

Port of Seattle Career Pathways

Maritime and Green Jobs
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SeattleJobs
Initiative

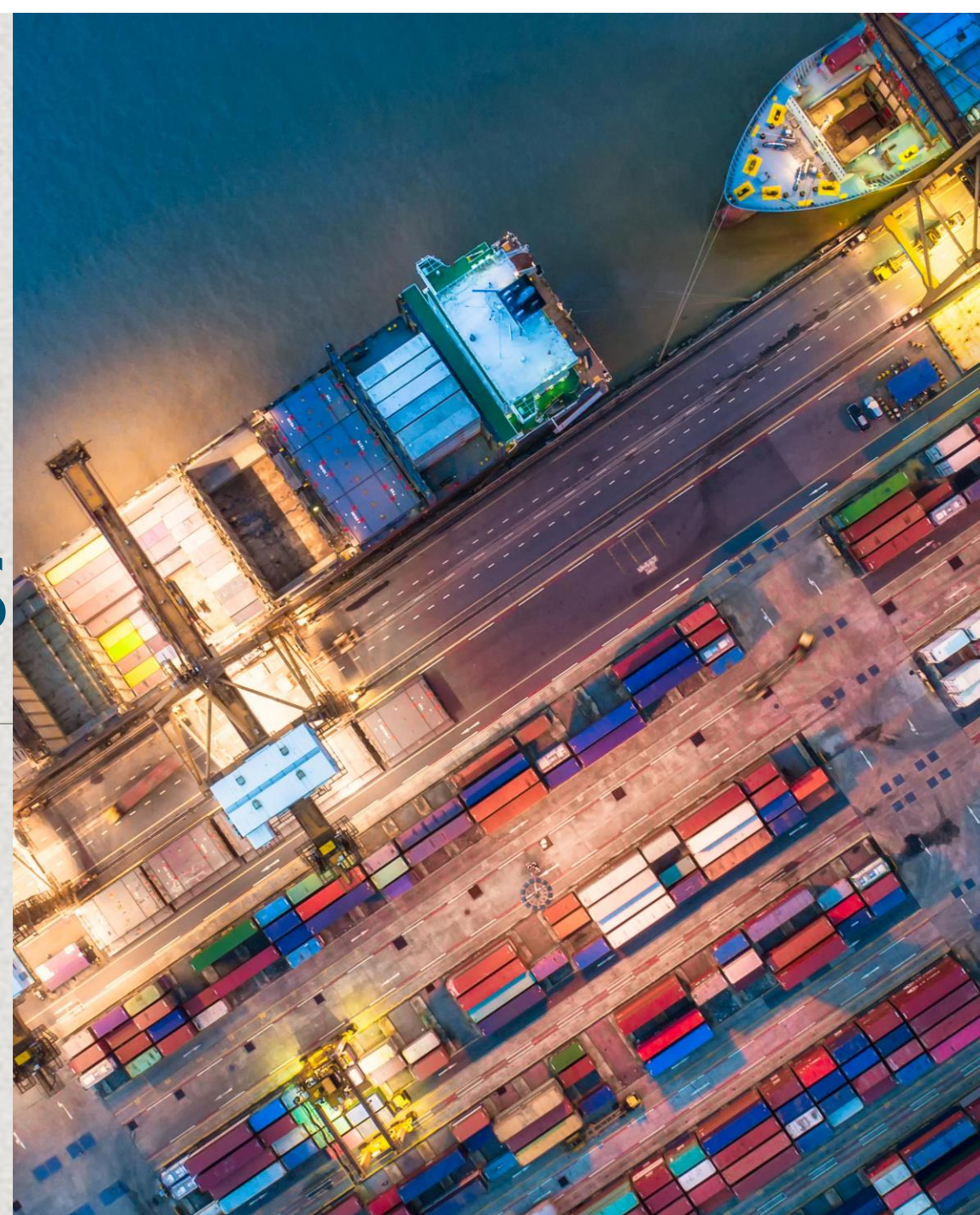


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Project Overview

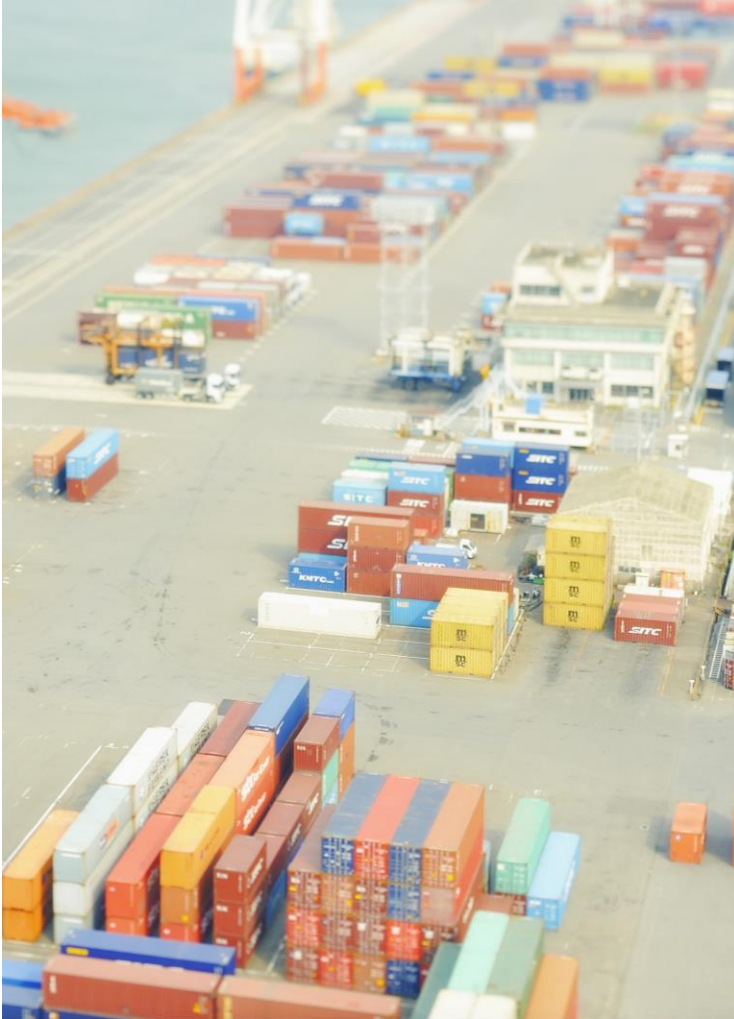
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01

WORKFORCE DEVELOPMENT AT THE PORT OF SEATTLE



Background

The Port of Seattle established a Workforce Development Policy Directive in June 2020 tasked with a two-pronged mission:

1. Increasing equitable access to economic prosperity in Port-related activities to impacted near-Port communities
2. Leveraging the Port's impact and innovation as a critical regional institution to develop a sector-based approach to workforce "development centered on equity, diversity, and inclusion"

The primary goal of this initiative is to ultimately provide training to students from Port-impacted communities and help them acquire skills in port-related industries.

Actions

The Workforce Development Policy Directive will achieve its goals through the following strategic actions:

- **Identifying Port-related industries and their in-demand jobs**
- **Establish or strengthen current training pipelines in port-related industries**
- **Promote equitable access to training opportunities**

Strategic Plan

The Port of Seattle developed a three-year work plan to guide these actions to identify best practices for workforce development in the port-related industries, outline the skills needed in in-demand port-related occupations, and identify gaps and opportunities to make these jobs and careers more inclusive and accessible.

PORT OF SEATTLE WORKFORCE DEVELOPMENT STRATEGIES

Construction

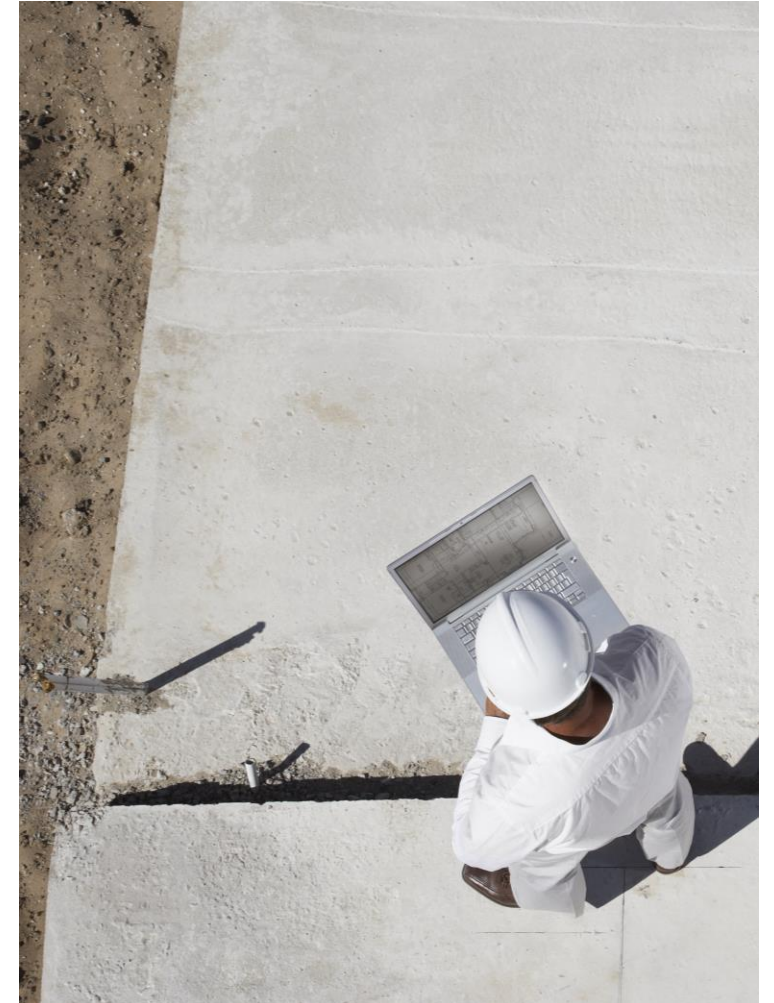
Construction is a strategic sector indirectly or directly supporting all port-related industries and a major economic activity in the Seattle region. The Port of Seattle's comprehensive strategic plan includes the goal of making construction worker training more accessible and inclusive and improving worker retention.

To these ends, the Port has partnered with the following organizations to prepare young people for careers as ironworkers, laborers, pipefitters, bricklayers, and cement masons:

- **ANEW**, a pre-apprenticeship program focusing on improving access to construction careers for women and people of color

- **Urban League**, an organization providing workforce development programming and services among others to African Americans and those from underserved communities
- **Ironworkers Local 86**, a union offering training programs in the greater Seattle area

Approximately 133 trainees were enrolled in these Port-supported training programs in 2021, with 43% identifying as African American.



PORT OF SEATTLE WORKFORCE DEVELOPMENT STRATEGIES

Aviation

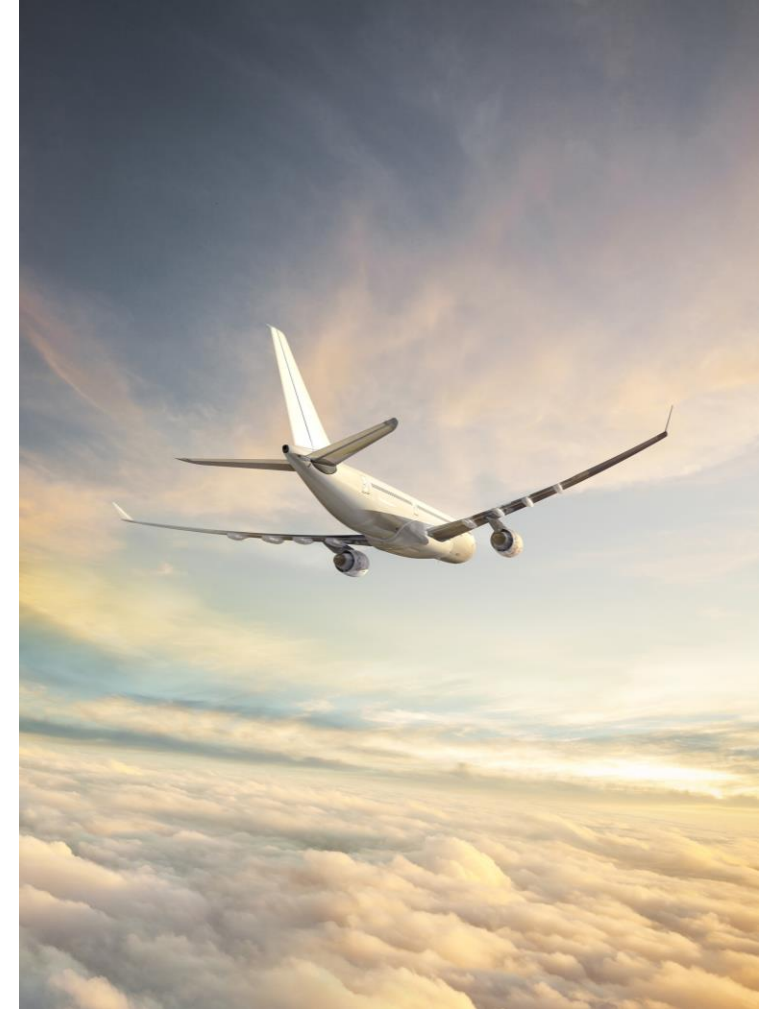
The Port of Seattle also operates the Seattle-Tacoma International (SEA) Airport which helps connect the Pacific Northwest to the rest of the country and the world. The strategic plan included the following aviation-focused efforts:

- An Aviation Employment Center connecting workers from underserved communities to entry-level job opportunities at the airport in janitorial services, food services, and customer service, among others.
- An Introduction to Aviation Maintenance Technician course offered by South Seattle College at SEA Airport to current airport workers in entry-level jobs. Participants receive financial aid, application assistance, support for their entry into the Associate's degree, and a \$1,000 scholarship for the Alaska Airlines-Airport University.

- Developing a second aviation career pathways program.
- Hiring a consultant to provide career support services and help create a stable and inclusive working environment at SEA Airport.

Green Jobs & Maritime

The Port's Workforce Development strategies also include ramping up inclusive and equitable access to the maritime and green job sectors. Following the disruptions in the labor market caused by the Covid-19 pandemic, the Port needs updated research to guide strategic investments in these two sectors.



PROJECT OVERVIEW



Seattle Jobs Initiative has been hired to conduct labor market analysis on the Port-related industries to extract growth trends, understand how the Covid-19 pandemic impacted the Port-related industries in nearby Port-impacted communities, and help identify in-demand career pathways in maritime and green jobs offering a living wage to workers.

This report focuses on this last point.

Activities

First, Seattle Jobs Initiative's Policy & Research team first identified the industry NAICS (North American Industry Classification System) codes most related to the maritime sector. The team selected the following two occupation pathways due to their current and projected employer demand, accessibility for entry-level workers, and earnings potential:

- Maritime deck crews from Ordinary Sailors to Captains

- Maritime Engine crews from Wipers to Chief Mechanical Engineers

Regarding green jobs, the team first focused on reviewing the literature to identify the industrial sectors most likely to support greenhouse gas emission reduction efforts and receive public investment. The team then assessed the growth potential of entry-level occupations in these sectors and selected the following career pathways:

- Electricians, from Electrician Helpers/Apprentices to Master Electricians
- Heating, Air Conditioning, and Refrigeration (HVAC) Mechanics and Installers and Insulation Workers

The entry-level jobs in these career paths require less than a two-year degree and the median wage for the occupations except Helpers and Sailors and Oilers is 80% or more of the region's median wage, making them middle-wage jobs. They are in high demand and core to their respective sectors.

Maritime Pathways

-
- + *Deck Crew Occupations*
 - + *Deck Crew Career Paths*
 - + *Engine Room Occupations*
 - + *Engine Room Career Paths*

02

MARITIME EMPLOYMENT OUTLOOK

The maritime industry is varied and encompasses multiple sectors including Freight Transportation, Deep Sea or Coastal Passenger Transportation, and Fishing. Even though these sectors' activities and goals are different, they rely on a common set of occupations.

| Occupational Title | King County | | | | Washington State | | | |
|---------------------------|-----------------|----------------|----------------|--------------------------------|------------------|----------------|----------------|--------------------------------|
| | Employment 2020 | Projected 2030 | Percent Change | Avg. Annual Openings 2020-2025 | Employment 2020 | Projected 2030 | Percent Change | Avg. Annual Openings 2020-2025 |
| Sailors & Marine Oilers | 1,572 | 1,591 | 1% | 364 | 1,961 | 1,985 | 1% | 450 |
| Captains, Mates, & Pilots | 950 | 951 | 0.1% | 247 | 1,375 | 1,405 | 2% | 360 |
| Ship Engineers | 707 | 680 | -4% | 151 | 798 | 772 | -3% | 171 |

Source: WA Employment and Security Department, 2022.

These jobs can provide many opportunities to travel across a region or even worldwide. The work environment also provides workers with an opportunity to work outdoors in a job with benefits as these occupations are typically unionized.

However, there has been a decline in worker supply in recent years which led to a strong labor shortage and high turnover rates while regional employers struggle to recruit crew members. Supporting these maritime career pathways and increasing labor availability would provide the youth with strong career prospects in jobs with a living wage and support crucial regional economic activities, including Passenger Water Transportation and Towing and Tugboat Services

MARITIME EMPLOYMENT OUTLOOK

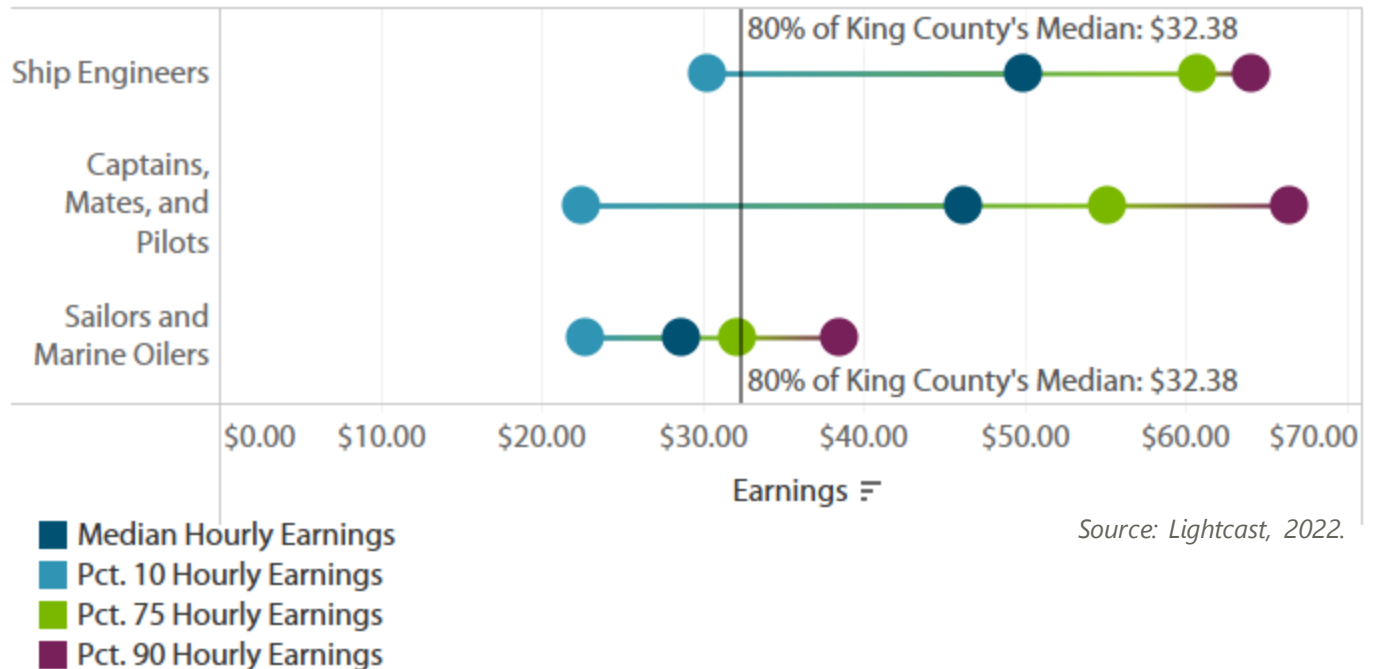
Wages

The wages in the maritime industry range from a median hourly wage of \$28.69 per hour for Ordinary and Able Sailors (junior and senior deckhands) and Oilers to \$46.15 for Captains and \$49.91 for Ship Engineers in King County.

These are statistics for the Standard Occupation Codes (SOC), which often group similar occupations together. For example, Ordinary and Able Sailors and Oilers (unlicensed Qualified Members of the Engine Department) belong to the same SOC code, 53-5011.

This limits the ability to analyze the positions' wages based on credentialing and experience. However, the narrow range from the 10th percentile to the 90th percentile of wages for Sailors and Oilers suggests there is very little distinction between these positions despite Oiler and Able Sailor positions requiring more experience (sea time) and credentials than Ordinary Sailors.

Maritime Hourly Wages



Source: Lightcast, 2022.

The other note is that Captains, Mates, and Pilots have a low 10th percentile pay. This is likely starting pay for Second Mates, and there is steady wage growth from there to first mate and captain.

MARITIME EMPLOYMENT OUTLOOK

Gender

All the selected maritime occupations are disproportionately male. The percentage of women workers ranges between 7% and 8%. More work needs to be done to support women who want to enter these occupations by building a safe work environment with transparent career advancement opportunities and by providing additional support services, including childcare.

Race and Ethnicity

The maritime industry in the region is also not representative of the Seattle region's workforce's racial demographics. The share of Black, Indigenous, and other People of Color (BIPOC) is largest for entry-level vessel crew occupations (Sailors and Marine Oilers) and Ship Engineers (21%). However, only 13% of Captains and Mates are BIPOC.

There are two key elements in the underrepresentation of BIPOC and women to be addressed. The first is that historically, like many trades, new workers have family members already in the industry. These workers are familiar with how the systems work and have support and guidance from those family members in the industry. As a result, it is difficult for workers from communities that have historically been excluded from those opportunities or that are newer to the region to enter and advance in the industry. Strategies for addressing this structural barrier include:

- Implementing and improving mentorship programs
- Supporting workers in getting and maintaining licensure
- Making the advancement process more transparent

The second is that working aboard vessels, particularly deep-sea vessels is quite isolated. This makes a safe

workplace free of gender- and race-based discrimination and violence that much more important. Training and enforcement of standards are important. However, the most effective strategy for ensuring an inclusive workplace is to diversify leadership.

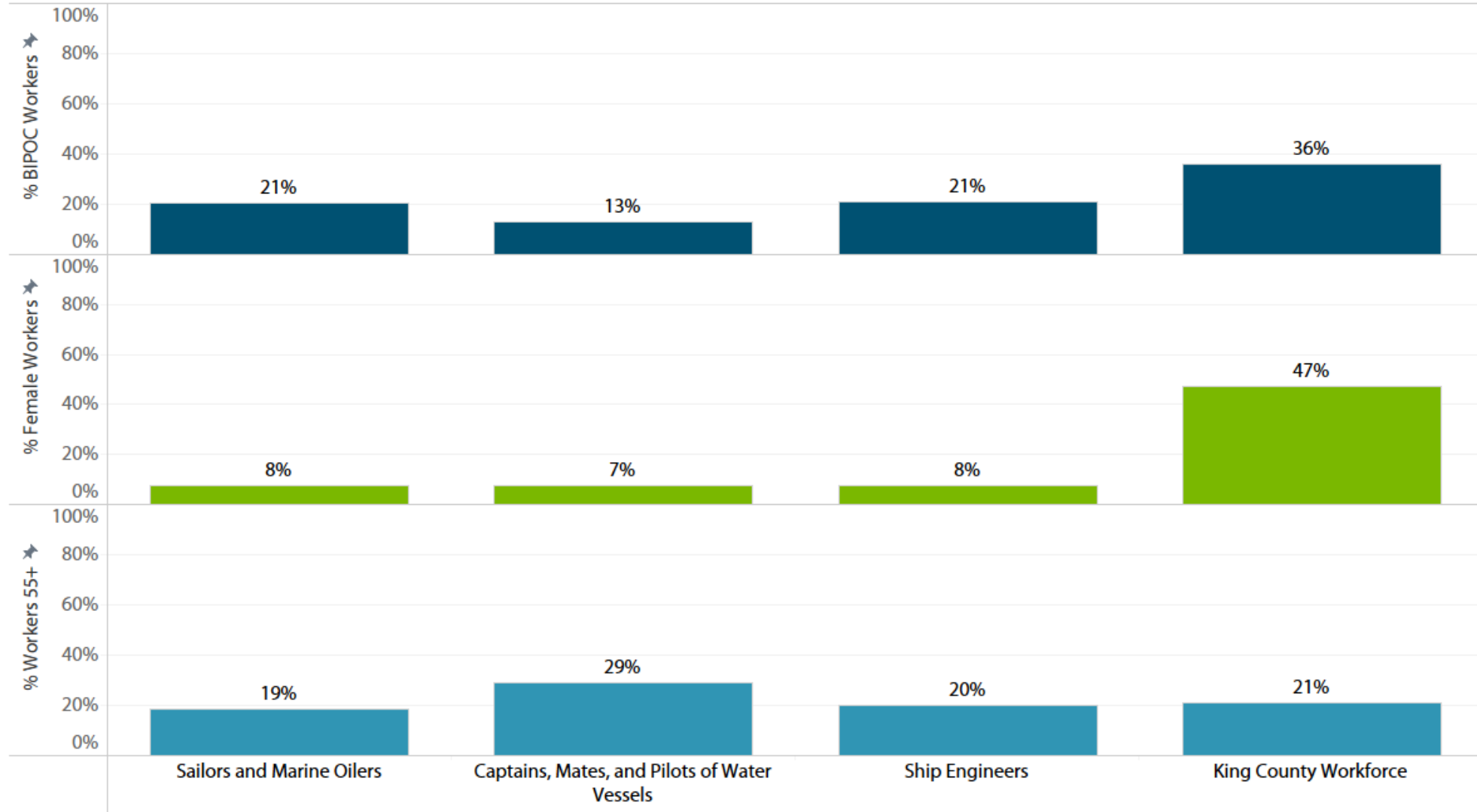
Age

The age of the workforce is essential to consider because even if the occupation does not have high projected growth if it has an aging workforce, it is critical to plan to fill those positions that older workers vacate. Captains and Mates are more likely to be 55 years and older than other workers in the selected maritime career pathways. Given the length of time it takes to become a captain, it is critical to ensure that there are enough workers prepared to advance as these workers age out of the workforce.

The charts on the following page summarize the demographics of workers in these occupations.

MARITIME EMPLOYMENT OUTLOOK

Maritime Demographics in King County



Source: Lightcast, 2022.

MARITIME DECK CREW

| Unit | Position | O*Net Description | Minimum Qualifications |
|-----------------|------------------------|---|--|
| Unlicensed Deck | Able Sailor | Highest-rated unlicensed deck employee. May act as Bosun or Quartermaster. | <ul style="list-style-type: none"> • Transportation Workers Identification Card (TWIC) • USCG Merchant Mariners Credential (MMC) certificate as Able-Bodied Sailor. • Standards of Training, Certification, and Watchkeeping (STCW) certification |
| | Ordinary Sailor | During a shift maintains the passenger cabin area, assists passengers with vessel egress, assists with vehicle loading, stands as a gangplank watch, assists in line handling, stands as a lookout, acts as a watchman, and fills a position on vessel muster list. | <ul style="list-style-type: none"> • TWIC • USCG MMC certificate as Ordinary Sailor • STCW certification |

The most entry-level position in a deck crew is the Ordinary Sailor (OS). These workers will perform work pertaining to general maintenance, repair, sanitation, and upkeep of material and equipment in areas that are under the responsibility of the Deck Department.

Once they acquire at least 540 days of sea time and proper licensing with the United States Coast Guards, they can move up to an Able Sailor (AB) position. Able Sailors perform all operations connected with the launching of lifesaving equipment. An AB is expected to be able to operate deck machinery while mooring or unmooring, and to operate cargo gear.

Able Sailors may move on to the first position in the licensed deck crew, Second Mates, once they accumulate enough sea time and training and pass the required exam. Second Mates direct unlicensed deck crew members.

MARITIME DECK CREW

After additional days at sea, Second Mates can become First Mates (also known as Chief Mates). These workers are typically licensed mariners and heads of the deck department of a merchant ship. The chief mate is customarily a watchstander and oversees the ship's cargo and deck crew.

First Mates may advance to Captains following additional training and days at sea. Captains are high-grade licensed mariners who hold the ultimate command and responsibility of a merchant's vessel.

The career pathway of the deck crew is governed by strict requirements from the United States Coast Guards as shown on the following pages.



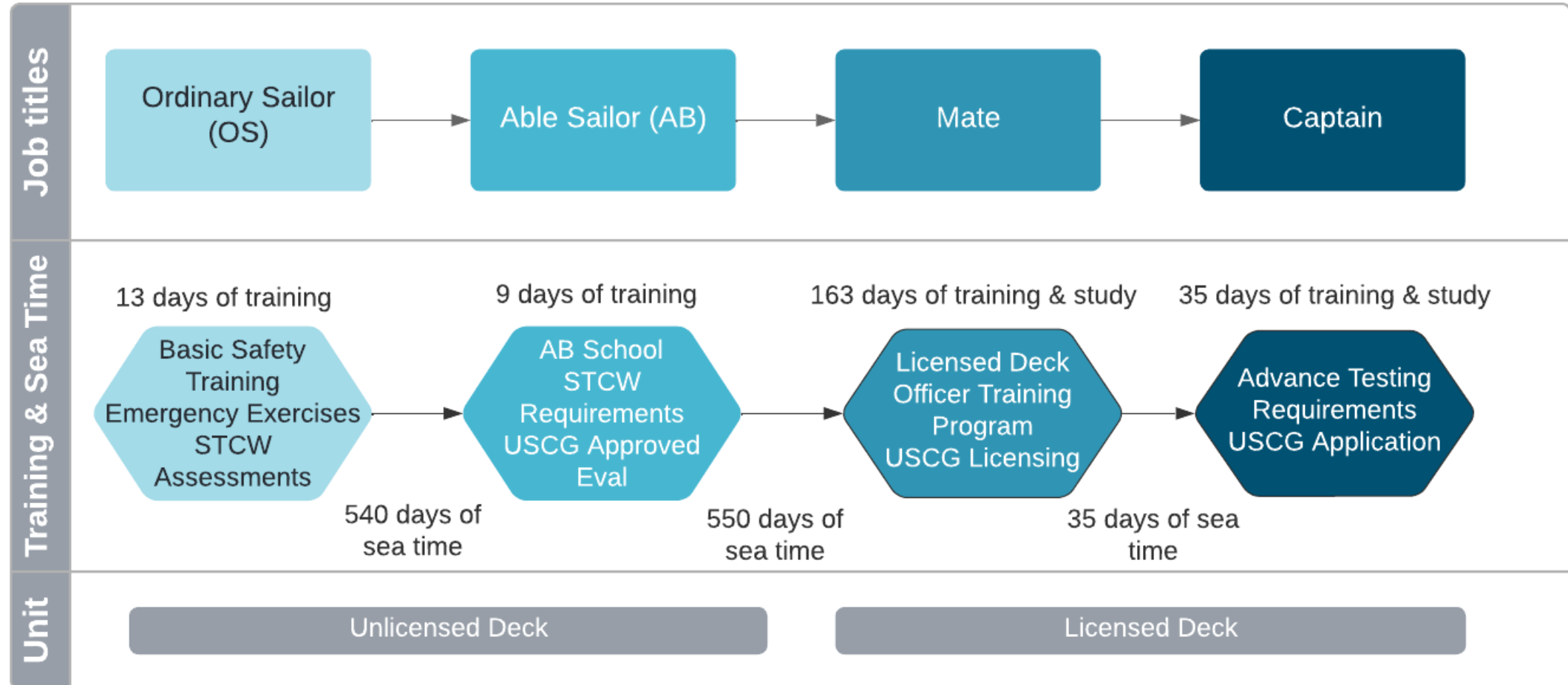
Photo by Jeremy Bishop

MARITIME DECK CREWS

| Unit | Position | O*Net Description | Minimum Qualifications |
|---------------|-------------------------|---|---|
| Licensed Deck | Captain | Exercises full command of a vessel, manager of and responsible for entire vessel operations. Has authority over all persons on board. Also serves as a licensed pilot. | <ul style="list-style-type: none"> • TWIC • USCG Merchant Mariners Credential license as Master of Motor Vessels • Endorsement as a first-class pilot for all routes operated • Radar observer endorsement • FCC marine radio operator permit • STCW certification • Electronic Chart Display & Information System (ECDIS) certified. |
| | First Mate/Pilot | Serves as Chief Officer, second in command of a vessel. Directs other officers and all members of the deck crew on all matters pertaining to the safe operation and deck maintenance of the vessel. Stands as watch officer in charge on bridge during normal operations. | <ul style="list-style-type: none"> • TWIC • USCG Merchant Mariners Credential license as Mate of Motor Vessels • Endorsement as first-class pilot on all routes • Radar observer endorsement • FCC marine operator permit • STCW certification. • Electronic Chart Display & Information System (ECDIS) certified. |
| | Second Mate | Deck officer next in rank below First Mate. Directs other officers and all members of the deck crew on all matters pertaining to the safe operation and deck maintenance of the vessel. | <ul style="list-style-type: none"> • TWIC • USCG Merchant Mariners Credential license as Mate of Motor Vessels • Endorsement as first-class pilot on all routes, on vessels of any gross tons • Radar observer endorsement • FCC marine radio operator permit • STCW certification • Electronic Chart Display and Information System (ECDIS) certified |

MARITIME DECK CREW

Maritime Deck Career Path



MARITIME ENGINE ROOM

The engine room aboard a vessel is of crucial importance to the good functioning of the ship. Like the deck crew, occupations in the engine room tend to follow a set pathway and are regulated by the United States Coast Guards. Also, they tend to offer the same advantages as the deck crew:

- Opportunity to travel
- Strong connection to the outdoors
- Good benefits and job prospects

Positions in the engine room have also been suffering from a decline in worker availability leading to a global shortage of Ship Engineers.

| Unit | Position | O*Net Description | Minimum Qualifications |
|-----------------|----------|--|---|
| Unlicensed Deck | Oiler | Serves as the highest rated of the unlicensed members of the engine department. Under supervision of the licensed engineering officer(s) on watch, performs inspection, maintenance and repair duties throughout the vessel. | <ul style="list-style-type: none"> • TWIC • USCG MMC certificate as a Qualified Member of the Engine Department (QMED) in the rating of Oiler |
| | Wiper | Serves as the entry level of the unlicensed engine department crew. Under supervision of the licensed engineering officer(s) assists in and learns inspection, maintenance and repair duties throughout the engine department of the vessel. | <ul style="list-style-type: none"> • TWIC • USCG MMC certificate as Wiper |

MARITIME ENGINE ROOM

Wipers are the first entry-level occupation in the engine room. They assist with maintenance and repair duties in areas under the engine crew responsibility.

After enough sea time experience and additional training, wipers move up to become Oilers (also known as Engine Cadets or Qualified Members of the Engine Department, QMED), also performing maintenance and repair duties in the engine room under the supervision of the Assistant Engineer or Chief Engineer.

Following 540 days at sea and training and passing the qualifying exam, Oilers can move up to a licensed engineering position: Assistant Engineer. In addition to maintenance and repair, these workers are also in charge of the propulsion and electrical systems.

Assistant Engineers may then move up to a Chief Engineer position. These workers are responsible for ensuring that all mechanical and electrical systems aboard the vessel are properly functioning and maintained.

Like the deck crew, career pathways in the engine room are set and regulated by the United States Coast Guards (see following pages).

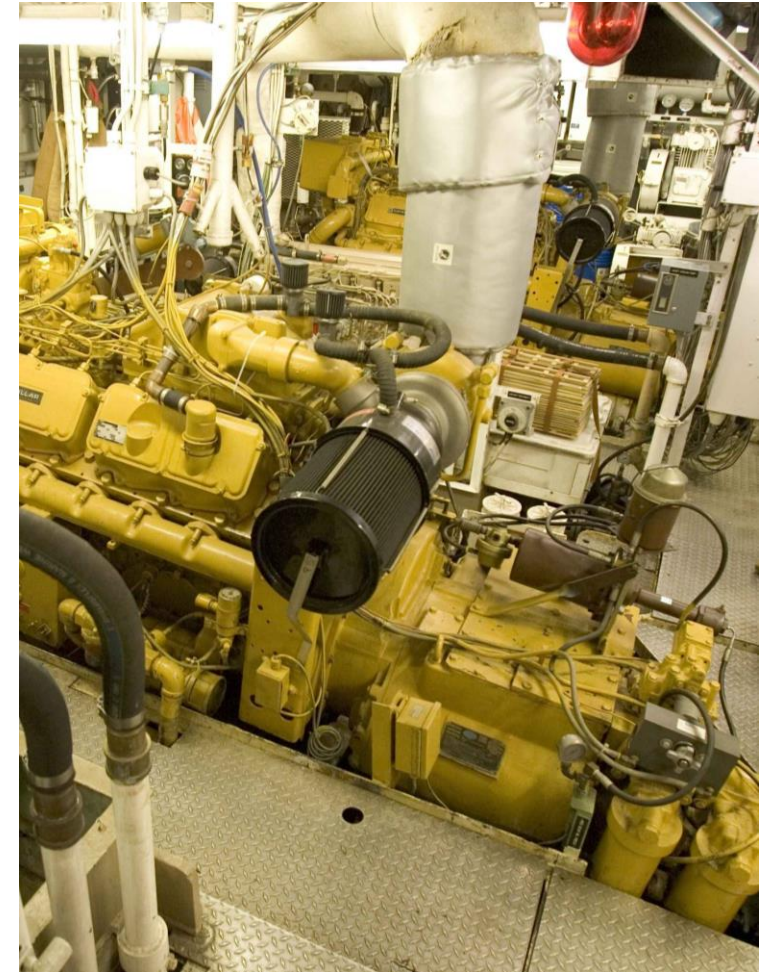


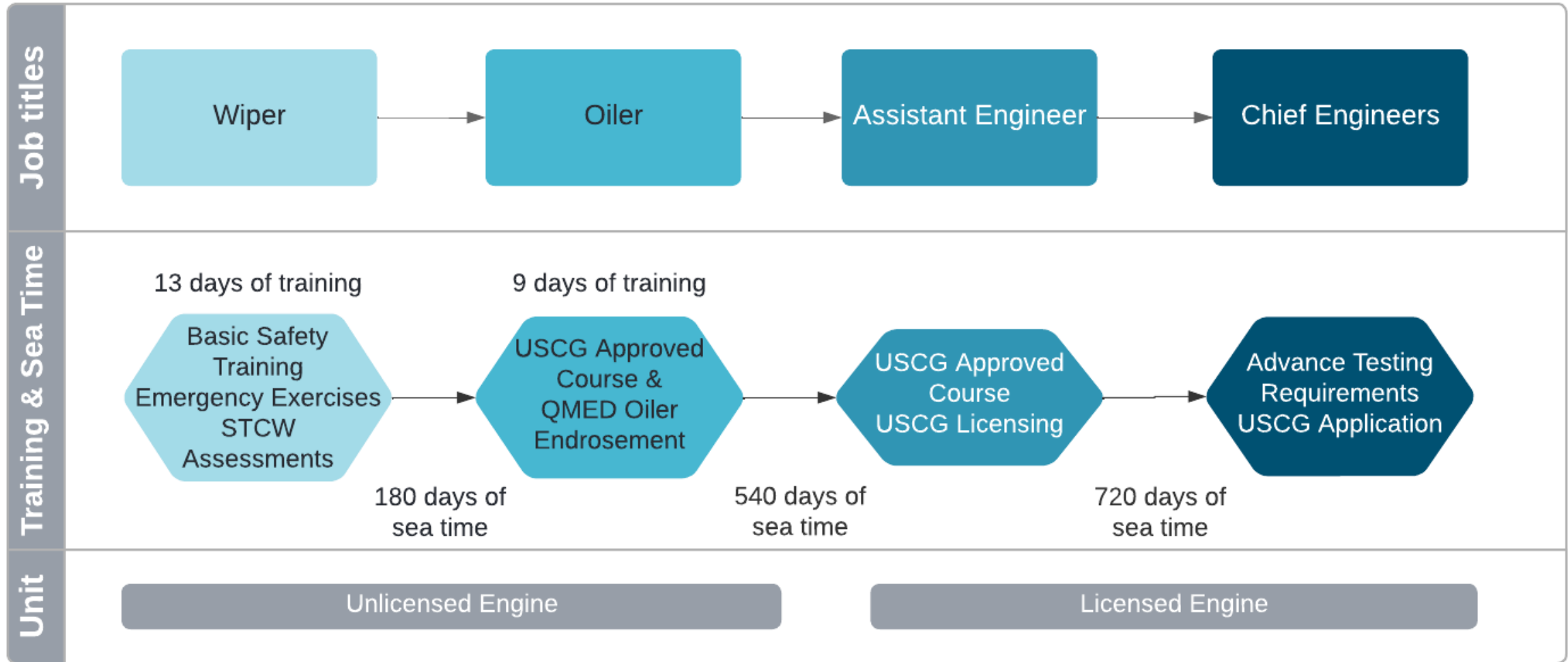
Photo by Seve Hillebrand, USFWS

MARITIME ENGINE ROOM

| Unit | Position | O*Net Description | Minimum Qualifications |
|---------------|-----------------------------|--|---|
| Licensed Deck | Staff Chief Engineer | Supervises and ensures the efficient operation and maintenance of all propulsion and electrical systems of the vessel. Supervises and coordinates the activities of all engine room employees assigned to the vessel. Establishes vessel procedures for all engine room operations and maintenance. | <ul style="list-style-type: none"> • TWIC • USCG MMC license as Chief Engineer • STCW certification |
| | Chief Engineer | Under the general direction of the vessel's Staff Chief Engineer, is in full charge of the Engine Department. Ensures that the vessel's mechanical and electrical machinery is properly maintained and serviced. Assigns licensed and unlicensed engine room employees to duty stations. Maintains discipline of engine room crew. | <ul style="list-style-type: none"> • TWIC • USCG license as Chief Engineer Limited of Motor Vessels • STCW certification |
| | Assistant Engineer | Responsible for running, operating, and maintenance of propulsion and electrical systems aboard the vessel. General maintenance duties may extend throughout the entire vessel. Routinely inspects and maintains all equipment; reports malfunctions and makes adjustments and repairs as directed by Chief Engineer's instructions. | <ul style="list-style-type: none"> • TWIC • USCG license as First, Second, or Third Assistant Engineer of Motor Vessels or Assistant Engineer |

MARITIME ENGINE ROOM

Maritime Engine Career Path



+ *Green Jobs Pathways*

-
- + *Identifying Green Jobs*
 - + *Occupations in Green Sectors*
 - + *Career paths in Green Sectors*
 - + *Eco-tourism*

03

WHAT ARE GREEN JOBS?

In 2009, the National Center for O*NET Development published a report, *Greening of the World of Work*, in which they created three categories of green jobs:

Increased Demand Occupations: the greening of the economy will increase the demand for workers in these existing occupations, but their work will not significantly change.

Enhanced Skills Occupations: the work and the training and certification for these existing occupations change as the economy greens, but their overall purpose remains the same.

New and Emerging Occupations: these are new occupations that develop as green economy activities and technology are implemented. These occupations could be entirely new or emerge from existing occupations.

Compared to the other two major Port-related industries (Maritime and Aviation), the Construction trades occupations are essential in a variety of green



projects (e.g., energy-efficient new construction, retrofitting older buildings, green stormwater infrastructure). Comparing the NAICS and SOC codes that the National Center for O*NET Development identified as “green” industries and “green” occupations and the Port-related industries, the construction trades rose to the top as those with the highest growth potential and thus were selected as the central area of focus for the green job career pathways.

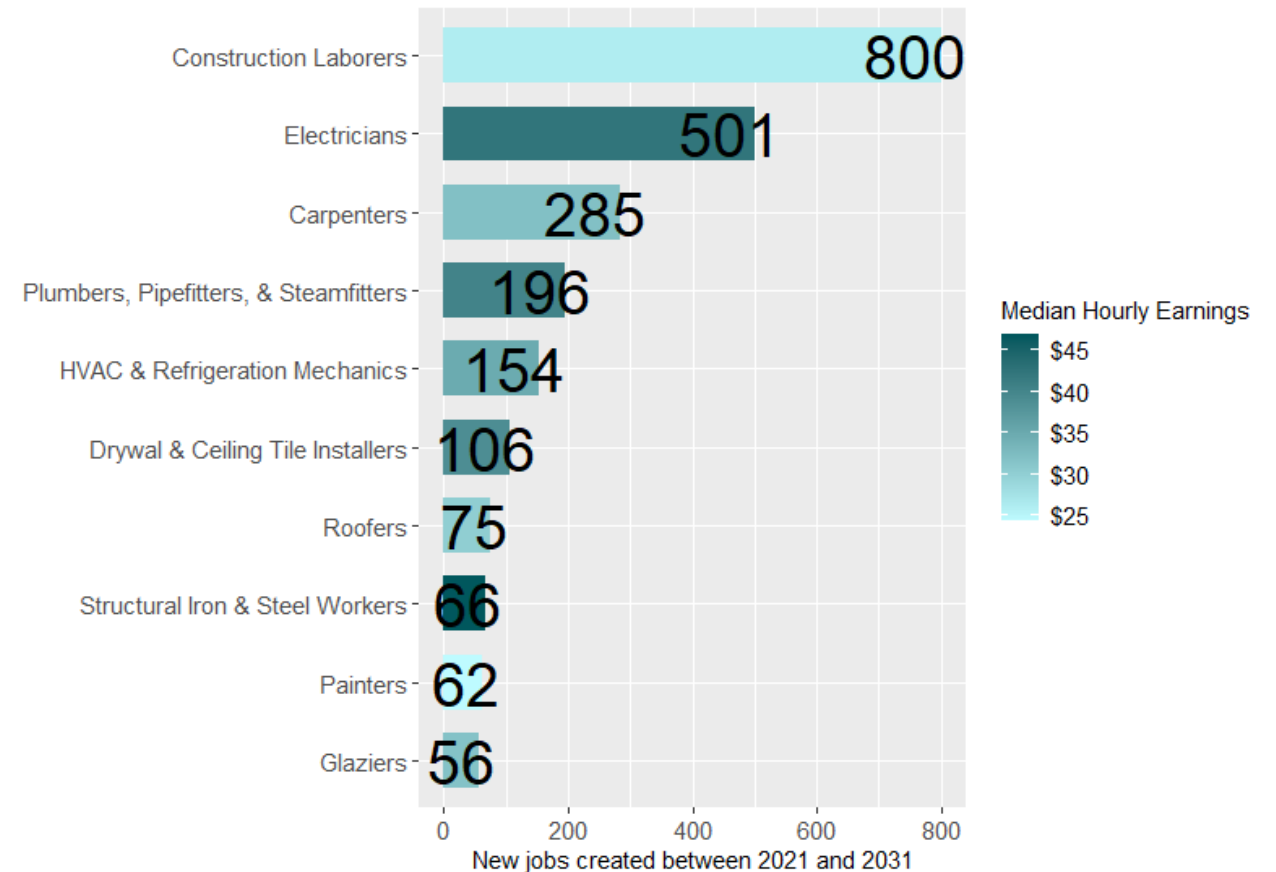
GREEN JOBS CONSTRUCTION OCCUPATIONS

The Construction sector includes businesses operating in both construction (residential, plants, bridges, etc.), building maintenance, and equipment contractors (HVAC, Electricians). The Construction sub-sectors with the largest potential for job growth in the green space:

- Residential Building Construction
- Nonresidential Building Construction
- Utility System Construction
- Other Heavy and Civil Engineering Construction
- Foundation, Structure, and Building Exterior Contractors
- Building Equipment Contractors
- Building Finishing Contractors
- Other Specialty Trade Contractors

Across all these subsectors, **Electricians** and **HVAC and Insulation Workers** are among the occupations with the largest expected job creation in the industries outlined above within the next ten years (between 2021 and 2031). They are expected to have many new jobs offering a relatively high hourly wage (\$42 and \$31-\$49 respectively) in King County.

Job Creation in King County in 2021-2031 - Construction



Source: Lightcast, 2022.

GREEN JOBS CONSTRUCTION OCCUPATIONS

These two occupations, **Electricians** and **HVAC and Insulation Workers** also have some of the largest employment pools in King County, with 6,199 and 3,285 workers in 2021. However, not all these positions are entry-level as many require licensing.

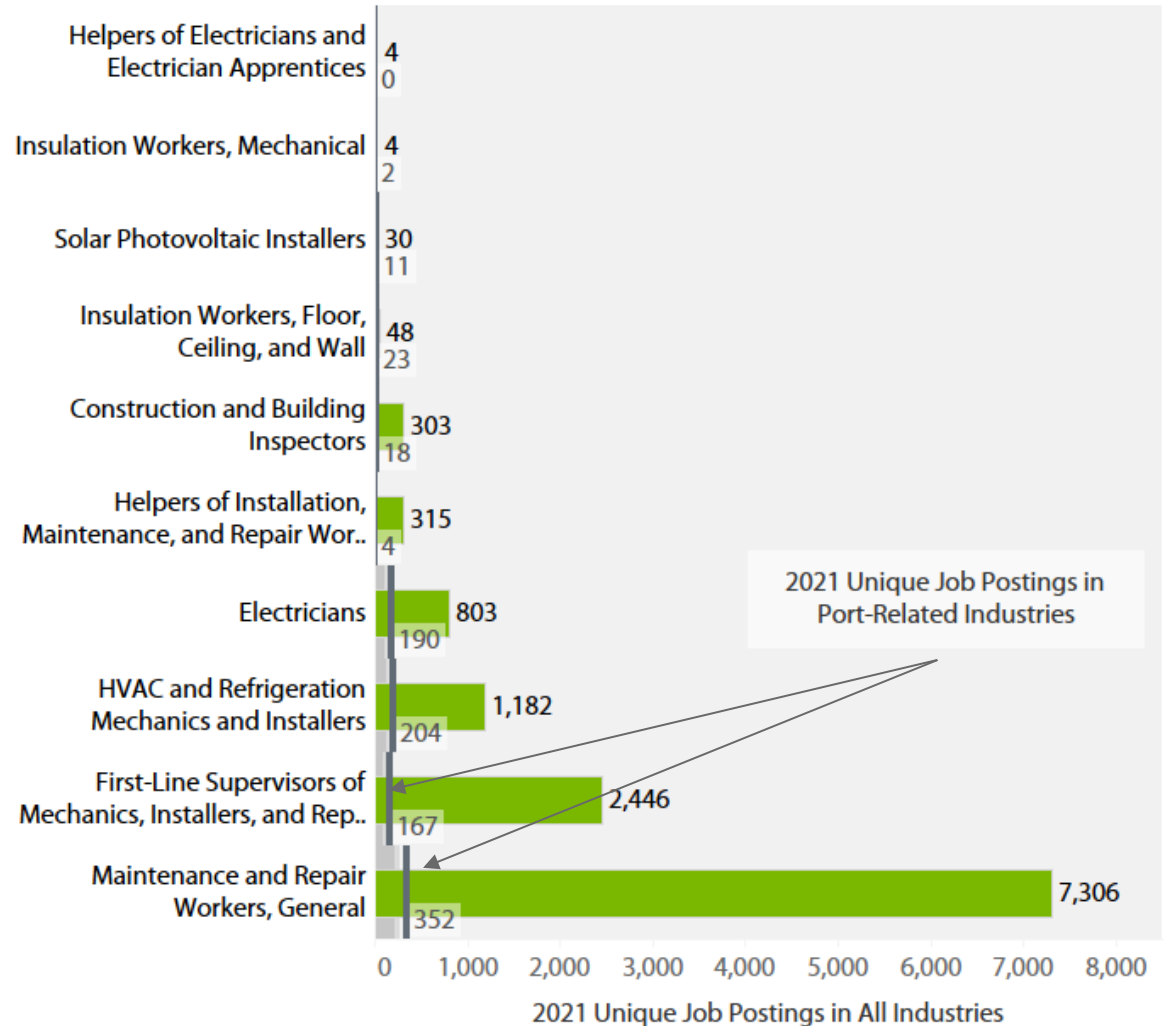
Unique Job Postings give an indication of the labor demand for each occupation. Specifically, job postings for entry-level positions help understand the potential for new workers to secure a position in a specific industry.

These 2021 entry-level job postings must meet the following requirements:

- Posted between January and December 2021
- Require less than a Bachelor's degree
- Require less than three years of work experience

Here again, **Electricians** and **HVAC and Insulation Workers** have many entry-level job postings.

Online Job Postings for Selected Green Jobs



Source: Lightcast, 2022.

GREEN JOBS PATHWAY 1: ELECTRICIANS

Electricians and related occupations provide crucial services to all economic sectors. They will also be indispensable to meeting clean energy and greenhouse gas emission reduction goals in the next 20 years. They are required members of crews installing electric vehicle charging stations and solar photovoltaic arrays. The number of workers is expected to increase within the next ten years for all Electricians and other related occupations in both Washington state and nationwide.

Job openings (for new positions or to replace retiring workers or workers exiting the industry) are expected to reach 25,270 Electricians by 2031, 798 Electrician Helpers (also referred to as electrical trainees, which will be phased out by July 2023 and limited to Electrical Apprentices), and 171 for Solar Photovoltaic Installers.



GREEN JOBS PATHWAY 1: ELECTRICIANS

| Occupational Title | King County | | | | Washington state | | | |
|--------------------------------------|-----------------|----------------|----------------|--------------------------------|------------------|----------------|----------------|--------------------------------|
| | Employment 2020 | Projected 2030 | Percent Change | Avg. Annual Openings 2020-2025 | Employment 2020 | Projected 2030 | Percent Change | Avg. Annual Openings 2020-2025 |
| Construction and Building Inspectors | 1,685 | 1,819 | 8% | 389 | 3,773 | 4,036 | 7% | 874 |
| Electricians | 7,496 | 8,896 | 19% | 2,779 | 23,586 | 27,776 | 18% | 8,693 |
| Solar Photovoltaic Installers | 115 | 216 | 88% | 57 | 243 | 461 | 90% | 122 |
| Helpers--Electricians | 86 | 100 | 16% | 33 | 322 | 372 | 16% | 122 |

Source: WA Employment and Security Department, 2022.

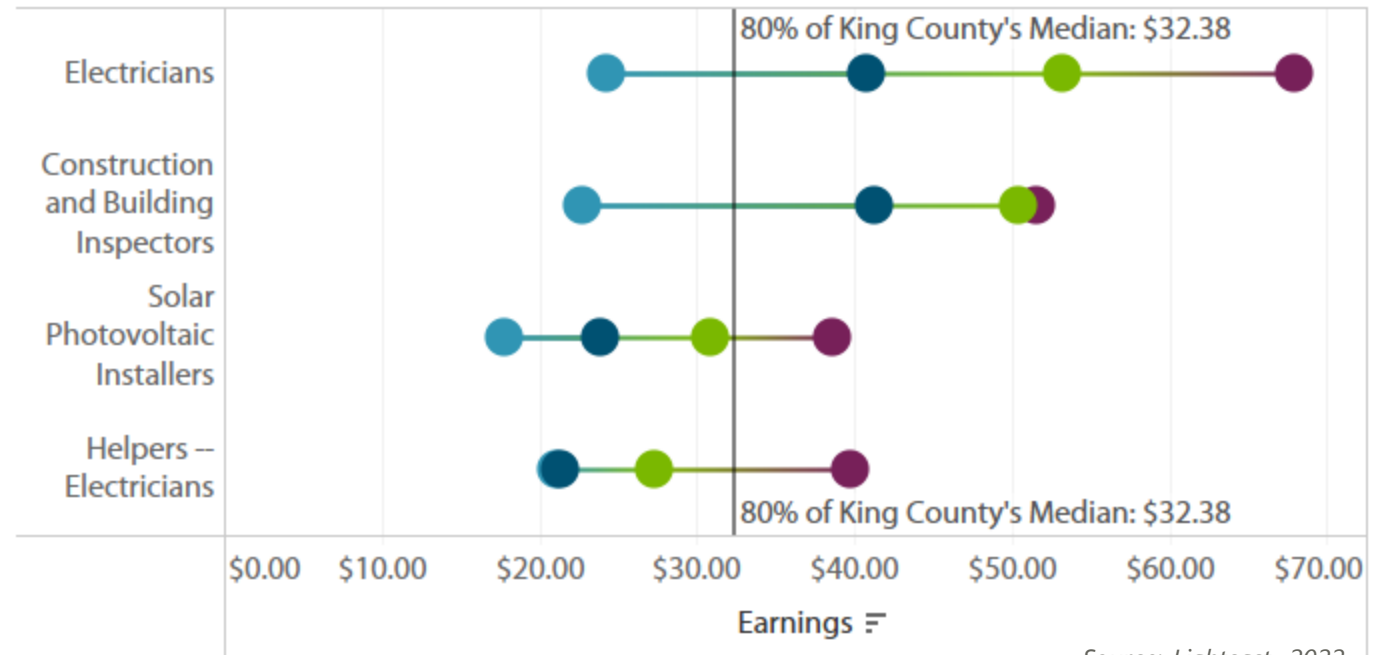
GREEN JOBS PATHWAY 1: ELECTRICIANS

Wages

The median wages along the electrician career path generally range from \$21.32 per hour for Electrician Helpers to \$40.80 for Electricians and \$41.32 for Inspectors. Electricians and Inspectors are both middle-wage jobs with their median wages exceeding 80% of the County's median wage. However, Helpers and Solar Photovoltaic Installers do not meet that criterion.

As mentioned earlier in this report, these statistics pertain to the same SOC code since similar occupations are often grouped together, and there are no distinctions made between the different levels within the occupation. For example, Journey Electricians and Master Electricians belong to the same SOC code 47-2111. Thus, we can assume that Master Electricians account for those who earn at the higher end of the distribution of the hourly earnings and Journey Workers earn in the middle and lower range. But we do not have independent statistics on each.

Electrician Career Path Jobs Hourly Wages



Source: Lightcast, 2022.

- Median Hourly Earnings
- Pct. 10 Hourly Earnings
- Pct. 75 Hourly Earnings
- Pct. 90 Hourly Earnings

GREEN JOBS PATHWAY 1: ELECTRICIANS

Race and Ethnicity

Racial diversity is largest for entry-level occupations, Helpers, at 39% but decreases sharply for Electricians to 21%.

Gender

None of the occupations along the electrician career pathway have gender parity. The percentage of women workers ranges between 3% for Electricians and 13% for Construction and Building Inspectors (including Electrical Inspectors).

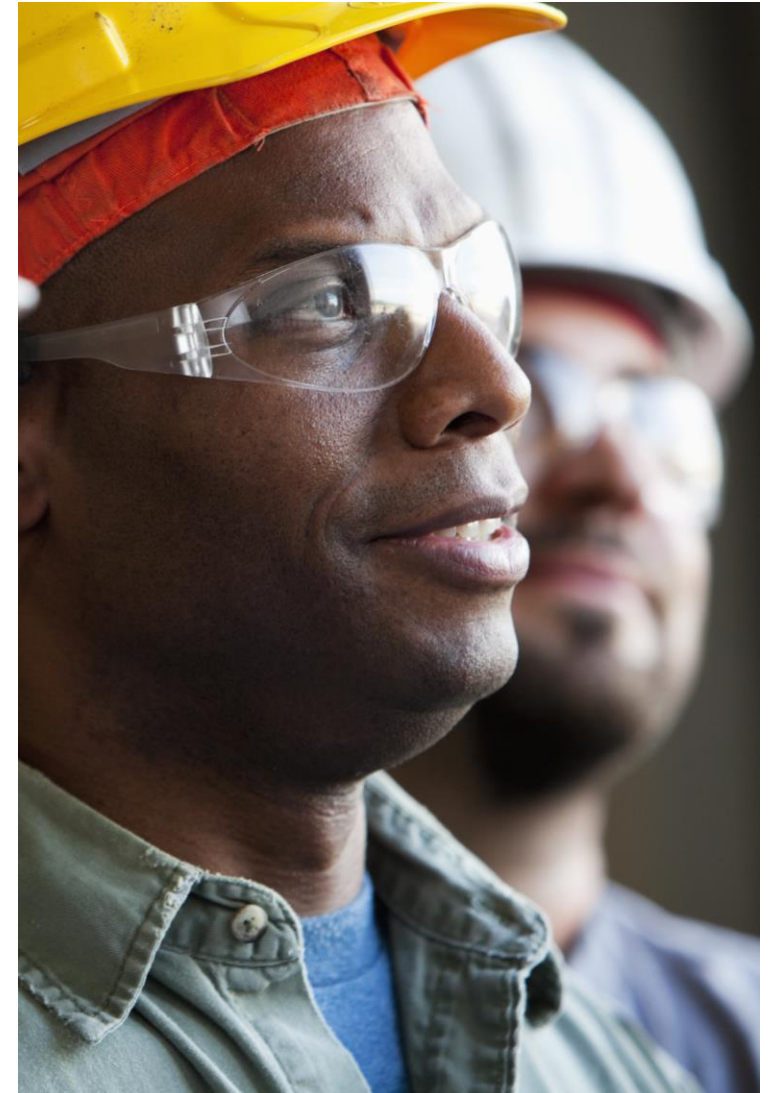
Supporting trainees from underrepresented communities to move along the career ladder would help make the sector more equitable.

Ramping up communication around the benefits of these occupations could help motivate more women and BIPOC workers to enter this field. Supporting current female and BIPOC trainees by providing relevant support services could also increase

representation. However, apprentice sponsors, programs, and mentors have a responsibility to make sure that the workplace is an inclusive environment. Apprenticeships should include training for mentors and supervisors to ensure that underrepresented workers are welcomed and can advance in the field.

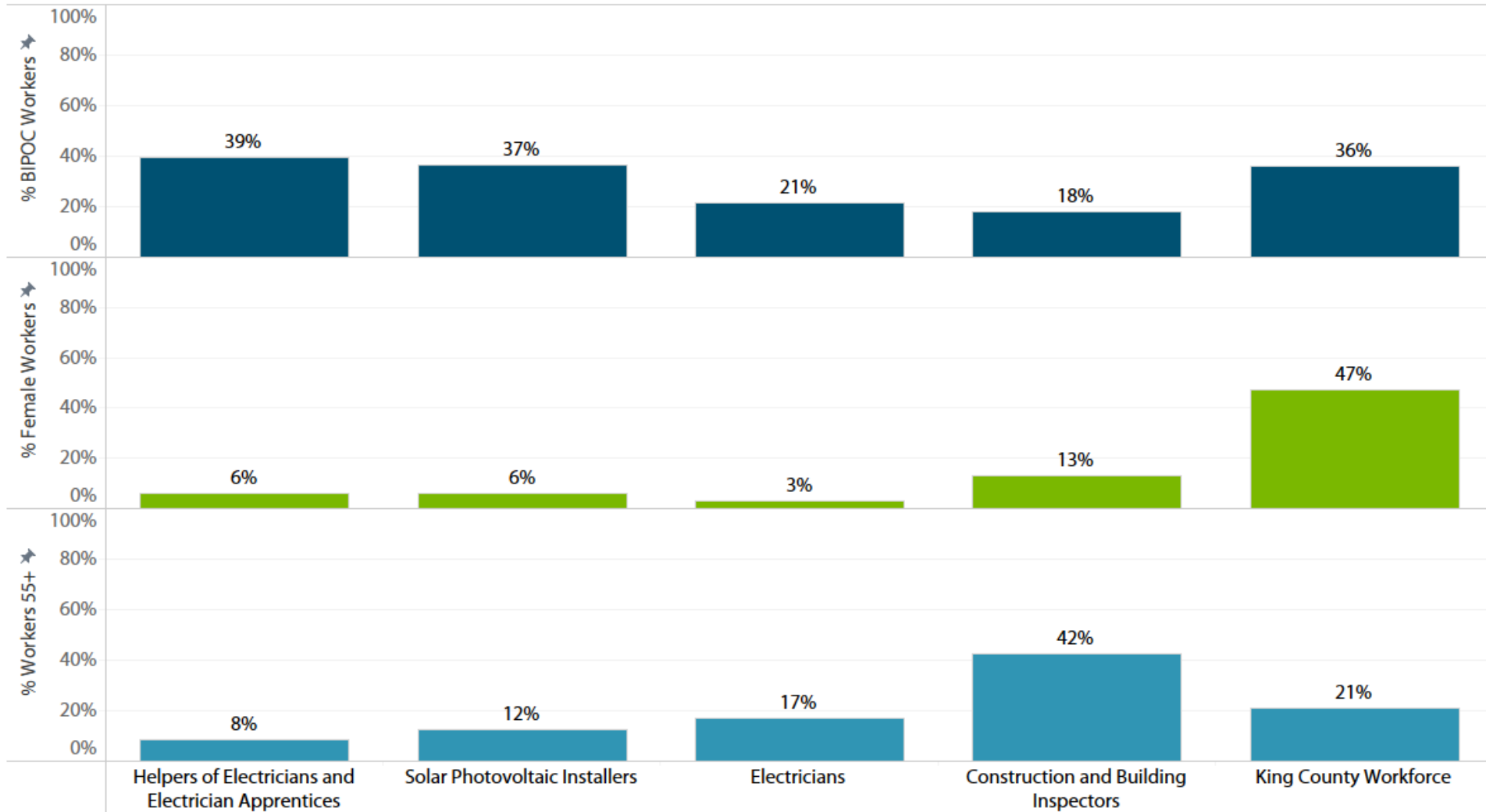
Age

As noted earlier, in addition to the occupation's projected growth, a large percentage of older workers indicates a future increase in job openings when these older workers retire. Occupations along the Electrician career ladder are expected to grow and have a moderate share of workers aged 55 years old or above (8% for the most entry-level occupations Helpers/Apprentices to 17% for Electricians). Construction and Building Inspectors (which includes Electrical Inspectors) are notably much older with 42% of workers aged 55 years old or above, signaling an upcoming wave of retirements and an increase in job openings.



GREEN JOBS PATHWAY 1: ELECTRICIANS

Electrician & Related Occupations Demographics in King County



Source: Lightcast, 2022.

GREEN JOBS PATHWAY 1: ELECTRICIANS

Electricians are the original green job and, thanks to the push for transport electrification nationwide, they are one of the most critical green occupations. For example, they are responsible for installing and maintaining the network of charging stations required to ensure adequate access to energy for electric car or truck owners.

Occupations related to electrical systems maintenance and installation are more varied from the Electrician pathway that job seekers might typically have in mind. In fact, workers in occupations that will be crucial in supporting the clean energy space require a valid Washington state certified electrician license.

Moving along the Electrician career pathway can be broken down into phases:

1. Acquiring foundational skills through pre-apprenticeship and apprenticeship
2. Acquiring a specialty or becoming a master-level electrician or contractor.

Becoming an Electrician Helper can be a first step on this career pathway. It introduces entry-level workers with no prior education or experience to the electrical sector. This occupation title will be phased out in Washington state in the next year and replaced with Electrical Trainee.

Following electrician helper or trainee one can enroll in a registered apprenticeship program. Completing a registered apprenticeship program is now required in Washington state to become a certified Electrician. An apprenticeship program typically lasts between two (Specialty Electricians) to five years (General Electricians).

Upon completion of an apprenticeship, the apprentice can pass an exam to obtain an Electrician Certificate and become a Journey Worker Electrician.

Journey Worker Electricians may then acquire specific skills to service specific products. For example, in Washington state, solar panel and electric vehicle

charging station installations require work done by Certified Electricians. Other technicians and laborers are typically involved; however, the core electrical work must be done by a certified electrician.

These skills may be acquired by enrolling in short-term training programs in community or vocational colleges or their local unions.

Once a Journey Worker Electrician has acquired enough years of work experience, they may pass a qualifying exam to become a Master Electrician. This professional has more responsibilities than a Journey Worker Electrician and can become an independent contractor. Independent contractors only need a Washington state Electrical Contractor License to open this type of business. They do however need a Master Electrician on their team.

Similarly, Electrical Inspectors don't need to be Certified Electricians but need to have an Electrical Administrator license from the state.

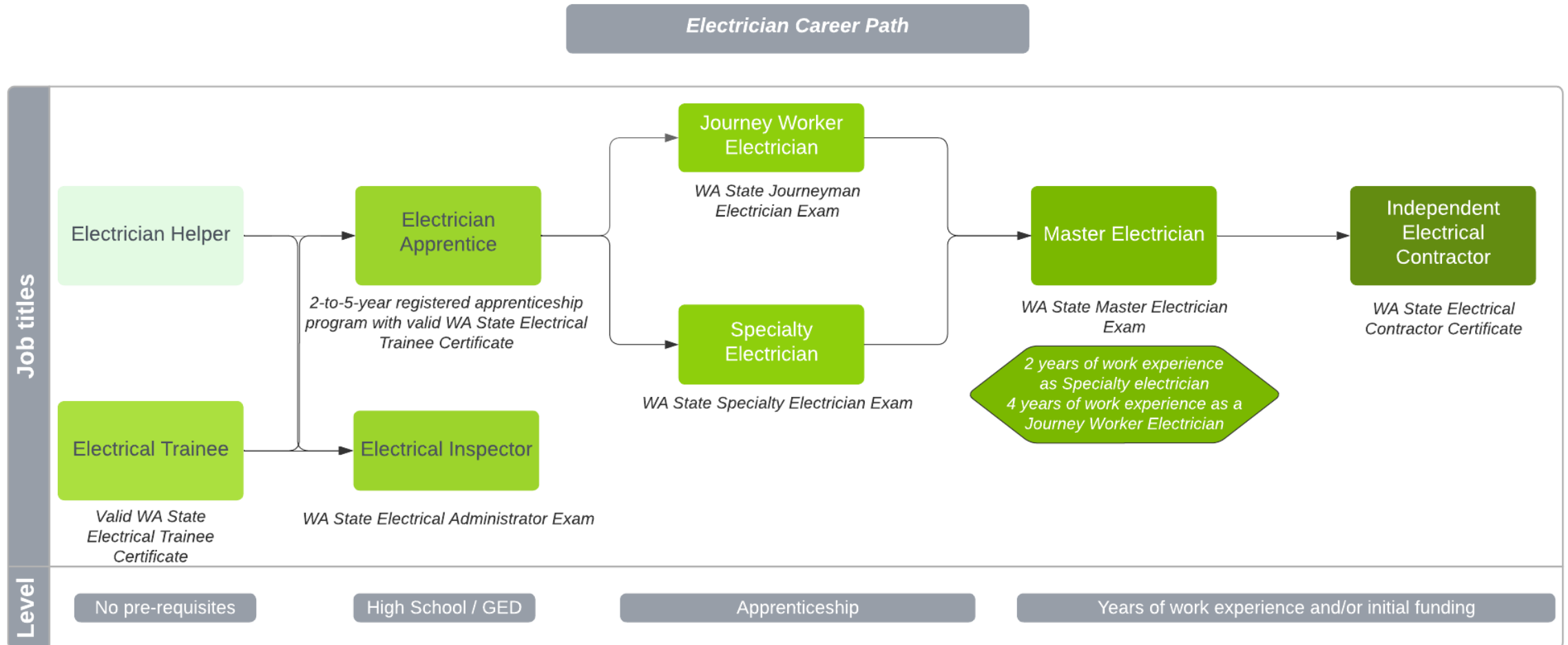
GREEN JOBS PATHWAY 1: ELECTRICIANS

| Category | Position | O*Net Description | Minimum Qualifications |
|--|------------------------------------|---|---|
| Helpers & Trainees | Electrician Helpers | Help electricians by performing duties requiring less skill. Duties include using, supplying, or holding materials or tools, pulling wire, digging trenches, and cleaning work area and equipment. | <ul style="list-style-type: none"> • None |
| | Electrical Trainees | Help electricians by performing duties requiring less skill. Duties include using, supplying, or holding materials or tools, pulling wire, digging trenches, and cleaning work area and equipment. | <ul style="list-style-type: none"> • Electrical Trainee certificate |
| Apprentice & Journey Worker Electricians | Electrician Apprentices | An apprenticeship is a combination of on-the-job training (OJT) and related classroom instruction under the supervision of a journey-level craft person or trade professional in which workers learn the practical and theoretical aspects of a highly skilled occupation (L&I, 2022) | <ul style="list-style-type: none"> • Electrical Trainee certificate • Make satisfactory progress throughout the apprenticeship program (typically lasts 2 to 5 years) |
| | Journey Worker Electricians | Install, maintain, and repair electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service streetlights, intercom systems, or electrical control systems. | <ul style="list-style-type: none"> • Journeyman Electrician certificate |

GREEN JOBS PATHWAY 1: ELECTRICIANS

| Category | Position | O*Net Description | Minimum Qualifications |
|---|--|--|---|
| Specialty positions | Electrical Inspectors (note: do not have to be a certified electrician) | Performs field inspections for residential, commercial, and industrial electrical installations to assure compliance with codes & regulations. Operates electrical testing equipment to conduct functional tests of equipment systems. | <ul style="list-style-type: none"> • Pass a qualifying exam as Electrical Administrators • Specialty Electrician certificate (if also complete duties of Certified Electricians) |
| | Electric Vehicle Charging Station Installers | Assemble, install, or maintain electric vehicle charging stations on public or private properties (highway, parking lots, single- and multi-family residences) in compliance with local regulations. | <ul style="list-style-type: none"> • Specialty Electrician certificate |
| | Solar Photovoltaic Installers | Assemble, install, or maintain solar photovoltaic (PV) systems on roofs or other structures in compliance with site assessment and schematics. May include measuring, cutting, assembling, and bolting structural framing and solar modules. | <ul style="list-style-type: none"> • Specialty Electrician certificate |
| Master Electricians & Independent Contractors | Master Electricians | Create electrical blueprints, install electrical wire systems, coach other electricians, plan electric components in new constructions. | <ul style="list-style-type: none"> • Journey level master electrician: At least four years of work experience as a journey-level certified electrician • Specialty level master electrician: At least two years of work experience as a specialty-level certified electrician • Pass a qualifying exam as Master Electrician |
| | Independent Electrical Contractor | Operate their own electrical contracting company and may supervise other journeyman or apprentice electricians. | <ul style="list-style-type: none"> • Electrical Contractor license • A \$4,000 bond or assignment of savings • Hire or be a designated master electrician or administrator |

GREEN JOBS PATHWAY 1: ELECTRICIANS



GREEN JOBS PATHWAY 2: VENTILATION AND INSULATION PROFESSIONALS

Like occupations on the Electrician career pathway, occupations in Ventilation and Insulation also support clean energy and retrofitting efforts to curb greenhouse gas emissions in the construction sector. Washington state and King County are implementing policies that require significant improvements in the energy efficiency of large buildings, which depends on improvements in HVAC. HVAC also has a crucial role in reducing the spread of illnesses like COVID.

Wages

The median wages in ventilation and insulation range from \$23.97 per hour for Helpers in Installation/Maintenance and \$24.39 for Maintenance and Repair Workers to \$48.56 for Mechanical Insulation Workers. Other certified professionals in the field (HVAC Mechanics and Installers and Floor/Ceiling/Wall Insulation Workers) earn a median wage between \$30 and \$32 per hour.

Thus, Mechanical Insulation Workers, Supervisors are middle-wage jobs, and HVAC Mechanics and Floor, Ceiling, and Wall Insulation are just below 80% of the county's median income. But General Maintenance Workers and Helpers are well below the cut-off.

Ventilation and Insulation Path Jobs Hourly Wages



Source: Lightcast, 2022.

GREEN JOBS PATHWAY 2: VENTILATION AND INSULATION PROFESSIONALS

Race and Ethnicity

These occupations are more racially representative than the maritime or electrical sectors. However, there is still a discrepancy between entry-level and advanced positions. While workers of color make up 44% of Helpers in Installation and Maintenance, they only make up 21% of HVAC Installers and Mechanics and 21% of Supervisors of Installation and Maintenance workers.

Gender

Like other trades-related occupations, none of the selected ventilation and insulation occupations have gender parity as the percentage of women workers ranges from 1% for HVAC Mechanics and Installers and 11% for Floor/Ceiling/Wall Insulation.

Supporting workers of color and women in moving along the career ladder and making the requirements more transparent is essential to make this sector more diverse and equitable.

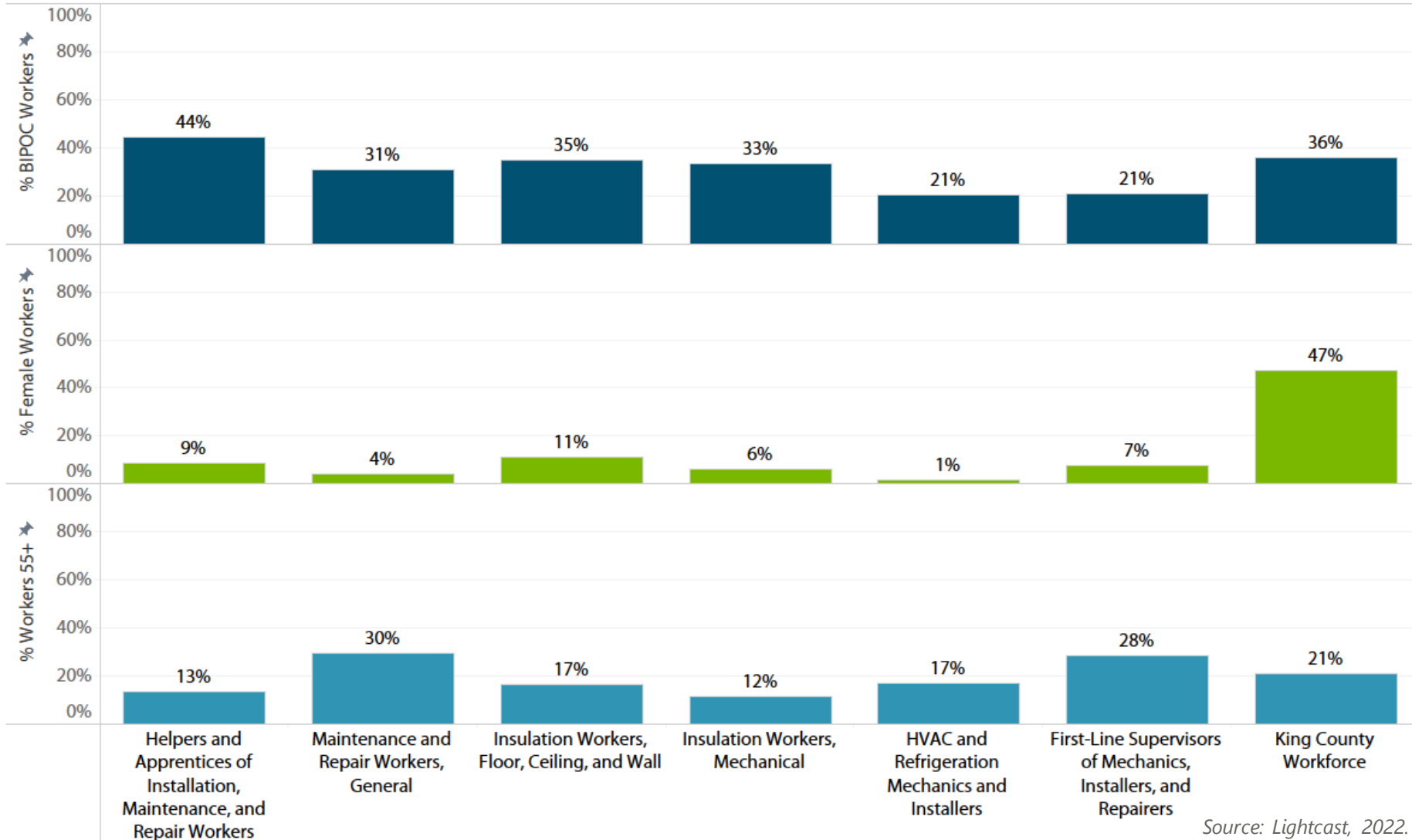
Age

Finally, occupations with the largest share of older workers (age 55 years or above) are Maintenance and Repair Workers (30%) and Supervisors of Installation and Maintenance Workers (28%), potentially indicating an increase in future job openings related to current workers retiring.



GREEN JOBS PATHWAY 2: VENTILATION AND INSULATION PROFESSIONALS

Insulation and Ventilation Demographics in King County



Source: Lightcast, 2022.

GREEN JOBS PATHWAY 2: VENTILATION AND INSULATION PROFESSIONALS

| Occupational Title | King County | | | | Washington state | | | |
|--|-----------------|----------------|----------------|--------------------------------|------------------|----------------|----------------|--------------------------------|
| | Employment 2020 | Projected 2030 | Percent Change | Avg. Annual Openings 2020-2025 | Employment 2020 | Projected 2030 | Percent Change | Avg. Annual Openings 2020-2025 |
| HVAC and Drywall & Insulation Contractors | 15,780 | 17,162 | 9% | | 42,436 | 47,953 | 13% | |
| Helpers--Installation, Maintenance, & Repair Workers | 612 | 666 | 89% | 165 | 1,596 | 1,767 | 11% | 439 |
| Maintenance and Repair Workers, General | 12,504 | 14,057 | 12% | 4,331 | 35,198 | 40,425 | 15% | 12,456 |
| Insulation Workers, Floor, Ceiling, & Wall | 469 | 559 | 19% | 227 | 1,193 | 1,410 | 18% | 576 |
| Insulation Workers, Mechanical | 263 | 321 | 22% | 103 | 1,269 | 1,511 | 19% | 493 |
| Heating, Air Conditioning, & Refrigeration Mechanics & Installers | 1,910 | 2,171 | 14% | 680 | 8,587 | 10,181 | 19% | 3,177 |
| Construction & Building Inspectors | 1,685 | 1,819 | 8% | 389 | 3,773 | 4,036 | 7% | 874 |
| First-Line Supervisors of Mechanics, Installers, & Repairers | 4,240 | 4,691 | 11% | 1,368 | 12,725 | 14,080 | 11% | 4,128 |

Source: WA Employment and Security Department, 2022.

GREEN JOBS PATHWAY 2: VENTILATION AND INSULATION PROFESSIONALS

Like Electricians, moving along the Ventilation and Insulation career pathway can be broken down into two phases:

1. Acquiring knowledge about the field and completing a registered apprenticeship program, and
2. Developing specialty skills or moving to managerial positions.

Workers can first get introduced to the sector by becoming Helpers of Installation, Maintenance and Repair professionals as this occupation doesn't require prior education or work experience. They can then either:

- Become a Maintenance and Repair Worker by enrolling in a short-term training program in a community or technical college or vocational school

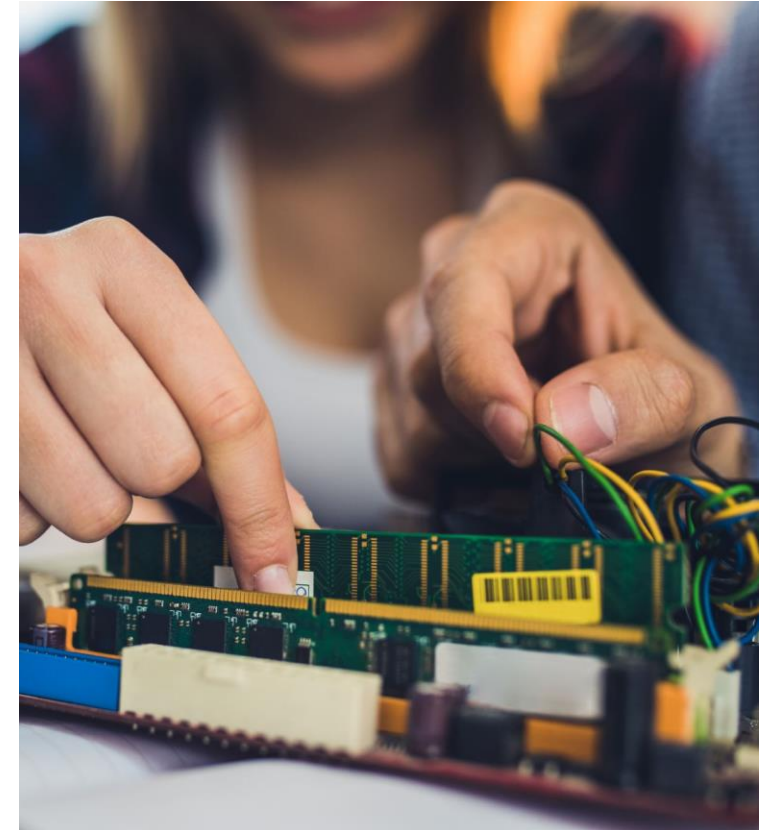
- Enroll in a registered apprenticeship program in insulation (typically a two-year program) or HVAC (typically a four-year program) to become a certified professional.

Insulation apprentices can choose between two specialties:

- Mechanical Insulation
- Floor, Ceiling, and Wall Insulation (for which a specific license is required for those working as Asbestos Workers)

HVAC (Heating, Air Conditioning, and Refrigeration) Mechanics and Installers typically follow a more general program with no specific specialty.

After successfully completing an apprenticeship program and after a few years work experience, workers may move up to managerial positions or become independent HVAC or insulation contractors.



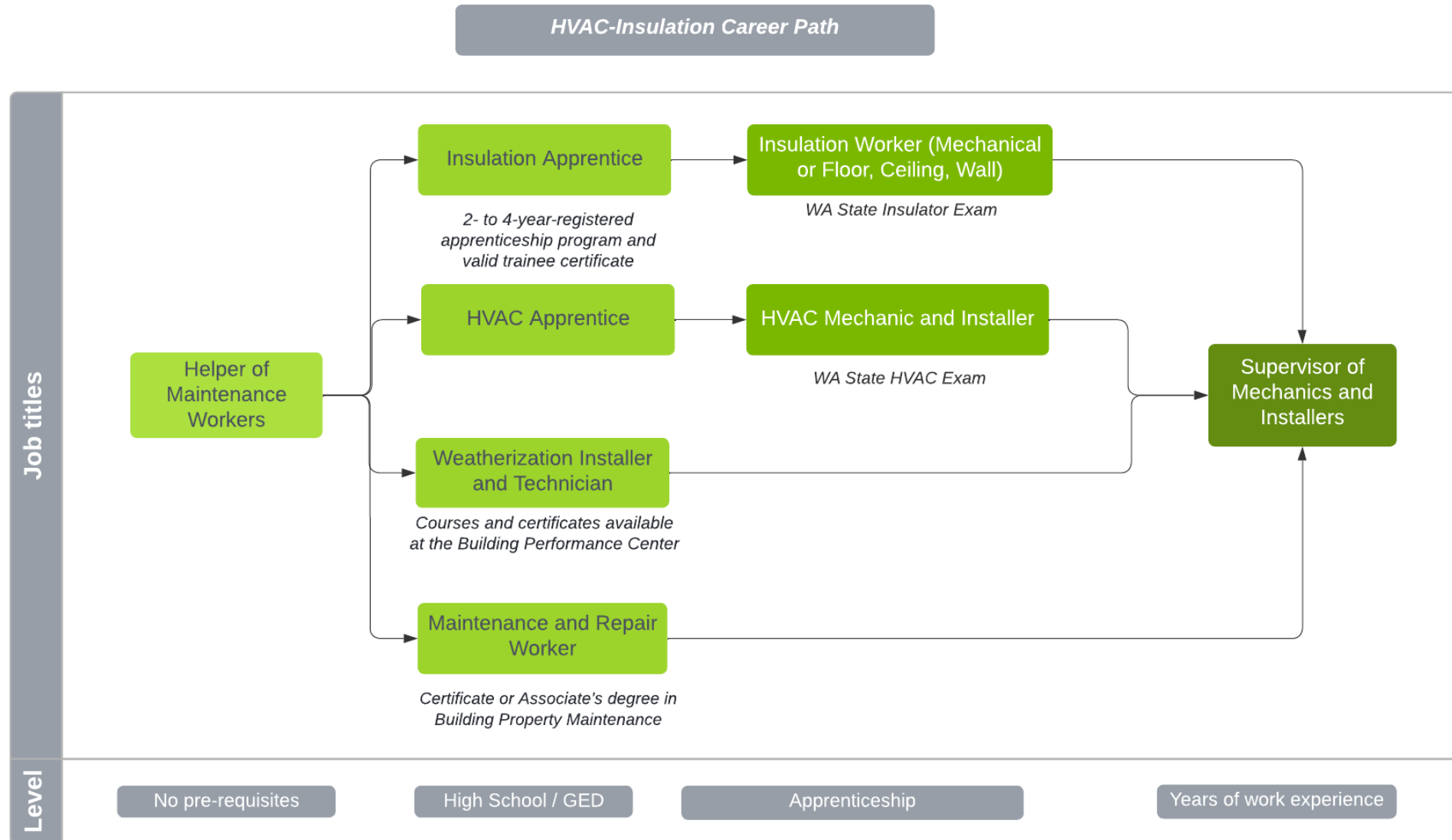
GREEN JOBS PATHWAY 2: VENTILATION AND INSULATION PROFESSIONALS

| Unit | Position | O*Net Description | Minimum Qualifications |
|-------------|---|---|---|
| Helpers | Helpers--Installation, Maintenance, and Repair Workers | Help installation, maintenance, and repair workers in maintenance, parts replacement, and repair of vehicles, industrial machinery, and electrical and electronic equipment. | <ul style="list-style-type: none"> • None |
| | Maintenance and Repair Workers, General | Perform work involving the skills of two or more maintenance or craft occupations to keep machines, mechanical equipment, or the structure of a building in repair. | <ul style="list-style-type: none"> • Certificate or Associate's degree in Building Property Maintenance |
| Apprentices | Insulation Apprentices | An apprenticeship is a combination of on-the-job training (OJT) and related classroom instruction under the supervision of a journey-level craft person or trade professional in which workers learn the practical and theoretical aspects of a highly skilled occupation (L&I, 2022) | <ul style="list-style-type: none"> • Insulation Applicator Trainee certificate • Make satisfactory progress throughout the apprenticeship program (typically lasts 2 years) |
| | HVAC Apprentices | | <ul style="list-style-type: none"> • Residential HVAC Trainee certificate • Make satisfactory progress throughout the apprenticeship program (typically lasts 4 years) |

GREEN JOBS PATHWAY 2: VENTILATION AND INSULATION PROFESSIONALS

| Unit | Position | O*Net Description | Minimum Qualifications |
|------------------------------|--|---|---|
| Journey Worker Professionals | Insulation Workers, Mechanical | Apply insulating materials to pipes or ductwork, or other mechanical systems in order to help control and maintain temperature. | <ul style="list-style-type: none"> State license required to work as an Insulation Contractor |
| | Insulation Workers, Floor, Ceiling, and Wall | Line and cover structures with insulating materials. May work with batt, roll, or blown insulation materials. | <ul style="list-style-type: none"> State license required to work as an Insulation Contractor State license required if working as an Asbestos Worker |
| | Weatherization Installers and Technicians | Perform a variety of activities to weatherize homes and make them more energy efficient. Duties include repairing windows, insulating ducts, and performing heating, ventilating, and air-conditioning (HVAC) work. May perform energy audits and advise clients on energy conservation measures. | |
| | Heating, Air Conditioning, and Refrigeration Mechanics and Installers | Install or repair heating, central air conditioning, HVAC, or refrigeration systems, including oil burners, hot-air furnaces, and heating stoves. | <ul style="list-style-type: none"> State license required to work as an HVAC Contractor |
| Supervision Roles | First-Line Supervisors of Mechanics, Installers, and Repairers | Directly supervise and coordinate the activities of mechanics, installers, and repairers. May also advise customers on recommended services. Excludes team or work leaders. | <ul style="list-style-type: none"> State license required to work as an Insulation or HVAC contractor, or an Asbestos Worker |

GREEN JOBS PATHWAY 2: VENTILATION AND INSULATION PROFESSIONALS



GREEN JOBS PATHWAY 3: ECO-TOURISM

Environmental Protection in WA state

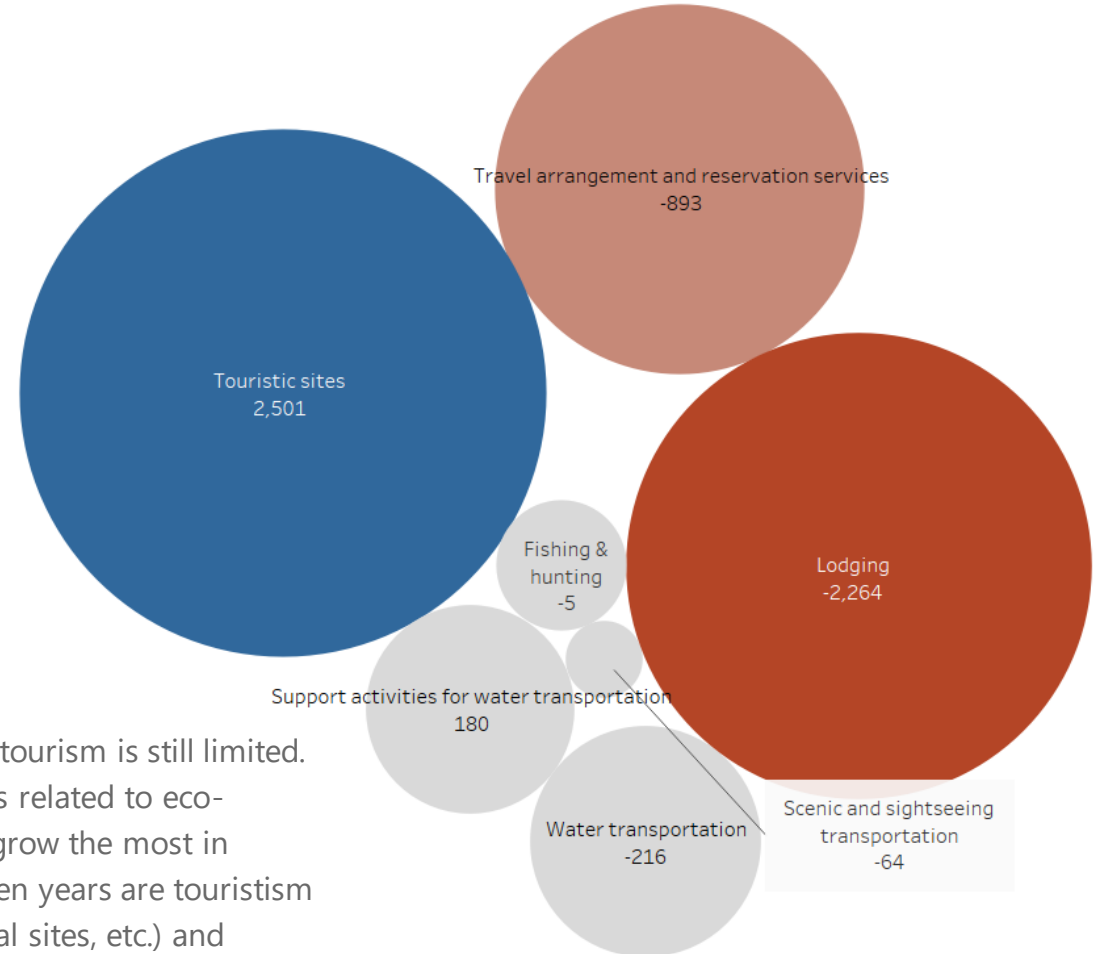
Washington state is renowned throughout the country for its landscapes, from lush evergreen forests to pristine lakes and diverse wildlife. Protecting and nurturing the state's natural ecosystem is the mission of several agencies and organizations. Several current policies are aimed at financially supporting these goals. For example, the U.S. Environmental Protection Agency has recently allocated funds to improving and protecting water quality in WA state, protecting underserved communities from harmful greenhouse gas emissions, or promoting sustainable recreation activities in the Columbia River Basin.

Eco-tourism Industry

Due to the state's varied landscapes, nature-related recreational activities are an important sector of the economy and employment. Besides hotels and hiking or sport equipment rentals, recent initiatives have been focusing on limiting the impact of recreational and hospitality activities on the environment.



Eco Tourism Employment in King County, 2020-2030



Labor market data about eco-tourism is still limited. However, the industrial sectors related to eco-tourism that are expected to grow the most in employment within the next ten years are tourism sites (museums, zoos, historical sites, etc.) and support activities for Water Transportation.

Source: WA Employment and Security Department, 2022.

GREEN JOBS PATHWAY 3: ECO-TOURISM

Careers in Eco-tourism

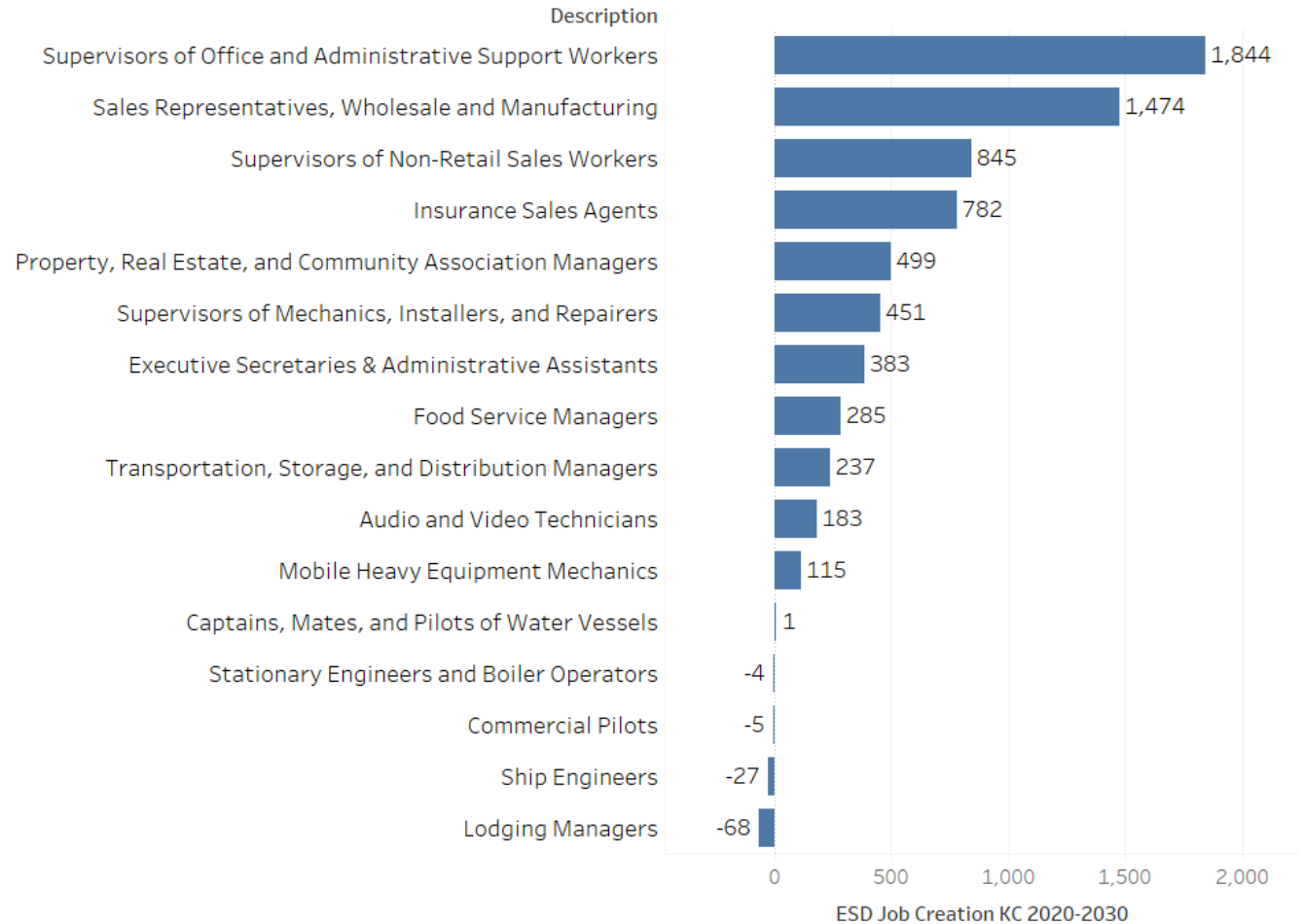
Eco-tourism relies on a wide range of skills and a workforce that offers diverse career paths.

For example, sustainable lodges might rely primarily on hospitality and customer service skills. Other business activities require specialized skills in forestry or wildlife biology (guided tours), mountaineering, sports, or community outreach and sustainability expertise. These diverse pathways highlight the range of education and work experience requirements to enter eco-tourism.

Still, many occupations in eco-tourism industries either offer limited employment opportunities (due to a low number of baseline workers and job openings) or do not provide a family-sustaining wage¹. Those that offer significant employment opportunities and are middle-wage tend to be managerial but include more technical positions such as mechanics or technicians.

1. The Brookings Institute defines middle-wage jobs as having a median hourly wage of at least 80% of the metropolitan's median hourly wage. King County's median hourly wage was \$40.48 in 2021 (WA ESD, 2022).

Middle-Wage Occupations in Eco-Tourism



Middle-Wage Occupations with at least 10 workers in Eco-Tourism-Related Industries and offering a middle-wage (median hourly wage of at least \$32/hour).
Employment Projections Source: WA ESD, 2022.
Median Hourly Wage Source: Lightcast, 2022.

Conclusion & Recommendations

04

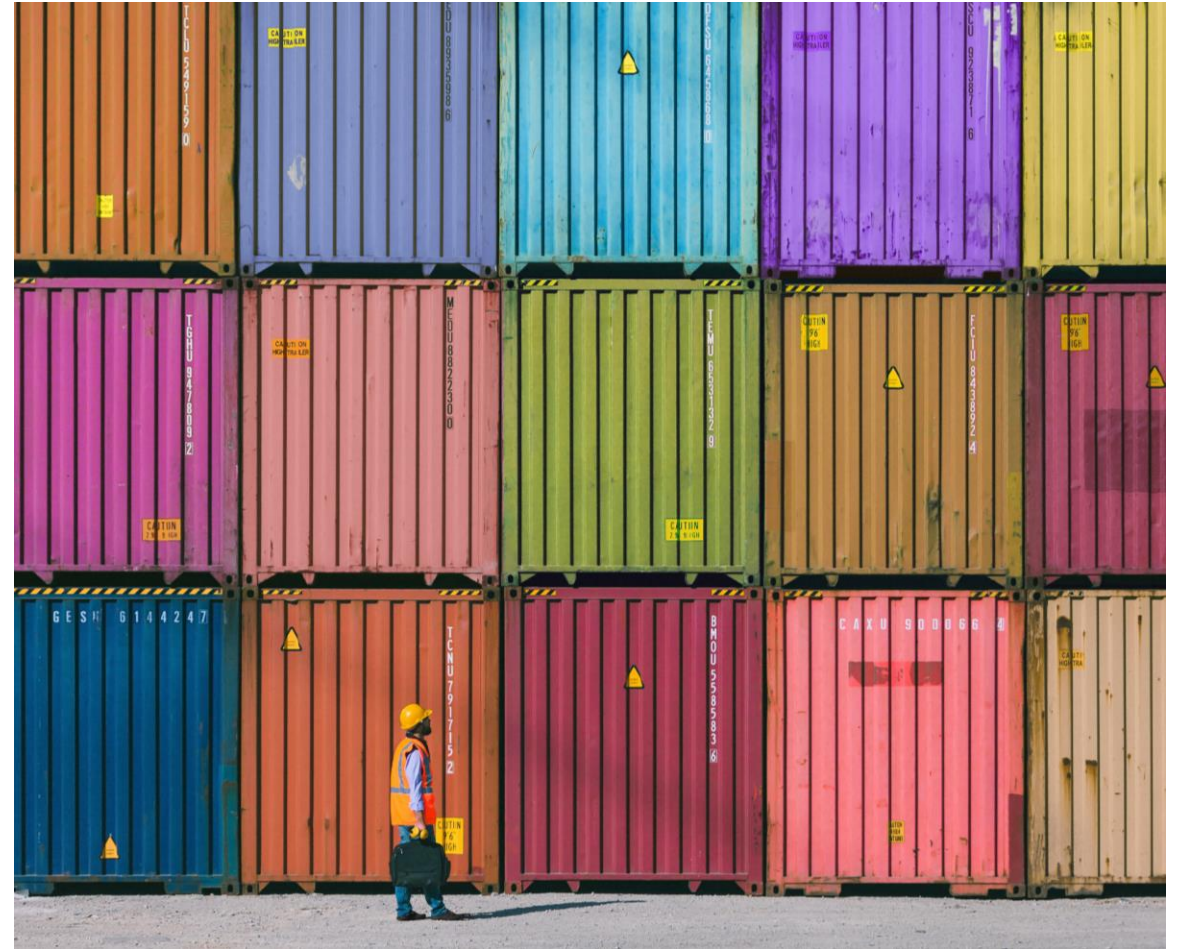
CONCLUSION & RECOMMENDATIONS

This report is aimed at supporting the Port of Seattle's workforce development strategies and guiding future investments in training programs. Past investments have focused on Aviation and Construction. The coming phase is focused on the Maritime Sector and Green Jobs. The occupations selected in this report are part of middle-wage career paths that do not require a Bachelor's degree. While not all the entry-level occupations identified are middle-wage, they offer clear stepping stones to move up the career ladder if individual workers have enough support and guidance to take advantage of career advancement opportunities.

Maritime Career Paths

The Maritime Sector is one of the Port's main branches of activity and includes passenger and cargo transportation, and commercial fishing. While there are many career paths in the maritime industry, there are two career paths working on vessels: deck and in the engine room.

In the first selected maritime career path, entry-level workers begin as Ordinary Sailors and may move up the ranks to become Captains. This career path involves accumulating a set number of hours of sea time as determined by the U.S. Coast Guard (USCG), as well as acquiring and maintaining the proper licensure at each step.



CONCLUSION & RECOMMENDATIONS



In the second selected maritime career pathway, entry-level workers begin as Wipers or Oilers and may become Chief Engineers by accumulating enough sea time (determined by the USCG), enrolling in short-term training programs, and acquiring and maintaining the proper licensure.

Green Jobs Career Paths

While maritime career pathways are already established, identifying green jobs can be more amorphous as many jobs in a variety of sectors may directly or indirectly support the greening of the economy.

Most existing jobs will experience a shift in the type of tasks completed and current workers will need to acquire new skills to perform these green tasks. For example, Electricians can now enroll in short-term training programs to work on renewable energy projects or service electric vehicle charging stations.

The trades are crucial to support curbing greenhouse gas emissions as they contribute to a range of activities, from retrofitting older buildings and installing new green stormwater projects to installing renewable energy equipment.

CONCLUSION & RECOMMENDATIONS

Electricians will be essential to support green efforts in a range of industries and are the first selected green job career pathway. Entry-level workers may start as Construction Laborers to get introduced to the trades sector. However, to become a certified Journey-Level Electrician (and eventually a Master-Level Electrician), it is required to complete a two- to a five-year apprenticeship program.

Ventilation and Insulation is the second selected green job career pathway. Similar to Electricians, entry-level workers must follow a two- to four-year apprenticeship program to become certified professionals in this field.

Diversity

The current workforce in all the identified career paths lacks both racial and gender diversity than King County's workforce. Failure to address the systemic and structural barriers that keep BIPOC and women workers from pursuing these careers will exacerbate labor shortages and harm these industries. Potential strategies include :

- Improving the transparency of advancement along the career
- Supporting workers in getting the necessary credentials and licenses
- Evaluating workplace structures and expectations that keep those workers from entering or succeeding in these careers.
- Training mentors and supervisors on how to mentor and lead a diverse workforce



References and Appendices

+ *References*

+ *Appendix A: Methodology*

+ *Appendix B: Data Sources*

05

+ *References*

05

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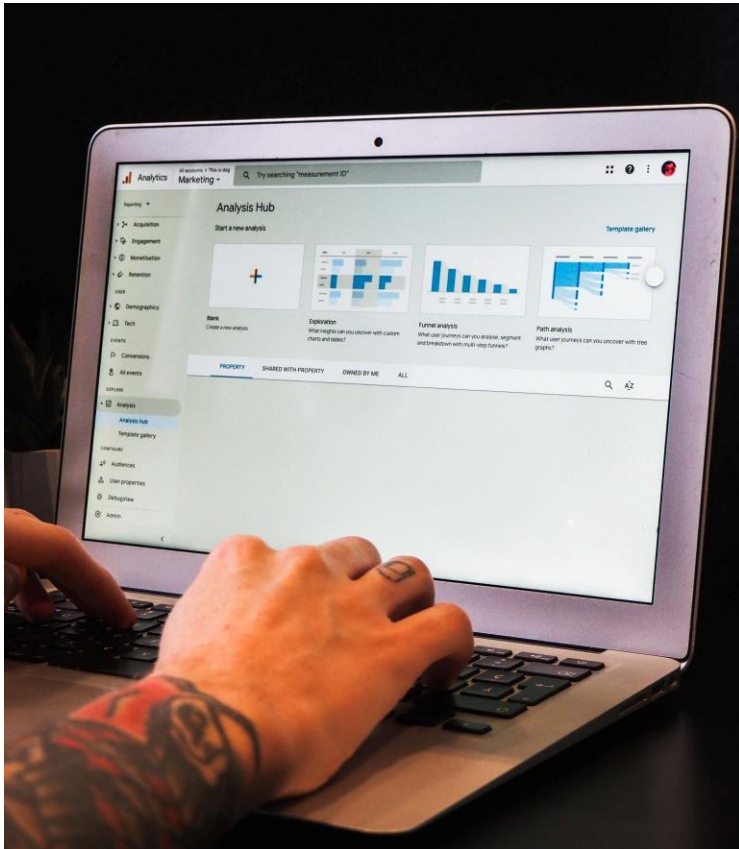
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+ *Appendix A: Methodology*

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APPENDIX A: METHODOLOGY



SJI leverages data from the Washington State Employment Security Department, and from a recognized labor market analytics provider: Lightcast. Lightcast's data contains a range of information for all NAICS industries, including:

- **Current and Projected number of workers**
- **Past annual hires and separations**
- **Worker demographics**
- **Median, 10th, 75th, and 90th percentile earnings**

For this report, we focus specifically on jobs directly participating in the implementation of maritime and green projects. However, it is worth noting that many occupations supporting the development of the green sector can be found in more general sectors of the economy, like administration or consulting services, and growth in green industries spills over to other areas of the economy.

Additionally, to identify prospective high-growth green sectors, SJI relied on a combination of literature and labor market data analysis:

1. Comparing the green sectors identified by the Bureau of Labor Statistics, EPI (2020), and the Port's identified industries
2. Analyzing labor market data for the prospective industries identified in (1) to assess:
 - **Current employment**
 - **Employment growth potential**
 - **Green potential**
3. Identifying the specific green occupations in these industries that have the greatest growth potential

The growth potential identified in this report is based on current policy and economic conditions. As EPI demonstrated in their report, public policy and public investment can change the growth of these sectors and occupations.

+ *Appendix B: Data Sources*

05

Appendix B: Data Sources

The following metrics, among others, collected from Lightcast (formerly Emsi Burning Glass), a leading labor market analytics firm:

Number of Workers

An industry's employment pool helps:

- Understand the importance of the sector in the local economy
- Assess how many workers depend on this industry,
- Evaluate the sector's capacity to absorb new workers entering the labor market.

Public investment programs should prioritize industries with an employment pool large enough to accommodate new cohorts.

Job Openings and Postings

Another crucial metric to measure an industry's employment potential is unique job postings. Even though the industry has many workers and is expected to grow, future positions may rely on current workers or require different skills and recruit workers from other industries.

Online job postings show how many positions industries are currently hiring for. Companies may post an advertisement several times for the same position. As a result, job postings with the same job characteristics observed in a short period of time (description, title, department, etc.) are counted only once. A note on the limitations of this metric: some industries like construction rely more on networking and word of mouth than online job boards.

In this report, entry-level job postings are online job postings requiring 0 to 3 years of work experience and at most an Associate's degree.

Wage and Demographics

Lightcast also provides a set of occupation earnings estimates: annual hourly and average earnings. These estimates are obtained from the Bureau of Labor Statistics' Occupational Employment Statistics Survey and directly collected from employers and reported pre-tax.

Demographics data include the estimated percentage of workers by occupation who identify as women or as belonging to a certain ethnicity and race category. Occupation-level demographic estimates are obtained from industry staffing patterns and industry-level demographic estimates from the Census Bureau's Occupational Employment Statistics Survey.

Appendix B: Data Sources

The following metrics, among others, collected from the Washington state Employment Security Department:

Employment Trends

Even with a large employment pool, industries are still subject to internal (e.g., technological innovations) and external (e.g., national economic context) factors that determine how fast the industry changes.

A second important factor to consider when identifying sectors to invest in is their projected employment growth rate.

The projections are computed by the Washington state Employment Security Department's alternative long-term projection model using industry-level projections, staffing pattern estimates, and wage records specific to Washington state.

These estimates are then augmented by the separations trends within an industry (number of workers expected to leave their positions due to retirement, or because they switch employers within the same industry and/or occupation, or because they exit the industry and/or occupation).

Finally, these estimates are complemented by national, state, and regional level industry projections from the Bureau of Labor Statistics and State labor market organizations.

However, because these projects are based on historical data and thus can be skewed downward by economic disruptions like the COVID-19 pandemic and chronic labor shortages and do not account for potential growth spurred by changes in public policy and investment.