete CWRM's water use reporting database*
- *Integration of databases and public access to databases*
- *Application of internet and GIS technology*

Spring discharge monitoring actions

- *Integration of databases*
- *Conduct additional analyses*
- *Conduct additional monitoring*

Surface water resource monitoring actions

- *Adopt guidelines for surface water monitoring*
- *Streamflow monitoring program*
- *Increase partnership activities*

Water use reporting actions

- *Require groundwater use reporting of all well owners*
- *Improve groundwater use reporting process*
- *Improve groundwater use reporting compliance*
- *Disseminate groundwater use information*
- *Establish protocols for measuring surface water use*
- *Establish a surface water use reporting program*
- *Revise CWRM policies regarding surface water use reporting*

Regulatory and administration actions

- *Examine water use assessment models*
- *Improve regulatory coordination*
- *Establish continuing education programs for well constructions and pump installation*
- *Establish funding for well abandonment/sealing*
- *Identify and specify follow-up actions for potentially abandoned wells*
- *Establish enforcement mechanism for well abandonment/sealing*

2. *Statewide water resource investigation and assessment program development: To refine components of the hydrologic budget and improve estimates of water resource availability, a statewide investigation and assessment program should be developed. The program should include long-term investigations to evaluate recharge, sustainable yield, ground water/surface water interaction, and instream flow standards and present these in timely updates to the WRPP.*

Rainfall monitoring actions
- *Increase rainfall data collection*
- *Coordinate rainfall data sharing*
- *Update drought frequency information*
- *Update climate station information*
- *Update statewide rainfall frequency information*
- *Update statewide median/average rainfall information*
- *Investigate potential impacts of long-term climate trends*

Cloud water interception and fog drip monitoring actions
- *Increase cloud water interception data collection*
- *Develop methods to estimate cloud water interceptions*

Evaporation monitoring actions
- *Identify evapotranspiration data sources*
- *Establish evapotranspiration monitoring stations*
- *Develop methods to estimate evapotranspiration*
- *Update statewide pan evaporation maps*

Recharge assessment actions
- *Improve recharge estimates*
- *Establish standard rainfall and evapotranspiration data inputs*
- *Consult other agencies*
- *Disseminate recharge information*

Ground water/surface water interaction assessment actions
- *Conduct seepage runs*
- *Collect baseline stream data*
- *Utilize numerical models appropriately*

Sustainable yield assessment actions
- *Apply revised recharge estimates to assess sustainable yield*
- *Apply information on ground water/surface water interaction to reassess sustainable yield*
- *Utilize new ground water monitoring data to study transition zone*
- *Utilize numerical models appropriately*

Instream flow standard assessment actions
- *Assess and adopt interim instream flow standards*
- *Implement instream use protection program implementation plan*

- *Assess stream-related cultural resources*
- *Inventory stream channel alternations*

Assess impacts of climate change on statewide water resources
- *Study the impacts of climate change to Hawaiian hydrology*
- *Study the impacts of climate change on long-range water resources planning*

3. *Statewide water conservation and water shortage program development: A statewide water conservation and water shortage program should be developed and should include provisions for the exploration of alternative water source development and for a water emergency declaration process.*

Water conservation planning actions
- *Implement DLNR water conservation plan*
- *Encourage state agency water conservation planning*
- *Encourage military water conservation planning*
- *Encourage water system conservation planning*
- *Encourage business and facility conservation activities*
- *Identify funding sources to support conservation activities*

Water resource augmentation planning actions
- *Provide guidance in resource augmentation*
- *Promote use of alternative water sources*

Wastewater reclamation activities
- *Explore potential recycled water initiatives*
- *Include water recycling programs in county water use planning*
- *Provide regulatory controls for water quality*

Stormwater reclamation actions
- *Explore potential stormwater reclamation initiatives*
- *Explore the use of stormwater reclamation to control non-point source pollution*

Drought planning actions
- *Continue implementing 2005 Hawaii Drought Plan Update*
- *Complete regular updates of the Hawaii Drought Plan*

Watershed protection actions
- *Support DOFAW's watershed protection initiatives*
- *Assess watershed protection policies*
- *Improve communication between watershed interests*
- *Explore potential watershed protection initiatives*

Water shortage planning actions
- *Develop water shortage plans for all water management areas*
- *Require water shortage plans from all water use permittees*

- *Monitor water use for compliance*
- *Identify domestic water use from public water systems*
- *Evaluate unused water allocations*

Water emergency planning actions

- *Develop water emergency declaration process*

Funding for drinking water infrastructure projects is available to Hawaii's four county water departments though the Drinking Water State Revolving Fund administered by DOH (DOH, 2009). [Additional funding appears to be directly appropriated from the state budget through legislative actions.]

7. OUTCOMES ASSESSMENT PROCESS

The success of the state planning process has not been formally assessed by CWRM since the development of the HWP in 1990 and the release of the Framework in 2000. CWRM does not have established performance measures to assess the effectiveness of the HWP and the planning process.

8. NEEDS, CHALLENGES AND CRITICAL PRIORITIES - INTERVIEW INSIGHTS

Needs, challenges, and priorities are discussed in the plan summary and the reader should look at the summary for more detail. Overall the state is seeking to sustainably manage water, food and energy resources, recognizing that there are synergies, potential conflicts, and interrelationships between these policies. A challenge is to set instream flow standards that protect instream uses and water rights, while balancing the offstream needs of agriculture and energy production.

There is a deficiency of basic water use data from ground and surface water sources. While the CWRM has fairly good data on ground water withdrawals in water management areas, there is a need to improve data collection in the non-water management areas and from stream diversions throughout the state. Ascertaining accurate water use data will help the Commission make better resource management decisions and will also help to monitor long-term trends in uses that is critical in long-range water resource planning.

Drought is a recurring problem in Hawaii and the state must address drought planning, impacts and management. The state is also in the process of establishing a statewide program for water conservation. Efficient water use will defer the need to develop additional water resources to meet growing demands for water.

There are areas in Hawaii that are experiencing growth booms which have made it difficult to manage and distribute water resources. Maui is facing challenges in regard to lack of infrastructure to address growth and water supplies being distant from demand areas. Oahu also has population growth and demand issues.

Agricultural infrastructure issues: Beginning in the early 1900's, sugarcane plantations constructed extensive irrigation systems to divert water from wetter windward areas to the drier

leeward plains. As large-scale monocrop plantations are closing, the irrigation systems are starting to fall into disrepair. Much of this infrastructure became the responsibility of the state Department of Agriculture and they have not had the resources to fully manage and improve the water systems, especially since there are fewer agricultural users and these users are limited by their lack of financial resources.

As Hawaii moves from a plantation-driven water system to emerging new uses for growth, addressing historical/cultural resource needs and environmental concerns have increased competition for water supplies and increased claims for water. The state focuses on long-range water planning and providing guidance and technical information to local county planning and land use agencies, and the local entities are charged with managing the resource. The state only steps in if planning at the county level indicates potential resource conflicts or over-reliance on the water resources of the state and unsustainable water management strategies.

Hawaii's water law has changed over time with it currently being guided by public trust, where water is not owned but its use is guided by the Public Trust Doctrine. Recent rulings by the Hawaii State Supreme Court identified four public trust purposes: domestic water use, the exercise of native Hawaiian traditional and customary rights, maintenance of water in its natural state (environmental use), and reservations of water for Hawaiian Home Lands. This broad legal guidance has created some challenges in quantification of the needs, especially for ecological and cultural purposes. The Commission is currently wresting with developing standards and methods for quantification.

Climate change creates uncertainties that are more significant in an island setting. Not only are there concerns over infrastructure impacts, but also uncertainties in supply related to potential sea level rise, which can impact rainfall and water resources. Being an island state, Hawaii can't easily import water from other areas.

The state has a mandate to sustainably manage water resources. In the future there is likely to be more emphasis on managing water from the mountains to the oeans. There is also a strong desire to have counties and land use planning be done in a way that promotes both sustainable economic and water resource development.

Some additional key needs of the state include:

- Increase funding for: long-term planning, funding for projects and infrastructure improvement, technology, technical tools, and methodologies.
- Improved coordination with multiple agencies.
- Developing and having access to more and better data; especially where there is old or limited data, and better science.
- It is hoped that Counties will utilize data resources in the water plan and provide guidance to CWRM in the allocation of water to land use. In turn, the impacts of land use policies on water resources can be used to inform future land use planning.

Finally, the state has benefited from some federal partnerships including: United States Geologic Survey for climate data/resource data; United States Bureau of Reclamation for some drought

planning assistance; United States Army Corps of Engineers to help fill in gaps in integrate databases, deep monitor well rehabilitation, data collection, and improvement and updates to the states rainfall atlas.

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