



OCEAN ECONOMY 101:

**Emerging Educational Supply
and Labor Market Demand**



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OCEAN ECONOMY 101:

Emerging Educational Supply and Labor Market Demand

The purpose of this report is to provide an overview of supply and demand for middle-skill talent that is currently being trained, or that could be trained with the development of new or modified programs at community colleges for one of the newest and fastest-growing sectors in the Los Angeles region — the Ocean, or Blue, Economy.

This report augments and complements the Ocean Economy 101 Look Book created for the first regional program advisory meeting on the ocean economy that CCW hosted in December 2021 with LAEDC, COE and Milken Institute. This meeting was the first in a series to introduce this emerging sector and fast-growing ecosystem being accelerated by AltaSea at the Port of Los Angeles, identify existing programs and discuss possible new career education programs and curricula aligned with the ocean economy, understand the job and career opportunities, and confirm the importance of community colleges in supporting a well-trained and sustainable talent pipeline.



Center for a Competitive Workforce

The Center for a Competitive Workforce (CCW) is a strategic regional employer engagement initiative of the Los Angeles Regional Consortium that was launched in 2017 as a Strong Workforce Program regional project of the LA19 community colleges led by Santa Monica College, in collaboration with the L.A. Center of Excellence for Labor Market Research (COE), hosted at Mt. San Antonio College, the Los Angeles County Economic Development Corporation (LAEDC), and its Institute for Applied Economics as primary strategic and operational partners to convene and connect with business, industry, workforce development, government, community-based organizations and education partners to improve and increase student outcomes. CCW is focused on building and strengthening connections between employers and the LA19 region community colleges to connect students to information, resources and opportunities that support their preparation and competitiveness for 21st century, sustainable jobs and careers in our region's highest growth and emerging industry sectors and clusters.

CCW regularly engages and builds partnerships between our LA19 community colleges and employers, particularly those in high-growth industry sectors (i.e., sectors with productive advantages, deep labor concentrations and projected growth of middle skill jobs). The development, institutionalization and activation of these productive partnerships and real-time feedback loops enable faculty to adaptively attune their programs, courses and curricula to fast-changing word of work and workforce demands in a way that is truly responsive, demand-driven and future-forward, while providing students with the very important real-world experiences through work-based learning opportunities.



Over the past five years, Strong Workforce Program regional funding has enabled CCW to publish 17 labor market and occupational reports on the region's economy (Powering Economic Opportunity), in a wide range of sectors (Health, IT, DME, Global Trade, Professional Services, Construction, Protective Services and Manufacturing), and on important topics such as High Growth Middle Skill Occupations, Career Education through the Lens of Race and Ethnicity, and Essential Occupations in Times of Covid. These unprecedented reports analyze supply data on talent produced by the LA19 community colleges and demand data for middle-skill occupations in high-growth industries to inform and influence the expansion of new or modified career education, and workforce development programs, training and curricula. CCW has hosted regional program advisory meetings for faculty at multiple colleges



with regional employers to get feedback on curriculum and training programs, and get their insights on workplace trends, new technology and the in-demand skills that will make students even more competitive for employment and improve their access to work-based learning opportunities.

CCW has hosted quarterly convenings for faculty, workforce, nonprofit, government and industry leaders in some of the L.A. region's most highly concentrated and fastest growing industry sectors—advanced transportation, bioscience and digital media/entertainment—with the co-equal goals to strengthen industry engagement with faculty and connect students to meaningful work-based learning opportunities and employment. Having a regular presence and voice at industry convenings is one of the best ways to re-position

community colleges as key partners in regional economic development; reframe the narrative of colleges as vital sources of well-qualified local and diverse talent; and to constructively connect students to the 21st century jobs and careers in the fast emerging and rapidly-changing knowledge-intensive industries that drive our regional economy.

CCW has also contributed to a Biosciences Industry portal, and a Workforce and Education Partner WBL/Jobs regional platform (Gladeo/LAEDC) that is designed to be the most comprehensive and accessible source of workforce development resources, connections and opportunities.

Acknowledgements

Report Authors

LAEDC Institute for Applied Economics

Shannon Sedgwick
Director

Alexander Specht
Associate Economist

Arthur Girard
Research Analyst

Max Dunsker
Research Analyst

LA Center of Excellence for Labor Market Research at Mt. San Antonio College

Luke Meyer
Director

Juan Madrigal
Assistant Director

Kristen Moore
Research Analyst

Milken Institute

Matt Horton
Director, Center for Regional Economics and California Center

CCW Advisory Council

Gene Carbonaro
Dean, Career and Technical Education
Long Beach City College

Salvatrice Cummo
Vice President, Economic and Workforce Development
Pasadena City College

Carmen Dones
Dean of Health Science
West Los Angeles College

Lyla Eddington, Ed.D., RN.
Project Lead, Career Pathways Partnership
Rio Hondo College

Dr. Armando Figueroa-Rivera
Dean of CTE and Workforce Development
Los Angeles City College

Jennifer Galbraith, M.S.
Dean, Business Division
Mt. San Antonio College

Mon Khat
Dean, Career Technical Education
Los Angeles Pierce College

Sasha King
Associate Dean, Economic and Workforce Development
Santa Monica College

Kendra Madrid
Dean, Continuing Education and Workforce Development
East Los Angeles College

Dr. Narineh Makijan
L.A. Regional Consortium Chair/Assistant Vice President, Economic & Workforce Development
Pasadena City College

Kimberly Mathews
Dean of Career, Technical & Continuing Education
Citrus College

Erica Mayorga
Dean, South Gate Campus & Administration of Justice
East Los Angeles College

Laurie Nalepa
Dean, Career and Technical Education
Los Angeles Valley College

Laura I. Perez, Ph.D.
Dean of Adult Education, Non-Credit, Continuing, and Community Education
Los Angeles Southwest College

Patricia Ramos, Ed.D.
Dean, Academic Affairs
Santa Monica College

Dr. Virginia L. Rapp
Dean, Business Division
El Camino College

Nick Real, Ed.D.
Instructional Dean, Technology Division
Cerritos College

Freddy Saucedo
Dean, Career Education and Workforce Development
Glendale Community College

Mike Slavich
Dean, Career and Technical Education
Rio Hondo College

Allison Tom-Miura, D.P.D.S.
Dean of Academic Affairs
West Los Angeles College

Marla Uliana
Dean of Academic Affairs, CTE and Workforce Development
Los Angeles Mission College

Marcia Wilson
Dean, Pathway Innovation and Institutional Effectiveness
Los Angeles Trade-Technical College

Lynell R. Wiggins
Director of Adult Education and Workforce Development
Compton College

Mercy Yanez
Dean of Student Services
Los Angeles Harbor College

Richard Verches, J.D.
Executive Director
Center for a Competitive Workforce

Luke Meyer
Director
Los Angeles Center of Excellence for Labor Market Research



College Leadership

Dr. Seher Awan
President
Los Angeles Southwest College

Dr. Keith Curry, Ed.D.
CEO
Compton College

Dr. Erika Endrijonas, Ph.D.
Superintendent-President
Pasadena City College

Dr. Jose Fierro
President/Superintendent
Cerritos College

Dr. Mary Gallagher
President
Los Angeles City College

Dr. Barry Gribbons
President
Los Angeles Valley College

Dr. Kathryn E. Jeffery
Superintendent/President
Santa Monica College

Dr. Katrina VanderWoude
President
Los Angeles Trade-Technical College

Dr. Luis Dorado
President
Los Angeles Harbor College

Dr. James M. Limbaugh, Ph.D.
President
West Los Angeles College

Dr. Brenda Thames, Ph.D.
Superintendent/President
El Camino College

Dr. Aracely 'Ara' Aguiar, M.B.A.
Interim President
Los Angeles Pierce College

Dr. Armida Ornelas
Interim President
Los Angeles Mission College

Dr. Greg Schulz, Ed.D.
Superintendent/President
Citrus College

Dr. Marilyn Flores, Ph.D.
President
Rio Hondo College

Dr. Mike Munoz, Ph.D.
Superintendent-President
Long Beach City College

Dr. Alberto J. Román
President
East Los Angeles College

Dr. William (Bill) T. Scroggins
President & CEO
Mt. San Antonio College

Dr. Ryan M. Cornner, Ed.D.
Superintendent/President
Glendale Community College

Dr. Francisco Rodriguez
Chancellor
Los Angeles Community College District

Primary Contact Information



Richard Verches, J.D.
Executive Director
Center for a Competitive Workforce

Verches@verizon.net
(213) 326-4882



Jermaine Hampton
Director of Workforce Development
LAEDC

Jermaine.Hampton@laedc.org
(213) 236-4828



Luke Meyer
Director
Los Angeles Region Center of Excellence for Labor Market Research hosted at Mt. San Antonio College

Lmeyer7@mtsac.edu
(909) 274-6106

Additional LAEDC Workforce Staff Contacts:

Jose Pelayo
Program Manager of Workforce Development
Jose.Pelayo@laedc.org

Mariana Hernandez
Assistant Program Manager of Workforce Development
Mariana.Hernandez@laedc.org

CCW Project Leadership

Dr. Patricia Ramos, *Santa Monica College*,
Jennifer Galbraith, M.S., *Mt. San Antonio College*,
co-college project leads (2017-2022) and
Dr. Virginia L. Rapp, *El Camino College*,
Chair of the CCW Advisory Council.



What is the Ocean Economy?

The blue economy is defined by the World Bank as the “sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystem.” The term ocean economy is often used interchangeably with blue economy, though it sometimes refers to only economic activities.

According to the 2020 Economic Impact Analysis:

[The Ocean Economy in Los Angeles County](#), which was sponsored by LA County Supervisor Janice Hahn’s office and released by the Los Angeles County Economic Development Corporation (LAEDC) and prepared in collaboration with AltaSea at the Port of Los Angeles.

The LAEDC Institute of Applied Economics (IAE) wrote in our 2020 economic impact analysis, that “conservative estimates indicate that the value of the blue economy will double over the next decade, with a projected global value of \$3 trillion by 2030. Across the world, municipal and national entities are investing in the sustainable development of their own blue economies and reaping significant economic and ecological rewards. Tangible opportunities exist for California and Los Angeles (L.A.) County to follow in their footsteps.”

In addition, IAE notes, “California is well known for its striking coastline. The nearly one thousand distinct beaches, pockets of surf and sand in each coastal neighborhood serve as both calming oases and centers of bustling activity. However, the connections that Californians have with the water go far beyond ocean views and beachside adventures. California’s ocean has fostered the development of a burgeoning blue economy, “currently providing over 660,000 direct jobs and over \$143 billion in total economic output in the state.”

Furthermore, the LAEDC Institute of Applied Economics shares that “as we look into the future, there are ample opportunities to harness the full potential of the blue economy and usher in a new era of innovation in Los Angeles. A ‘sea change’ is taking place, focused on developing sustainable solutions and contributing to emerging industries. The county’s 75 miles of coastline coupled with unique location-based resources including world-class research institutions and technology companies will lead to new discoveries and the creation of well-paying jobs.”

This report will give brief insight on Ocean Economy Data and the current landscape, along with key information to help inform readers looking to learn more about the Ocean Economy.

Source: [The Ocean Economy in Los Angeles County Economic Impact Analysis 2020](#).

OCEAN ECONOMY

Demand Data

The current ocean economy consists of maritime-based economic activities in the six distinct sectors listed on this page. While some of these sectors contribute more to the state and regional economies than others, they each play a vital role in the existing ocean economy. In both California and Los Angeles County, tourism & recreation and marine transportation currently make up over 90 percent of ocean economy employment, with all other industries contributing less than four percent each, as displayed in the bar graph below.

Over the next decade, tourism & recreation and marine transportation (specifically shipping) will remain important contributors to the blue economy, along with several new emerging sectors that have been identified and classified by their potential for long-term growth. Industries with the best prospects for high long-term growth include offshore wind, surveillance and safety, and marine aquaculture. In addition, industries that have long-term potential but are not yet at commercial scale will present new opportunities for innovations in technology and resource management. These emerging industries appear on the following page.

Finally, developing a robust blue economy in Los Angeles will require the expansion of existing workforce needs to include new jobs, training and education opportunities spanning a wide range of skills and knowledge. The occupations on page nine will play a large role in these emerging industries related to the ocean economy, and may require a newly evolved blue economy skillset that can be obtained at LA's community colleges.

Current Landscape

OCEAN ECONOMY SECTORS



Source: *The Ocean Economy In Los Angeles County Economic Impact Analysis 2020*

Employment Distribution

ESTIMATED EMPLOYMENT DISTRIBUTION OF THE OCEAN ECONOMY

LA COUNTY



CALIFORNIA



- Tourism and recreation
- Marine transportation
- Living resources
- Mineral extraction
- Marine construction
- Ship and boat building

Employment Forecast

Marine Construction
Marine Transportation
Tourism and Recreation
Living Resources



Ship and Boat Building

Source: *The Ocean Economy In Los Angeles County Economic Impact Analysis 2020*

Emerging Industries in the Ocean Economy

Deep-Water Oil and Gas
Offshore Wind Energy
Ocean Renewable Energy
Marine and Seabed Mining
Maritime Safety and Surveillance
Marine Biotechnology
High-Tech Marine Products
and Services

Occupational Profiles

Demographic		Water Transportation Workers (53-5000)	Petroleum Pump System Operators, Refinery Operators and Gaugers (51-8093)	Electricians (47-2111)	Industrial Machinery Mechanics (49-9041)
Sex	Male	91.9%	100.0%	99.6%	96.0%
	Female	8.1%	0.0%	0.4%	4.0%
Education	Less than High School	8.1%	3.4%	10.7%	11.6%
	High School (or equivalent)	32.8%	23.6%	34.8%	24.7%
	Some College/Associate	36.1%	73.0%	44.4%	45.4%
	Bachelor's	23.0%	0.0%	9.5%	12.6%
	Master's or Higher	0.0%	0.0%	0.6%	5.8%
Age	< 24	0.0%	20.2%	7.1%	3.5%
	25 - 39	36.2%	42.9%	41.4%	26.3%
	40 - 54	24.0%	21.9%	32.2%	45.5%
	55 +	39.8%	15.1%	19.3%	24.6%
Race/Ethnicity	Hispanic	0.0%	92.2%	70.6%	64.3%
	White	75.3%	7.8%	20.2%	24.7%
	Asian	16.6%	0.0%	6.0%	7.0%
	Black	8.1%	0.0%	1.7%	2.6%

Demographic		Farmworkers, Farm, Ranch and Aquacultural Animals (45-2093)	Geological and Petroleum Technicians (19-4041)	Electromechanical Technicians (17-3024)	Welders, Cutters, Solderers and Brazers (51-4121)
Sex	Male	68.9%	75.1%	77.9%	91.2%
	Female	31.1%	24.9%	22.1%	8.8%
Education	Less than High School	35.1%	0.0%	2.9%	37.3%
	High School (or equivalent)	46.4%	7.0%	8.1%	30.9%
	Some College/Associate	11.2%	61.8%	55.7%	30.6%
	Bachelor's	5.4%	17.4%	32.2%	0.0%
	Master's or Higher	1.9%	13.8%	1.1%	1.2%
Age	< 24	24.4%	0.0%	5.8%	7.5%
	25 - 39	35.7%	12.6%	16.9%	36.6%
	40 - 54	23.0%	47.5%	38.2%	29.6%
	55 +	16.8%	39.9%	39.1%	26.2%
Race/Ethnicity	Hispanic	86.9%	12.6%	39.6%	83.6%
	White	8.6%	47.7%	40.6%	10.0%
	Asian	1.5%	39.7%	19.8%	2.3%
	Black	3.0%	0.0%	0.0%	3.7%

Sources: Ocean Economy 101 Regional Program Advisory Look Book

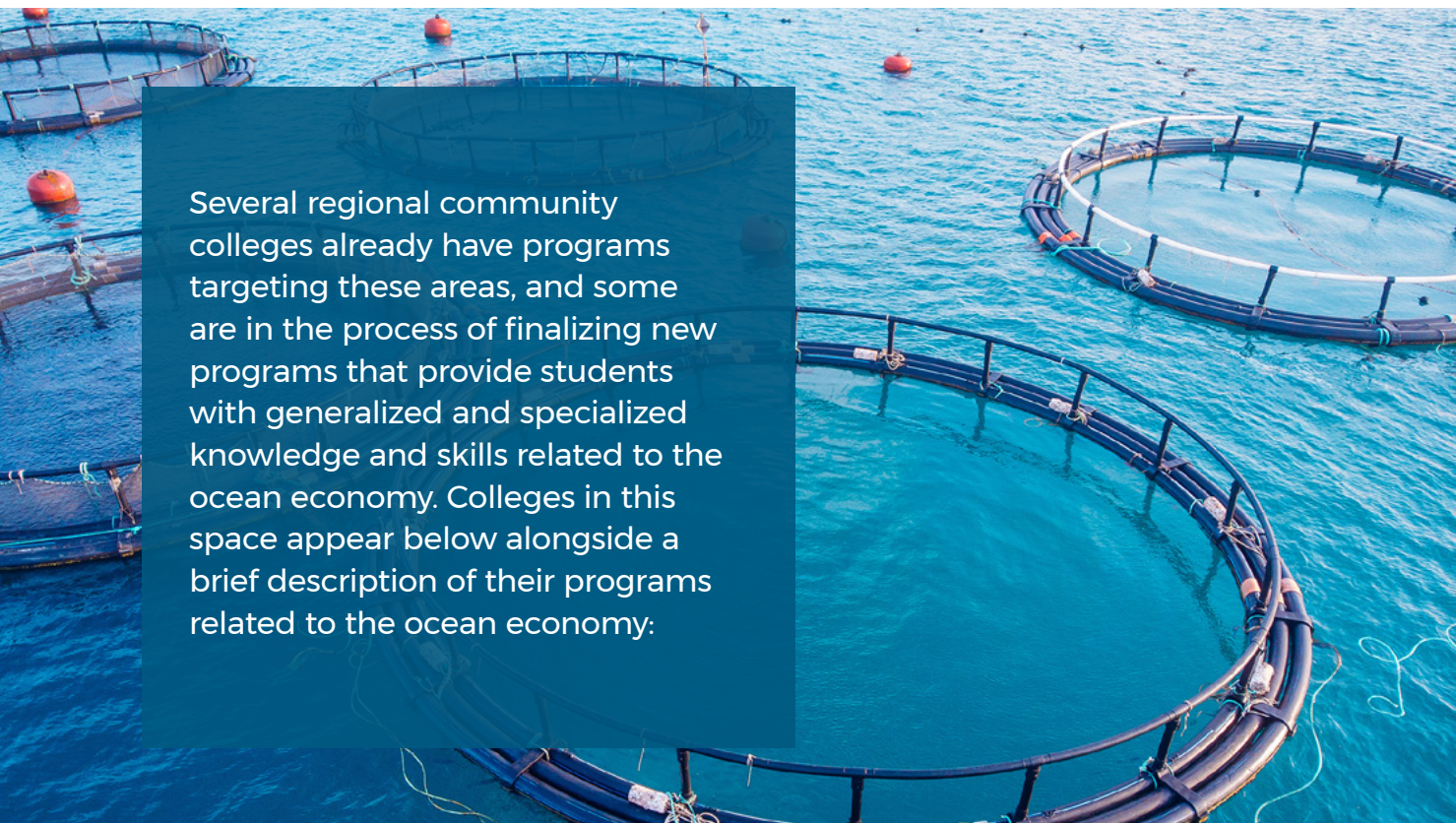
OCEAN ECONOMY

Emerging Industry for Program Development

Community College Program Analysis

Based on the broad definition of the ocean economy provided by the World Bank, community college career education training programs addressing this emerging industry could fit into any of the existing program areas listed below. This is not an exhaustive list as there are also several relevant, emerging fields not listed, such as newer programs related to Aquaculture.

- **1920.00 – Ocean Technology**
Procedures and techniques used to measure and analyze ocean currents, seas, and other major bodies of water and ocean life, including the operation and/or maintenance and repair of related equipment and instruments. Includes aquarium technology and aquaculture.
- **0959.00 – Marine Technology**
Operation and maintenance of ships systems and marine equipment.
- **0959.10 – Diving and Underwater Safety**
Professional diving, diving instructors or diving support personnel.
- **1919.00 – Oceanography (non-CTE)**
The physical and chemical properties of water, the topography and composition of the ocean bottom, waves, currents, tides, the formation of islands, and related subjects.
- **0303.00 – Environmental Technology**
Environmental management, monitoring, assessment, and restoration, including environmental pollution control systems and the management of hazardous materials and hazardous waste, and related government regulations.
- **0935.00 – Electro-Mechanical Technology**
Design, development, testing, and maintenance of electro-mechanical and servo-mechanical devices and systems.
- **0506.40 – Small Business and Entrepreneurship**
Principles, practices, and strategies of small business wholesale, retail, or service operations for owners/managers, and marketing principles and methods applicable to developing businesses.
- **0956.50 – Welding Technology**
Welding techniques, processes, and equipment applied in accordance with diagrams, blueprints, or other specifications.
- **0946.10 – Energy Systems Technology**
Theory and methods of energy conservation applied to heating, cooling, and related systems, including the measurement and assessment of energy consumption, diagnosis, and prescription. Includes alternative energy systems.
- **0948.40 – Alternative Fuels and Advanced Transportation Technology**
Conversion to, installation of, and maintenance of electric vehicles, liquefied petroleum gas, compressed natural gas, hybrid fuel technologies, and related systems.
- **2206.10 – Geographic Information Systems**
Computer-based tools for acquiring, editing, storing, analyzing, and visualizing geographically referenced information, with applications in research, education, management, and planning. Includes Global Positioning System (GPS).



Several regional community colleges already have programs targeting these areas, and some are in the process of finalizing new programs that provide students with generalized and specialized knowledge and skills related to the ocean economy. Colleges in this space appear below alongside a brief description of their programs related to the ocean economy:

COLLEGE	PROGRAM NAME	HOW DOES THIS PROGRAM RELATE TO THE OCEAN ECONOMY?
Santa Monica	• Aquaculture	The Aquaculture Program is a new, interdisciplinary CTE program at Santa Monica College (Business, Earth Science, & Life Science Departments) that seeks to train students for employment in the emerging field of aquaculture.
LA Mission LA Valley LA Southwest Long Beach City	• Robotics • Robotics and PLCs • Fundamentals of Robotics • Robotics Welding Automation	Underwater robotics is a rapidly growing field. These existing robotics programs provide the necessary knowledge, skills, and abilities for students pursuing careers as robotics, calibration, electro-mechanical, and mechatronics technologists and technicians. With additional experience and education, program completers set themselves on a path towards employment as a robotics engineer.
LA Pierce LA Trade-Tech Mt. San Antonio Pasadena City Rio Hondo	• Geographic Information Systems	Mapping the ocean floor is critical to understanding the ocean ecosystem as a whole. These GIS programs provide students with the skills necessary for ongoing ocean exploration and mapping.
East LA LA Harbor LA Valley Long Beach City Mt. San Antonio	• Oceanography • Earth Science	Knowledge of plate tectonics, coastlines, tides, marine resources, and the pollution sources that threaten these are essential to the ocean economy.

**The driving force behind program development related to the ocean economy is the employers operating in this space. Based on their input, colleges may discover that their existing programs fit their hiring needs as-is, while other colleges may choose to develop more specialized programs to meet the demands of the labor market.*

Sources: Los Angeles Center of Excellence for Labor Market Research, Ocean Economy 101 Regional Program Advisory Look Book.

Employer Workforce Development Survey

LAEDC surveyed several Ocean Economy employers to help better understand the current workforce needs within the Ocean Economy. Below is a summary of the findings from Ocean Economy employers who responded to a series of targeted workforce questions.

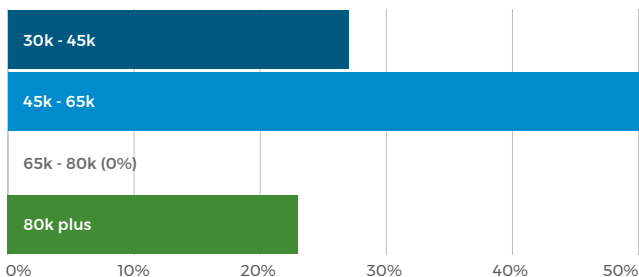
How many entry-level, middle skilled vacancies does your company/organization currently have, and are you experiencing hiring challenges for entry-level, middle skilled positions?

The survey found that all companies have multiple vacancies, however, there does appear to be limited candidates with experience available as only one company responded saying that they have candidates which they are moving forward with in the hiring process.

What is the salary range your company/organization offers for entry-level middle skilled positions?

Most respondents quoted starting salaries above the current living wage in L.A. County, which is currently \$19.35 per hour for a single adult.

STARTING SALARIES FOR ENTRY-LEVEL MIDDLE SKILLED POSITIONS



What emerging ocean economy industry has the largest number of entry-level middle skilled positions which need to be fulfilled within your organization/company?

Under Water Robotics followed by Aquaculture were stated to have the largest number of entry level positions. However, employers did mention that there is a high need for entrepreneur support, and various communications roles for multiple Blue Economy sectors.

What workforce skills should college students be trained in to prepare a more competitive workforce in Ocean Economy careers?

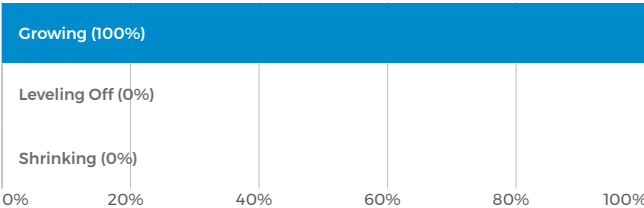
Employers noted the following skills should be an area of focus:

- Job Readiness Skills such as managing stress, communication, conflict resolution, problem and problem solving
- Interdisciplinary Engineering
- Data analytics, logistics, communication, sustainability, economics
- Trade skills such as hydraulics and welding

How would you describe the future of the Ocean Economy field in terms of evolving workforce needs? Do you see the demand for talent in Ocean Economy careers growing, leveling off, or shrinking in the LA region?

All employers surveyed stated that the Ocean Economy field and need for talent is growing.

DEMAND FOR TALENT IN OCEAN ECONOMY CAREERS



Do you have an upskill need for your current workforce that college faculty could accommodate by reshaping curriculum and provide to students with aspirations in Ocean Economy careers?

To summarize, employers noted that most Ocean work is harsh, and you must have a passion for the work. The bulk of the more skilled positions are great for those interested in becoming scientists, individuals who are seeking entrepreneurship, and business majors who are learning design thinking.

In Los Angeles County, what ocean-based sector has the largest need for entry-level middle skilled talent to grow its workforce?

Based on employer responses, Marine Transportation has a high need of entry level middle skilled talent, however it was noted that Aquaculture has a high need as well.

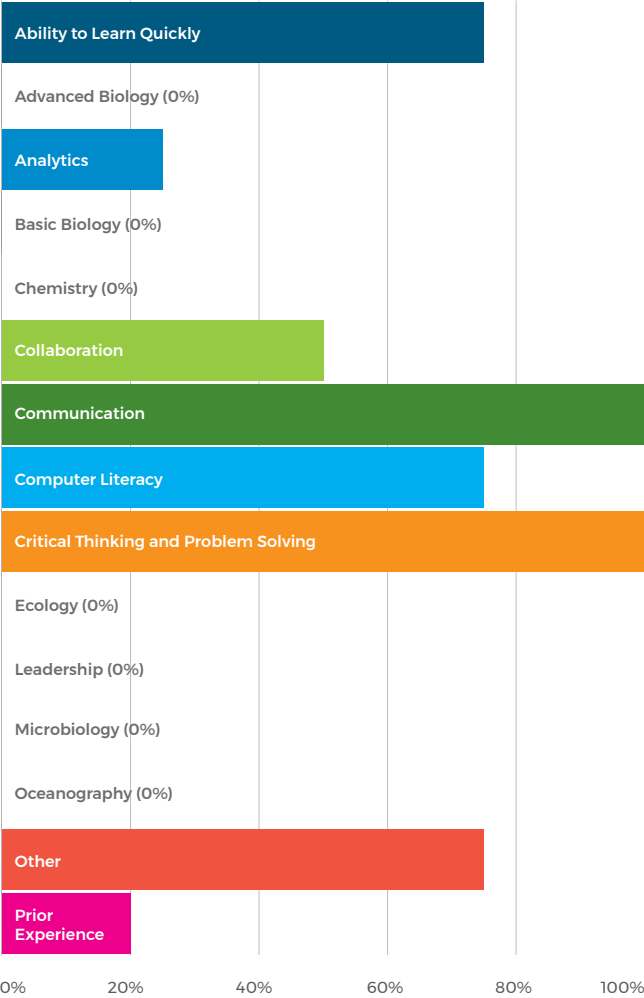
Do you have any systems or programs in place to ensure you have access to, and are cultivating, a diverse workforce?

Employers were split 50/50 in this area. However based on our employer partners who participated in the Ocean Economy Program Advisory meeting, most employers are looking to scale their businesses by cultivating a diverse workforce. The larger issue is expanding the talent pipeline and having a better prepared workforce.

What are the top competencies (soft skills and work readiness) that you expect entry-level middle skilled talent to have?

Employers had a very wide range of responses to this question. The bar chart below summarizes these responses.

**TOP COMPETENCIES
(Soft Skills and Work Readiness)**



Milken Institute Ocean Economy Analysis

To supplement the Ocean Economy information and data in this report, Milken Institute provided an analysis of Southern California's Blue Economy by looking at the investment in talent pipelines.



Investing in Southern California's Blue Economy through the Talent Pipeline

The ocean provides an undeniable value in not only ecological function and resources, but associated impact of ocean-based industries on trade and the global economy. The Los Angeles Economic Development Corporation's February 2020 economic impact analysis highlights the impact of the ocean economy in Los Angeles County, recording over 660,000 direct jobs and over \$143 billion in total economic output in the state. Conservative estimates place a projected global value of the blue economy at \$3 trillion by 2030.

With the competitive advantage of our California coastline, the ocean economy is uniquely positioned to provide critical economic support to the state in the development of climate conscious workforce recovery efforts. As the state's education and employer systems attempt to realign in the face of the pandemic, there is no better time than now to invest in structuring a robust education to employment pipeline, developing critical pathways to blue economy job creation in carbon capture technology, sustainable aquaculture, and more.

The future of the state's economic success lies in cultivating a 21st century workforce that facilitates access to education and employment opportunities while cultivating emerging sectors and technologies that enhance social mobility.

A photograph of a series of white offshore wind turbines in a row, stretching from the foreground into the distance over a blue ocean. The sky is clear blue with a few scattered white clouds. The turbines are reflected in the calm water.

Conservative estimates place a projected global value of the blue economy at \$3 trillion by 2030.

AltaSea at the Port of Los Angeles

AltaSea at the Port of Los Angeles is a non-profit research, education, and community engagement campus where innovators collaborate to develop ocean-focused solutions to global problems including climate change, environmental pollution, and food insecurity. AltaSea was created on the premise that convening a wide range of experts in ocean industry, academia, and business will yield advances in the Blue Economy and provide substantial economic and career development in Southern California and beyond.

The AltaSea Campus

With long-term control of unique assets, AltaSea is redeveloping 35 acres of dockland at the nation's largest Port into cutting edge facilities for tenants and partners to expand science-based understanding of the ocean, incubate and sustain ocean-related business, and pioneer new ocean-related education programs. The campus offers capacity that is especially valuable to organizations, educators, and students looking to interact with the ocean and marine resources, including over 4,500 linear feet of deep-water dock space and unparalleled access to the deep ocean less than one nautical mile from campus.

AltaSea has a 50-year lease from the Port of Los Angeles that enables the meaningful repurposing of a historic pier into a hub for Los Angeles' growing Blue Economy. AltaSea together with its architectural partner, Gensler, has worked with nearly 100 stakeholders including scientists, industry, and civic leaders to envision a robust, modern oceanographic research, business and educational center. The core of the ongoing AltaSea

renovation is the adaptive reuse of warehouses at Berths 57 – 60, which involve interior and infrastructure renovations to create 240,000-square feet of research, business, and education space for ocean-based entities focused on aquaculture, undersea robotics, clean energy solutions, carbon capture, ocean exploration, and other ventures in the Blue Economy.

Professionals and students that gather at AltaSea will enjoy a state-of-the-art research, business, and education facility that includes circulating seawater and marine life support systems, laboratories, research facilities and hands-on educational and job skills development areas. Among the amenities geared towards workforce development are the 'flexible blue economy research spaces.' These wet/dry labs will support the ocean-focused researchers and workers of the future, with special programming geared to post-secondary student researchers, workforce trainees, and other teams seeking temporary facilities for ocean-related research and development.



The AltaSea Model

Powered by a bold vision, AltaSea has created a model to allow business to fuel science and science to stimulate business as part of an overall endeavor to educate and inspire the next generation of ocean explorers, innovators, and researchers. While other marine institutions provide access to ocean technologies through education and research, AltaSea's model of collaboration is a new hybrid that strategically engages the research, education, and business communities. At AltaSea, researchers and businesses are offered unique opportunities to closely interact with each other, enabling access to top-notch research and development, and all tenants must engage with STEM-based education partners to assist in building the next generation workforce.

AltaSea is built on a strong foundation of anchor partnerships and works with an array of collaborators to propel the Blue Economy. High-profile tenants such as Dr. Bob Ballard's Ocean Exploration Trust, Los Angeles Maritime Institute, Pacific Mariculture, UCLA, and the University of Southern California have a clear picture of the AltaSea vision. Many other partners and tenants are engaging to catalyze new technologies in hydrogen production, wave energy, carbon capture, and more, expanding AltaSea's growing role as a hub for technological innovation and collaboration that generates economic growth.

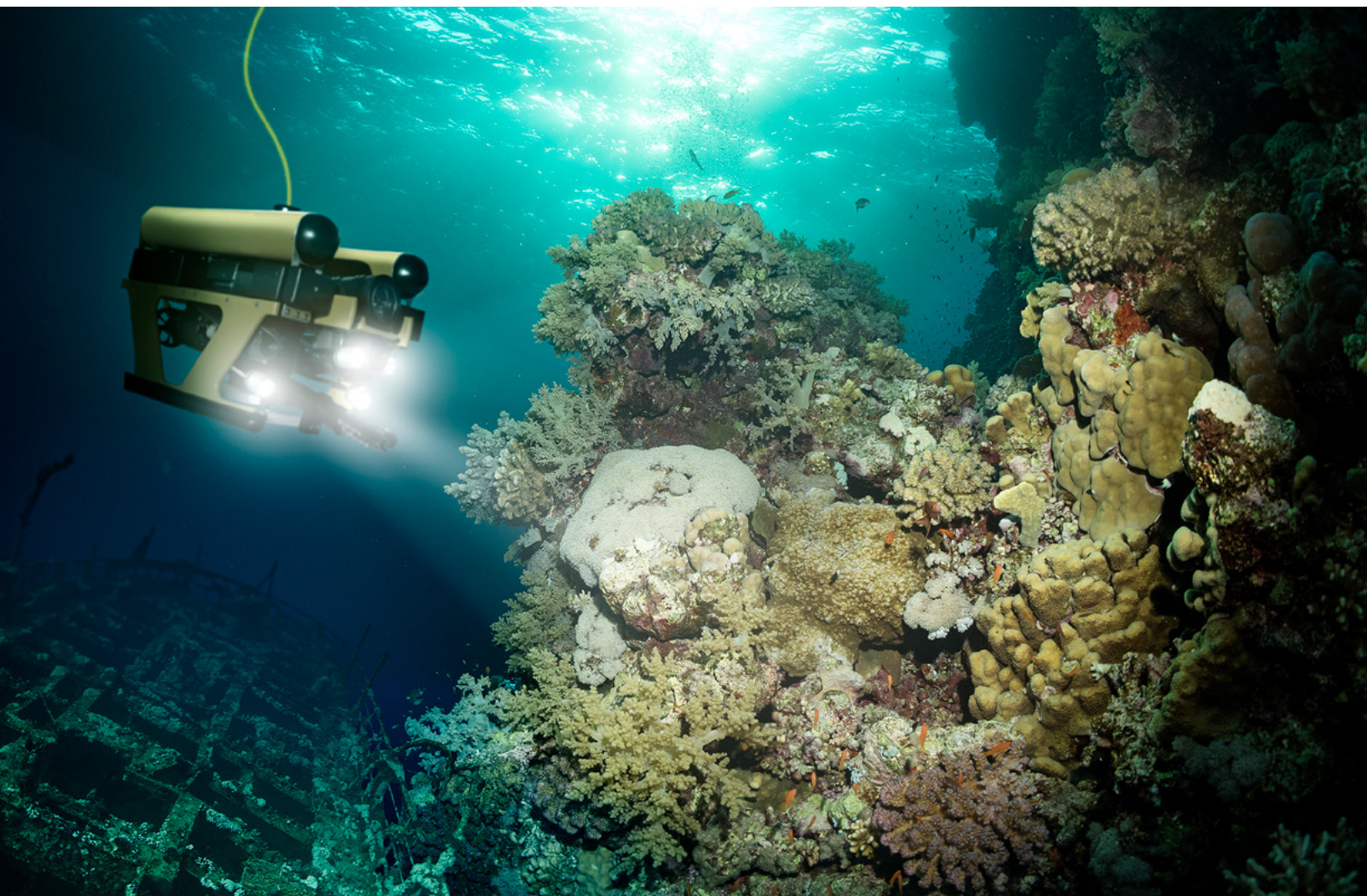
AltaSea Ocean Pathways (ASOP)

Education opens the door to opportunities. An essential part of AltaSea's mission is to prepare the next generation for a more sustainable, just, and equitable world by providing innovative ocean science education programs with an emphasis on mentorship and role model social support. Partnering with schools and youth development organizations, AltaSea pilots activities that link youth with scientists, explorers, and entrepreneurs to create education and career pathways and accelerate young leaders in the Blue Economy.

The AltaSea Ocean Pathways (ASOP) program is an equitable education and workforce development model directed at underrepresented communities and intended to enthrone influence in ocean-STEM fields. ASOP takes a ground-up approach that aims to inspire students to first understand and appreciate ocean STEM, and then actively participate in ocean STEM activities and careers. AltaSea's ocean STEM programming is shaped around rapidly advancing regenerative aquaculture, clean energy, carbon capture, ocean exploration and mapping, and underwater robotics. The ASOP program categorizes sustainable ocean STEM education and workforce development opportunities in three tiers; the first tier is focused on primary and secondary education, the second tier is focused on post-secondary education and workforce training, and the third tier is focused on Blue Economy jobs and entrepreneurship.

Ocean Economy Pathways to High-Paying Jobs

Generally, more education leads to higher incomes. Graduate degree-holders earn \$30,000 more than bachelor's degree-holders, and bachelor's degree-holders earn more than double those with only a high school degree in California, on average. But while degree level certainly impacts future earnings, field of degree matters more.

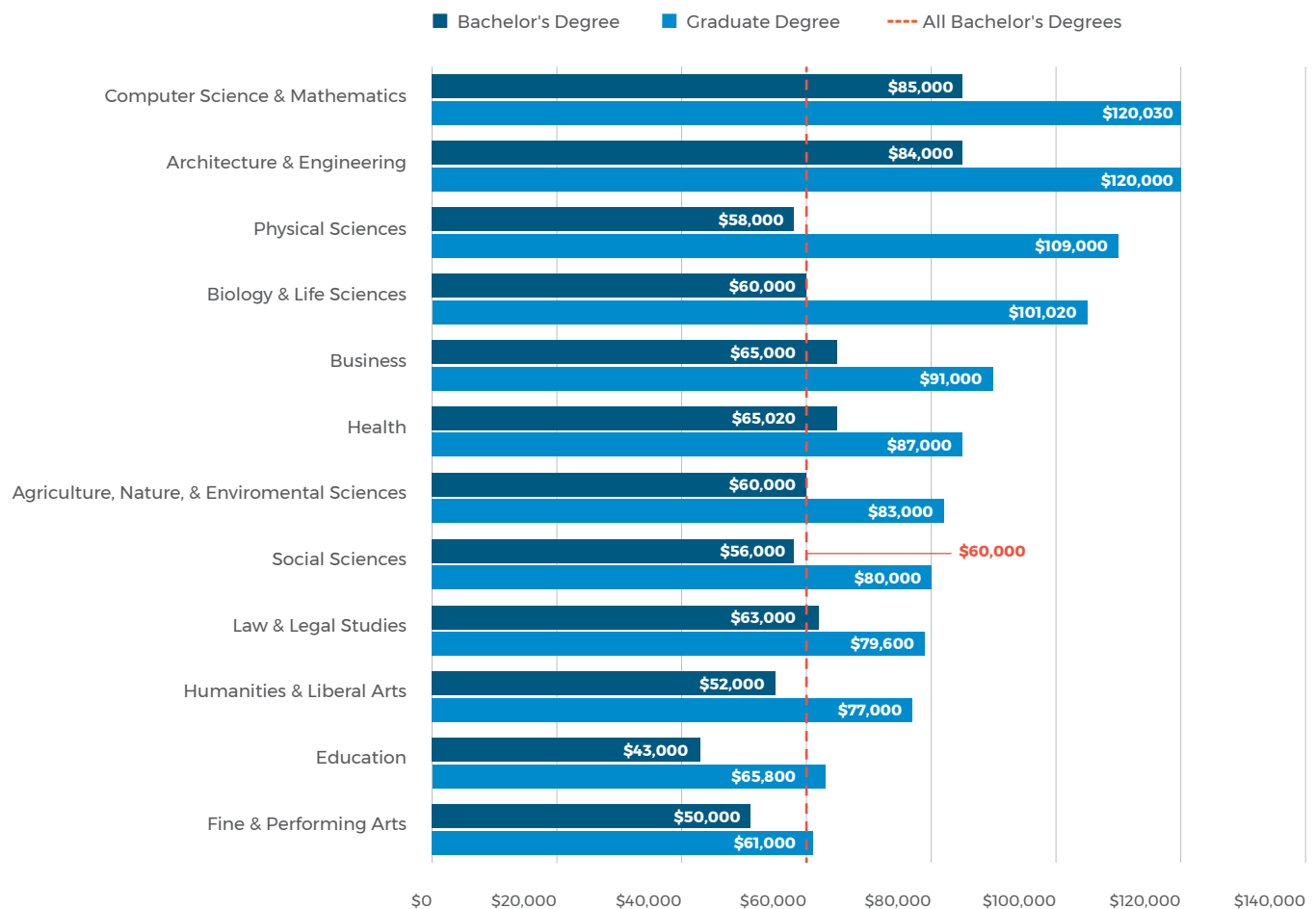


Areas of study within science, technology, engineering, and mathematics (STEM) fields tend to pay more than non-STEM fields. As shown in the figure below, top earning fields among bachelor and graduate degree-holders are Computer Science & Mathematics, Architecture & Engineering, and Biology & Life Sciences. Furthermore, bachelor's degree-holders in a STEM field can earn more than graduate degree-holders in a non-STEM field. For instance, bachelor's degree-holders in Computer Science & Mathematics or Architecture & Engineering can earn nearly \$25,000 more than graduate degree-holders in Fine & Performing Arts or Education.

The ocean economy offers an array of job opportunities—from water vessel captains and scuba instructors to underwater robotics engineers and offshore wind turbine technicians. Harnessing these jobs can help regions accelerate economic growth, sustainability, and workforce development—particularly as it relates to economic mobility.

EDUCATION

MEDIAN EARNINGS BY FIELD OF STUDY AND DEGREE, CALIFORNIA



Many of the industry's highest-paying jobs are within STEM fields—most of which do not require education beyond a bachelor's degree, as shown in the table below. The industry needs engineers to build underwater robotics and renewable energy systems, scientists to investigate wildlife in water-based ecosystems and develop ocean-sourced medicinal products, and data analysts to track and report research findings. Ocean economy STEM occupations that require at least an associate degree can pay more than the regional average wage across all industries, suggesting a relatively high return on investment for associate degree-holders in STEM fields.

For many of these jobs, there is significant room for growth in the Los Angeles and San Diego metros, as indicated by the employment location quotients with values less than 1 in the table below (a location quotient greater than 1 indicates the occupation has a larger relative share of area employment than it does nationwide). Enhancing ocean economy workforce pipelines and career pathways at educational institutions will allow coastal Southern California to tap into the benefits the ocean economy has to offer.

WORKFORCE

SELECT OCEAN ECONOMY STEM OCCUPATIONAL EMPLOYMENT, WAGES, AND EDUCATIONAL REQUIREMENTS

Occupation	Typical Entry-Level Degree Requirement	LOS ANGELES MSA		SAN DIEGO MSA	
		2020 Emp. Location Quotient*	Avg. Annual Wage	2020 Emp. Location Quotient*	Avg. Annual Wage
Environmental Engineers	Bachelor's	1.07	\$108,310	2.28	\$96,020
Life, Physical, & Social Science Technicians, All Other	Associate's	1.41	\$58,560	1.25	\$67,960
Biological Scientists, All Other	Bachelor's	1.44	\$101,610	6.49	\$98,140
Marine Engineers & Naval Architects	Bachelor's	0.10	\$104,730	n/a	\$87,480
Bioengineers & Biomedical Engineers	Bachelor's	0.73	\$93,840	2.69	\$91,150
Mechanical Engineers	Bachelor's	0.82	\$113,690	1.10	\$100,020
Mechanical Engineering Technologists & Technicians	Associate's	0.86	\$73,110	0.66	\$54,360
Hydrologists	Bachelor's	0.31	\$105,350	3.28	\$107,020
Data Scientists & Mathematical Science Occupations, All Other	Bachelor's	0.66	\$117,550	0.99	\$119,030
Geological & Hydrologic Technicians	Associate's	0.42	\$73,480	n/a	\$60,370
Zoologists and Wildlife Biologists	Bachelor's	0.24	\$86,590	0.45	\$108,680
Total, All Occupations	-	-	\$63,660	-	\$64,300

Source: Bureau of Labor Statistics - Occupational Employment Statistics
 *Note: If location quotient > 1, occupation has a larger relative share of area employment than it does nationwide.

Blue Economy Policy Considerations

As a result of the COVID-19 pandemic, workers in California and across America lost their jobs at record-setting numbers. As current students, recent graduates, and the massive wave of recently unemployed workers all enter the labor force, state and local leaders in education, business, and policy must collaborate to effectively insulate and direct California's talent pipeline. This effort requires recognizing the context and geographies of our state, driving place-based economic development and job creation through innovation in our existing and developing industries. A particularly underutilized opportunity for growth lies in cultivating broader cross-sector partnerships in the blue economy through coordinated investments in talent and skills. In terms of realizing these goals, we recommend local and regional leaders consider the following:

- Establish a sector skills advisory committee that cultivates regional competitiveness: By dedicating an operational framework that harnesses existing collaboration and partnerships, regional leaders can bridge silos, leverage funding, and incentivize place-based investment toward concentrating talent development in the blue economy.
- Implement career technical education and employment (cte2) pathway programs through the California Community Colleges: Coordinate and promote the array of curriculum offerings in the region while leveraging the Strong Workforce Program to engage employers in the blue economy, as well as enhance core-competency based curricula aligned with critical workforce needs to support regional talent pipelines.
- To fully realize the value of the ocean economy, leaders across Los Angeles must not only further support the development of skills driven curriculum that sustains industry growth across the higher education institutions but work to structure the necessary regional coordination that incubates entrepreneurs, research & development, and business formation in this sector. This enhanced regional leadership dynamic can also educate stakeholders on how to best support this rapidly growing sector and convene educators and employers on how to best support for the emerging Ocean Economy.



Los Angeles Region Community College's Blue Economy Skills and Pathways

COMMUNITY COLLEGE	BLUE ECONOMY SKILLS	BLUE ECONOMY CAREER PATHWAYS
Cerritos College	Biology, Botany, Chemistry, Computer and Information Sciences, Aerospace, Mechanical and Electrical Engineering, Microbiology, Zoology, Geology, Physics, Welding, Engineering Tech, Automotive Tech	Welding, Earth Sciences, Botany, Microbiology, Zoology, Welding, Biology, Geology, Automotive Tech
Citrus College	Computer Science, Information Technology and Systems, Biology, Biotechnology, Earth Sciences	Biology, Biotechnology, Earth Sciences
Compton College	General Science, Mathematics, Physical Sciences, Physics	Physical Sciences
East Los Angeles College	Oceanography, Earth Sciences, Computer Science Information Technology, Chemistry, Engineering and Technologies, Biology, Microbiology	Oceanography, Earth Sciences, Biology, Microbiology
El Camino College	Biology, Chemistry, Computer Science, Construction Technology, Electronics and Computer Hardware Technology, Engineering Technology, Environmental Horticulture, Environmental Technology, Geology, Machine Tool Technology, Welding, Physical Science	Biology, Environmental Horticulture, Earth Sciences, Welding Technology, Machine Tool Technology, Geology, Life Sciences
Glendale Community College	Biology, Small Business and Entrepreneurship, Oceanography, Mathematics, Physics, Welding, Mechanical Engineering, Electrical Engineering, Welding	Oceanography, Welding, Small Business and Entrepreneurship, Biology
Los Angeles City College	Small Business and Entrepreneurship, Computer Sciences, Earth Sciences, Life Sciences	Small Business and Entrepreneurship, Earth Sciences, Life Sciences
Los Angeles Harbor College	Oceanography, Earth Science, Biology, Engineering, Geology, Microbiology	Oceanography, Earth Sciences, Geology, Biology, Microbiology
Los Angeles Mission College	Biology, Biotechnology, Chemistry, Robotics, Engineering, Computer Programming	Robotics, Robotics and PLC's, Fundamentals of Robotics, Biotechnology
Los Angeles Pierce College	Geographic Information Systems, Small Business and Entrepreneurship, Biology, Oceanography, Engineering, Environmental Science	Geographic Information Systems, Oceanography, Small Business and Entrepreneurship
Los Angeles Southwest College	Robotics, Biology, Chemistry, Engineering, Natural Sciences, Physics	Robotics, Robotics and PLC's, Fundamentals of Robotics, Earth Sciences, Biology, Natural Sciences
Los Angeles Trade Tech	Geographic Information Systems, Biotechnology and Manufacturing, Chemical Technology, Computer Information Systems, Electronics Communications, Physics, Renewable Energy, Small Business Admin, Welding	Geographic Information Systems, Biotechnology, Renewable Energy, Welding, Small Business and Entrepreneurship

PATHWAYS

COMMUNITY COLLEGE	BLUE ECONOMY SKILLS	BLUE ECONOMY CAREER PATHWAYS
Los Angeles Valley College	Applied Technology, Biological Sciences, Business Admin, Chemistry, Physics, Engineering, Computer Applications and Information Systems, Robotics, Welding	Robotics, Robotics and PLC's, Fundamentals of Robotics, Welding Automation, Small Business and Entrepreneurship
Long Beach City College	Robotics, Oceanography, Earth Science, Life Sciences, Marine Biology, Computer Science, Engineering, Engineering Technology, Geology, Horticulture, Mathematics, Physical Sciences	Robotics, Robotics and PLC's, Fundamentals of Robotics, Oceanography, Marine Biology, Horticulture, Earth Science, Physical Sciences
Mt. San Antonio College	Oceanography, Earth Science, Agricultural Technology, Aviation Science, Biology, Automation, Business Admin, Computer Programming, Digital Systems Technology, Electronics Technology, Environmental Studies, Engineering, Geology, Geotech, Industrial Engineering, Natural Sciences, Ornamental Horticulture, Unmanned Aircraft Systems, Welding	Oceanography, Earth Sciences, Agricultural Tech, Aviation Science, Biology, Automation, Small Business and Entrepreneurship, Ornamental Horticulture, Unmanned Aircraft systems Welding, Environmental Studies, Geology, Geotech, Natural Sciences
Pasadena City College	Aquaponics, Geographic Information System, Biological Technology, Business Admin, Computer Information Systems, Electrical Technology, Welding, Geology, Microbiology	Aquaponics, Geographic Information Systems, Small Business and Entrepreneurship, Welding, Earth Sciences, Microbiology
Rio Hondo College	Geographic Information Systems, Alternative Technology, Automotive Technology, Biology, Electronics, Engineering Design, Environmental Science, Geology, Heavy Equipment Technology, Physics, Welding Technology	Geographic Information Systems, Earth Sciences, Welding, Heavy Equipment Technology, Biology, Environmental Science, Geology
Santa Monica College	Aquaculture, Information Systems, Earth Sciences, Oceanography, Biology, Microbiology	Aquaculture, Earth Sciences, Biology, Microbiology, Oceanography, Geographic Information Systems, Entrepreneurship
West Los Angeles College	Biology, Bio Tech, Climate Change and Environmental Studies, Earth Science, Microbiology, Oceanography	Biology, Biotechnology, Earth Sciences, Microbiology, Oceanography, Environmental Studies

OTHER COLLEGE BLUE ECONOMY CAREER PATHWAYS

COLLEGES

BLUE ECONOMY CAREER PATHWAY

Fullerton College →
 Orange Coast College →
 Cypress College →
 Cal State Long Beach →

Hydroponics/Aquaponics
 Aquarium Science
 Marine Engineering, Naval Architecture
 Marine Terminal Operations

Overview

Overview of the CCW Regional Program Advisory — Ocean Economy, December 2021

CCW has hosted over twenty Regional Program Advisory meetings in the last three years for LA region community college career education faculty to meet with employers and learn about the latest industry trends, new technologies being used, current or anticipated employment opportunities, hiring processes, work-based learning opportunities, and the requisite skills, knowledge and abilities that students are expected to have to be eligible and competitive for employment with a certificate or degree. Employers also provide valuable input and feedback on the career education program curriculum that colleges present to ensure that curriculum is up to date and aligned with industry needs and standards.

Engagement of employers by faculty lead to on-going partnerships that have resulted in new and more work-based learning and job opportunities for students in a field aligned with their course of study. LAEDC, in collaboration with its large, diverse and committed member companies from throughout all of LA County, has successfully engaged many of the hardest to reach companies, as well as the newest and growing employers to connect with LA region community colleges. Faculty from all 19 community colleges in the LA region have attended one or more Regional Program Advisory meeting, with 96% of attendees reporting it will impact their curriculum, thanks to employer insights and feedback.

In December 2021, the Center for Competitive Workforce, in collaboration with LAEDC, the LA Center of Excellence and Milken Institute hosted a regional program advisory meeting with 19 faculty and Deans from ELAC, El Camino, L.A. Harbor, Long Beach City College, L.A. Mission, Mt. SAC, Rio Hondo and Santa Monica College, and five employers and industry leaders (listed below) to better understand this emerging sector, develop and build new college-employer-industry relationships, and explore the opportunities for modified or new curriculum and training to build a sustainable talent pipeline from the community colleges in the LA region that will meet the expected needs of the fast-growing Blue or Ocean Economy:

- **Ann Carpenter,**
Chief Executive Officer at BraidTheory
- **Nathan Churches,**
Co-Founder at Holdfast Aquaculture
- **Nick Hajek,**
Aquaculture Engineer at Pacific Mariculture
- **Meredith Brooks,**
Grants and Special Projects Manager at AltaSea
- **Tom Grimm,**
Chief Executive Officer, and President
at Carlsbad Aquafarms

In addition, thank you to The Los Angeles Region Center of Excellence Center, Santa Monica College, the lead college for this effort, along with Ferris Kavar, who provided the Community College Perspective on Building a Program.



The Center for a Competitive Workforce was funded by the California Community Colleges Chancellor's Office under the Strong Workforce Program (SWP). As of April 2022, CCW is a regional employer engagement initiative of the Los Angeles Regional Consortium, under the leadership of Pasadena City College.

LEARN MORE AT:

**LosAngelesRC.org and
CompetitiveWorkforce.LA**



California Community Colleges



LARC LOS ANGELES
REGIONAL
CONSORTIUM

The Los Angeles County Economic Development Corporation (LAEDC) was founded in 1981 as a nonprofit, public-benefit organization to harness the power of private sector in collaboration with L.A. County, to guide economic development and create more widely shared prosperity. LAEDC collaborates with all stakeholders in the region including education, business, and government.

LEARN MORE AT:

LAEDC.org



LOS ANGELES COUNTY
ECONOMIC DEVELOPMENT CORPORATION

Collectively Advancing Opportunity and Prosperity for All

The Centers of Excellence for Labor Market Research (COE) are the leading source of labor market research for the California Community Colleges. With nine regional offices, the COE provide quality labor market data and information to help colleges respond to workforce needs.

LEARN MORE AT:

coeccc.net



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