25 YEARS PACIFIC INSTITUTE

SUSTAINABLE WATER JOBS

A NATIONAL ASSESSMENT OF WATER-RELATED GREEN JOB OPPORTUNITIES

EXECUTIVE SUMMARY

January 2013

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Executive summary

The United States faces a complex set of water challenges that can only be addressed with a greater commitment to invest in sustainable solutions. Failing to rise to this challenge will leave crumbling infrastructure, contaminated waterways, and water shortages that threaten public health, economic growth, and ecosystems in myriad ways. A range of sustainable water strategies to address 21st century water challenges have emerged that reach far beyond the conventional water sector, such as water conservation and efficiency, water reuse, green infrastructure and low-impact development, watershed restoration, and many other proven and promising practices. As the country shifts to more sustainable management of water resources, additional jobs are created in conventional occupations as well as occupations requiring new skills. The need to take advantage of opportunities for increased quantity and quality of employment opportunities is acute: twelve million U.S. workers interested and available to work are unemployed (BLS 2012), and some 10.5 million more are working but have an income below the official poverty level (DOL 2012).[1]

This report analyzes the jobs created through sustainable water management and the potential for increasing opportunities for disadvantaged communities. The research focuses on the following questions:

- What are the water challenges facing the nation and the best practices across sectors for sustainable water management and use?
- What policies and investments are driving sustainable water strategies and what evidence exists of their prevalence and growth?
- What activities and occupations are involved when sustainable water strategies are put in place?
- What data are available that quantify the jobs generated by these practices?
- What is the quality of these sustainable water occupations, their growth in the overall economy, and the demographics of the workforce involved?
- How can disadvantaged communities be linked to sustainable water jobs?

The research is drawn from a review of academic and professional literature, exploration and analysis of secondary data, interviews with practitioners and researchers, case studies of community-based water jobs programs, and focus group discussions with practitioners. This executive summary provides a synthesis of the research, while the report provides much more detailed information, including lists of occupations, analysis of policy and financing, promising practices of community-based programs, and more. The five case studies published separately provide more in-depth exploration of programs linking disadvantaged communities to water-related green job opportunities.

Water Challenges and Sustainable Solutions

As we enter the second decade of the 21st century, the United States faces a complex and evolving set of freshwater challenges. Despite the fact that the nation is, on average, a comparatively water-rich country, we are reaching absolute limits on our ability to take more water from many river systems, such as the Colorado, Sacramento-San Joaquin, and Chattahoochee River systems. We are also over-pumping groundwater aquifers, including in the Great Plains and California's Central Valley. Wetlands and aquatic ecosystems and fisheries are in decline. At the same time, continued population and economic growth are adding new demands for water, in competition with other uses – and many of the nation's water bodies remain contaminated, with 42% of the nation's total stream length considered to be in poor condition (EPA 2006).

Much of our water infrastructure has not been adequately maintained and confidence in our tap water system is falling.

[1] See full report for references at www.pacinst.org/reports/

The EPA projects that if we maintain current levels of investment in water systems through 2020, the percentage of the nation's water pipes considered "poor," "very poor," or "life elapsed" will reach 44%. Significant public health threats from contaminated drinking water exist in a growing number of communities, and the affordability of water for low-income users is a growing concern. Climate changes compound many of these challenges by altering water availability and quality and increasing the risk of both floods and droughts. A nationwide study analyzing water demand and supply under future climate change scenarios found that 70% of U.S. counties may be at moderate-to-extreme risk of their water demand surpassing water supply by 2050 (NRDC 2010).

In the past, the traditional approach to meeting these challenges has relied on building massive, centralized, capital-intensive infrastructure, such as large dams and reservoirs. This approach has brought many benefits, but it has also come at great social, economic, and environmental costs, many of which were either ignored, undervalued, or unknown at the time. Currently, nearly 40% of North American freshwater and diadromous fish species are imperiled because of physical modifications to rivers and lakes (Jelks et al 2008). Other consequences include loss of valuable ecological services that aquatic ecosystems provide, such as water filtration and retention, as well as massive energy demands to move and treat water and substantial and heavily subsidized costs.

The water challenges our nation faces must be addressed with strategies that avoid the negative outcomes of the past. To develop these strategies, water managers and others are rethinking approaches to ensure that sufficient water resources are available to meet anticipated needs in ways that improve, rather than ignore, social equity, ecological conditions, and long-term sustainability of human-ecological systems. Many of these approaches reflect "Soft Path" principles, which include taking advantage of the potential for decentralized facilities, efficient technologies, flexible public and private institutions, innovative economic instruments, and human capital. We define sustainable water strategies as those that reduce or eliminate water contamination, restore watershed systems, and increase efficient use of natural, social, and financial resources. We group the diverse range of techniques that meet these criteria into five overarching strategies:

1. Urban Water Conservation and Efficiency

This strategy includes a range of technologies and practices that improve the productivity of urban water use, allowing for the same or increased production of goods and services while maintaining or even reducing overall water needs. Conservation and efficiency measures, also referred to as demand management, include installing water-efficient appliances and fixtures in residential, commercial, industrial, and institutional settings; improving landscape efficiency; and replacing and/or repairing pipes to reduce water loss.

2. Stormwater Management

This strategy includes a series of practices and techniques designed to infiltrate, retain, and/or reuse stormwater on the site where it is generated – also referred to as low-impact development (LID) or "green infrastructure." Techniques include downspout disconnection, rainwater harvesting, urban tree planting, land conservation, and installing rain gardens, planter boxes, bioswales, permeable pavement, groundwater retention basins, and green roofs.

Green roof capturing rainwater in Philadelphia (Source: EPA)

3. Environmental Restoration and Remediation

Environmental restoration is the process of returning the chemical, physical, and/or biological components of a degraded ecosystem to a close approximation of pre-disturbance conditions. Techniques include reconfiguring stream beds, daylighting urban stormwater channels, and restoring riparian areas and wetlands.

4. Alternative Water Sources

Alternative water sources include a range of unconventional sources, such as rainwater, stormwater, greywater, and reclaimed water. Projects to capture these alternative water sources can be implemented by a water utility and at the site level by households and businesses.

5. Agricultural Water Efficiency and Quality

These practices improve the productivity of water use, reduce runoff, and, in some cases, improve crop yield and quality. Techniques include utilizing improved irrigation scheduling and technology (such as sprinkler and drip irrigation systems); lining canals and other seepage control options; constructing spill reservoirs and district reoperation; recycling tailwater (also called runoff) on-farm; increasing pump efficiency; utilizing conservation tillage/no till techniques; restoring riparian zones or constructing buffer zones; planting cover crops; and constructing livestock fencing around water bodies.

Policy and Financial Drivers

There are a range of regulatory, financial, and educational drivers of sustainable water management strategies (Table 1). These drivers are implemented at federal, state, and local levels. For example, the federal Clean Water Act, particularly the National Pollutant Discharge Elimination System (NPDES) permitting program and Section 303(d), mandates and promotes techniques in each of the sustainable water strategies. NPDES requires permitting of all discharges to water resources and promotes techniques that reduce discharge volume and improve water quality. Other regulatory drivers include state legislation like Florida's Water Resource Caution Areas, judicial mandates, regional and watershed planning, and state and local building codes and regulations (See Table 1 on the next page).

Likewise, State Revolving Funds (SRFs) and, more specifically, the Green Project Reserve (GPR), are a major source of funding for sustainable water projects. The Drinking Water and Clean Water SRFs establish low-interest loan programs for public water utilities to invest in water infrastructure or projects that improve water quality. The American Recovery and Reinvestment Act (ARRA) of 2009 mandated that 20% of SRFs go to projects with "green" components (referred to as GPR). Of the $3.8 billion allocated to the Clean Water SRF from the Recovery Act, 30% supported an estimated 649 GPR projects. Although the ARRA funding was temporary, the GPR has now been incorporated into all Clean Water SRFs, with a permanent requirement that 10% of SRFs be dedicated to projects with green components (EPA 2012a). Other financial drivers of various sustainable water strategies include funding from water service providers, local government and utility funding, customer revenue and taxes, and natural resource damage claims.

TABLE 1 : KEY DRIVERS OF SUSTAINABLE WATER STATEGIES

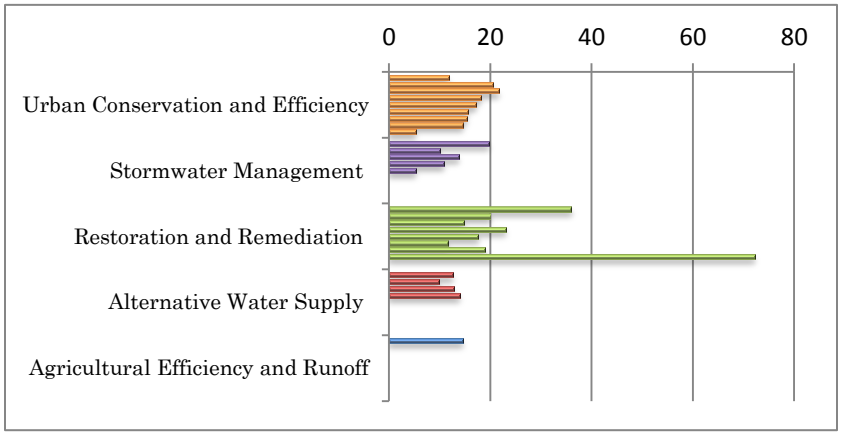
WATER STRATEGY	MANDATES AND REGULATIONS	FINANCIAL INCENTIVES	EDUCATION AND OUTREACH	EMERGING POLICIES AND FUNDING MECHANISMS
Urban Water Conservation and Efficiency	• Federal regulations (e.g. CWA: Water Quality Standards, NEPA) • State and local building codes and regulations (e.g., California's Water Conservation Act 2009)	• Water service providers: Customer revenue (e.g., SNWA Water Smart Landscapes Rebate) • Federal, state, and local government funding (e.g., SRF loans)	• Labeling (e.g., WaterSense) • Educational campaigns (e.g., Save our Water, Home Water Works, Neverwaste Consumer Media Campaign)	• Water service companies • PACE Programs • Water demand mitigation fees
Stormwater Management	• Federal regulations (e.g. CWA: NPDES, TMDL) • State and local buildingcodes and regulations	• Local government and utility funding: Customer revenue and taxes • Federal and state funding (e.g., SRF loans)	• Labeling (e.g., LEED, Sustainable Sites Initiative)	• New federal regulations (e.g., EPA) • PACE Programs
Restoration and Remediation	• Federal regulations (e.g., CWA: TMDL, Section 404, compensation mitigation) • Regional or watershed plans (e.g. CERP)	• Federal and state funding(e.g., Superfund Trust) • Natural resource damage claims • Local government and water service provider funding: bond revenue, taxes, lottery, natural resource damage claims • Regional or watershed plans (e.g. CERP)	• Volunteer Programs • Educational signs and materials	• RESTORE Act
Alternative Water Source	• State regulations (e.g., Florida Water Resource Caution Areas) • State or judicial mandates (e.g., CWA Section 316(b))	• Federal grants and loans (e.g., WRDA, Title XVI, Clean Water SRF) • State grants and loans (e.g., Florida Water Protection and SustainabilityProgram, California Water Recycling Funding Program) • Local government and water service providerfunding: customer revenue and taxes	• Educational campaigns (e.g., San Diego Council Educational Campaign, Florida DEP camapign) • Labeling (e.g., Standard 350 certification program)	• Productiontax credits • Tax exemptions • Investmenttax credits
Agricultural Water Efficiency and Quality	• Federal regulations (e.g. CWA: NPDES for CAFOs, TMDLs) • State policy (e.g., California's Water Conservation Act of 2009)	• Federal funding (e.g., SRF, Section 319, Farm Bill) • State funding (e.g., State SRF, Sustainable Conservation BMP Challenge)	• Educational campaigns (e.g., NRCS programs)	• New TMDLs

Job Growth and Job Quality

Who is hired when sustainable water strategies are put in place? How many jobs are created? Implementing sustainable water strategies can increase demand for workers in traditional occupations, such as truck drivers and receptionists, where no new skills are required. These strategies can also increase demand for workers who will have to learn new and enhanced skills, such as plumbers that install greywater systems. The available data, although limited, suggest that sustainable water projects generate large numbers of jobs and in many cases, more jobs than traditional water infrastructure (for detailed estimates, see pages 30-43 in the full report). The data include a broad range of employment numbers: 10 to 15 jobs per $1 million invested in alternative sources; 5 to 20 jobs per $1 million invested in stormwater management; 12 to 22 jobs per $1 million invested in urban conservation and efficiency; 15 jobs invested per $1 million in agricultural efficiency and quality; and 10 to 72 jobs per $1 million invested in restoration and remediation. In comparison, traditional water infrastructure is estimated to generate 10 to 26 jobs per $1 million invested. The assumption that environmental conservation produces net job losses is not supported by the data available on sustainable water projects.

Taken as a whole, we identified 136 distinct occupations engaged in sustainable water projects (see detailed lists on pages 30-43 in the full report). These include from scientists developing new water-efficient technologies to landscaping workers installing rain gardens and pipelayers building infrastructure for distributing recycled water. Public relations and outreach specialists are hired to raise awareness among community members and consumers. Construction laborers, building inspectors, groundskeepers, precision agricultural technicians, engineers, and plumbers carry out the paving, roofing, landscaping, and other construction services related to sustainable water jobs.

FIGURE 1: JOBS PER $1 MILLION INVESTED IN SUSTAINABLE WATER STRATEGIES



Note: each bar represents a distinct study, see full report for more detail

But, who is currently working in sustainable water occupations, and in what conditions? Are opportunities in these occupations growing? These questions are core to identifying strategies that advance ecological preservation and address economic inequality.

Twenty-seven sustainable water occupations each have more than 100,000 job openings projected for 2020 in the overall economy and have relatively accessible education and experience requirements. We use the Bureau of Labor's five "Job Zones" for categorizing levels of education, job training, and experience typically required to be qualified for a job. Nine of these 27 high-growth sustainable water occupations require little or no previous work experience or education (Job Zone 1), while eight require some experience and education (Job Zone 2), and 10 require experience and some formal education (Job Zone 3).

Of the 27 sustainable water occupations with high projected openings, half have median wages above the national median wage of $16.57 per hour. Of those in Job Zone 1, the median hourly wage ranges from $10.50 to $14.50. In Job Zone 2, median hourly wage ranges from $11.50 for laborers and freight movers to $20 for operating engineers. Median wages of occupations in Job Zone 3 vary widely, with recreation workers and maintenance and repair workers earning $10.50 and $17, respectively, while business operations specialists and agricultural managers earn more than $30 per hour.

LA Conservation Corps team plants new seedlings as part of a restoration project (Source: Amigos de los Rios).

The median wages of many of these sustainable water occupations may not currently provide enough income to support a modest living in regions across the country. Ten of the occupations in 27 high-growth accessible occupations have median hourly wages under $13.25, which would be sufficient to cover basic expenses in less than 25% of the regions in the country. The eight occupations with median hourly wages of $19.50 or higher would be sufficient to cover basic expenses in 90% or more of regions in the country.

Unionization in these occupations varies from the low 4-7% of farmworkers and recreation workers to 20% of construction workers and plumbers. Occupations with higher levels of union representation are also among those with extremely low percentages of women workers. The gender make-up of the workforce in these sustainable water occupations suggests a dividing line between clerical occupations and those that involve managerial or manual labor roles. Women comprise 47% of the U.S. workforce. Women are under-represented in all but four of the 15 occupations for which worker demographic data are available. Furthermore, the four occupations with above average women workers are office clerks; receptionists and information clerks; bookkeeping, accounting, and auditing clerks; and business specialists.

The racial make-up of workers in sustainable water occupations ranges from the predominantly white agricultural managers to the disproportionately Latino and African American laborers and truck drivers. Latino, African American, and Asian American workers comprise 30% of U.S. workers, and comprise a similar proportion of the workers in clerical occupations and carpenters. These workers are under-represented in positions as farmers, ranchers, and other agricultural managers (6%); general and operations managers (17%); bookkeeping, accounting, and auditing clerks (20%); electricians (22.5%); operating engineers and other construction equipment operators (22%); and business operations specialists (25%).

The under-representation of people of color and women working as agricultural managers and general managers is concerning given that these are two of the highest paid sustainable water occupations that do not require advanced degrees. Agricultural managers and general managers are projected to have 235,000 and 410,000 openings in 2020, and currently have median hourly wages of $31 and $45.75, respectively.

TABLE 14: SUSTAINABLE WATER OCCUPATIONS WITH OVER 100,000 PROJECTED JOB OPENINGS IN THE OVERALL ECONOMY AND MORE ACCESSIBLE EDUCATION AND TRAINING REQUIREMENTS (JOB ZONES 1-3)

KEY

Jobs Requiring Little or No Education and Training (Zone 1)

TABLE 14: SUSTAINABLE WATER OCCUPATIONS WITH OVER 100,000 PROJECTED JOB OPENINGS IN THE OVERALL ECONOMY AND MORE ACCESSIBLE EDUCATION AND TRAINING REQUIREMENTS (JOB ZONES 1-3)

KEY

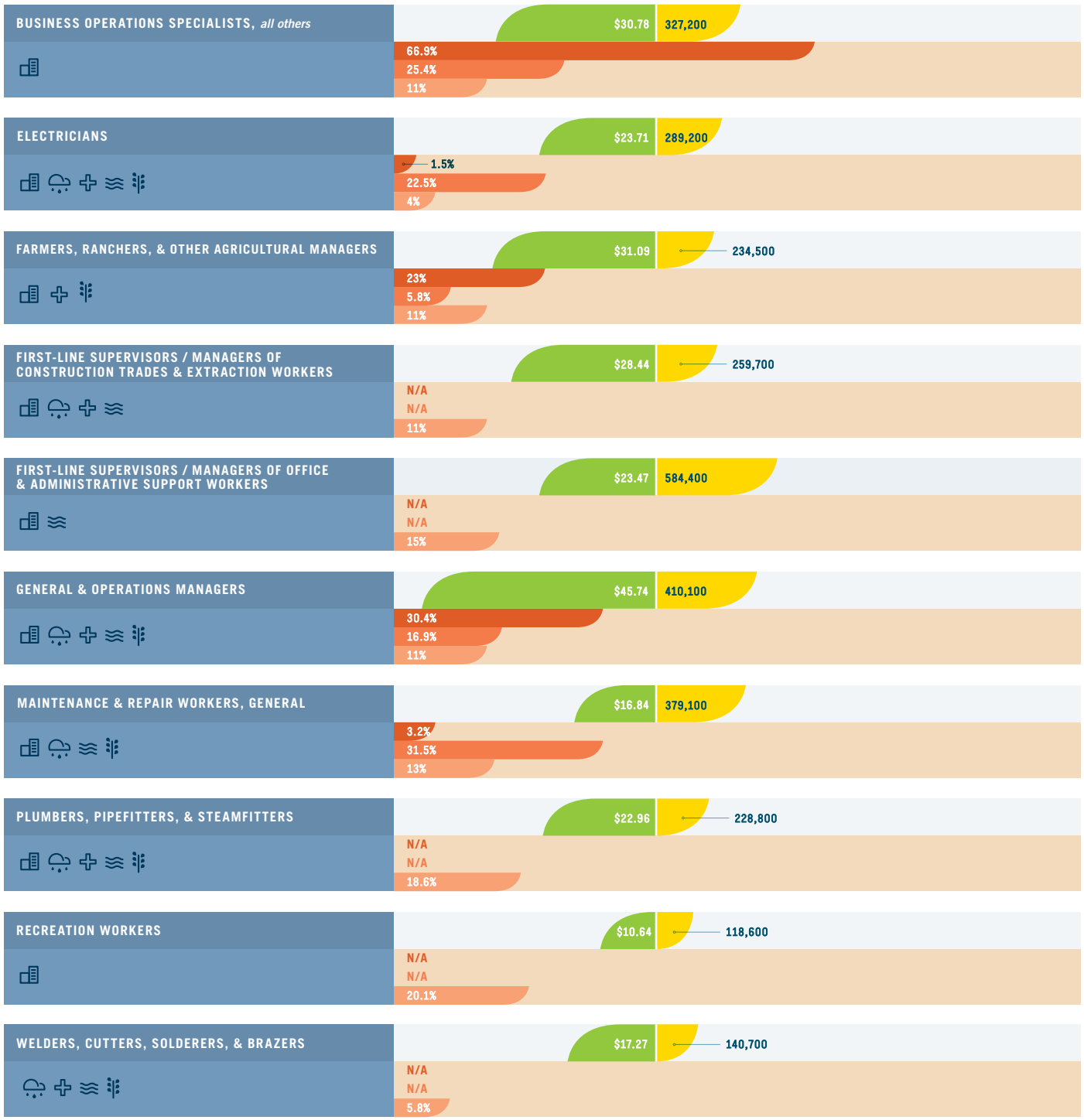
Jobs Requiring Basic Education (Zone 2)

* For Agricultural Equipment Operators, the total number of employees and the projected number of openings reported by BLS corresponds to the more general occupational category of General Farm Worker.

TABLE 14: SUSTAINABLE WATER OCCUPATIONS WITH OVER 100,000 PROJECTED JOB OPENINGS IN THE OVERALL ECONOMY AND MORE ACCESSIBLE EDUCATION AND TRAINING REQUIREMENTS (JOB ZONES 1-3)

KEY

Jobs Requiring Some Previous Education, Training and Experience (Zone 3)



Conclusions

The potential for job creation through implementation of sustainable water strategies has been largely ignored by policymakers, scholars, and practitioners, with the efforts on green jobs mostly limited to energy efficiency and renewable energy activities. This has left a gap in understanding and action on these opportunities.

Our research finds that the quantity of employment created by sustainable water practices is substantial. The data available point to 10 to 15 jobs per $1 million invested in alternative water sources; 5 to 20 in stormwater management; 12 to 22 in urban conservation and efficiency; 14.6 in agricultural efficiency and quality; and 10 to 72 jobs per $1 million invested in restoration and remediation. Further, we find that the types of jobs involved in implementing sustainable water strategies cover a broad range of occupations. We identified 136 occupations involved in the work of achieving more sustainable water outcomes in agriculture, urban residential and commercials settings, restoration and remediation, alternative water sources, and stormwater management.

Many of the occupations involved in sustainable water projects are also projected to have high demand in the overall economy, and numerous sustainable water occupations are accessible to workers without advanced degrees. Twenty-seven out of the 37 occupations with 100,000 job openings by 2020 generally require on-the-job training, with some requiring previous experience and associates degrees or technical training, but not bachelors or graduate degrees.

Team training on precision irrigation technology (Source: Irrigation Association)

Federal mandates that require water improvements and promote green strategies – such as the recent stormwater guidelines and green reserve programs in State Revolving Funds – make labor demand more predictable and allow for more effective planning of green jobs programs.

Together, these factors indicate that water policy can expand demand for workers without bachelors or advanced degrees if occupational training programs and pathways to jobs are created. However, the occupations with median wages below the national median demonstrate that measures to improve job quality must also be a priority. While data are limited, the existing training and education programs preparing workers with the skills needed in sustainable water fields appear nascent and small-scale. Conventional educational and job training resources like community colleges and union apprenticeships are only beginning to integrate green water skills. And the link to disadvantaged communities is even more tenuous. We identified fewer than a dozen independent nonprofits that are piloting innovative approaches to serve disadvantaged communities with job training and certification combined with supportive services.

Existing programs linking disadvantaged communities to sustainable water opportunities appear to face multiple challenges in designing and implementing programs, meeting the scale of need, and placing program graduates. Programs have difficulty matching training to actual labor demand for particular occupations and skills. Certifications and licensing related to sustainable water occupations too often are accepted in too small a geographic area or too narrow an industry to provide workers and employers with the needed level of confidence in their value.

Nevertheless, existing training programs have developed promising strategies for connecting disadvantaged communities to sustainable

water jobs. Hybrid models that both train and hire workers through coordinated business and nonprofit branches have found greater success placing graduates and maintaining stable funding. Organizations with contracts to provide operations and maintenance for public and private entities have also found a more stable source of funding and practical work experience for participants. However, training programs are unlikely to achieve substantial economic improvements for disadvantaged communities unless coupled with policies and hiring practices, such as community benefits agreements, that increase demand for new workers and target disadvantaged communities.

Recommendations

Data Collection and Research

State agencies managing state revolving funds and other state and federal funding programs should require grantees and loan recipients to submit information on job types and numbers using a template aligned with standard occupational codes. Workforce development and training organizations must increase their capacity to track and evaluate job placement and other program outcomes to strengthen the feedback loop that will improve programming and broader understanding of best practices.

Economic research projecting job generation of sustainable water projects should incorporate data on the occupations and types of firms specific to these projects, as they in some cases are significantly different from those involved in conventional water project industries.

Models for financing the ongoing operations and maintenance of sustainable water projects must be developed, piloted, and refined to ensure desired environmental and economic outcomes are sustained. This research should start with the lessons of leading local efforts, such as stormwater in Portland and Philadelphia.

Policy and Planning

Development of water policy should consider jobs created by sustainable water strategies and maximize their impact on economic inequality. The jobs created must be recognized as a co-benefit and planned for such that there is an integrated approach to workforce training and placement.

Water utilities, state water agencies, planning departments and other public entities funding and managing sustainable water projects should implement "high-road" strategies that consider job quality, training, and targeted hiring as an integral component of project design and implementation. This should include local hiring and minority hiring requirements and incentives that increase contracting and hiring with individuals from local and disadvantaged communities.

Considering the strong interdependence between water and energy use, policy and workforce efforts to take advantage of the win-win solutions at the water-energy nexus should be strengthened.

Better planning for and investment in financing the ongoing operations and maintenance of sustainable water projects is needed to ensure that the maximum environmental and employment benefits are realized.

Community Programs and Partnerships

Unions, community-based organizations, and environmental advocates should join together in envisioning and promoting policies and funding programs that incorporate "high-road" work opportunities into sustainable water projects.

Workforce development and training organizations must build stronger partnerships with unions and employers to ensure training is well-aligned with emerging occupations and skill sets, and increase placement rates for program participants.

Training programs seeking to improve access of disadvantaged communities to sustainable water jobs should focus on occupations that are projected to have high labor demand in the overall economy. Data on the labor demand generated by sustainable water projects alone is not robust enough to justify training workers for these jobs unless their training will also prepare them to qualify for conventional occupations in demand.

Partnerships between industry associations, labor unions, and training programs are needed to develop, deliver, and evaluate and update standardized training and certification that reflects actual skills needed and is accessible to disadvantaged communities. This should include the creation of a centralized, up-to-date clearinghouse of training curricula and certification standards.