Global Ports Need to be Enablers of the New Blue Economy

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There is an entirely new set of buzz words surrounding the ocean ecosystem, one of which is "The New Blue Economy." While there are many definitions, they all relate to shifting the global economy more toward sustainable use of 70% of the world's resources that are still largely untapped: the ocean. This vision will not become reality without direct action from the ports. To enable the New Blue Economy, ports will have to transition from shipping- driven models to more flexible support infrastructures that facilitate the innovations that are driving this economic wave (thanks for allowing us at least one pun).

The list of emerging technologies is extensive, so focusing on a few specifics and being the early adopter to support the companies in these verticals of the New Blue Economy will allow a port to create synergistic environments that will benefit the port and the new types of companies to which this infrastructure is imperative. Leading in any vertical will be a crucial strategic initiative for any port as it will create a positive feedback loop and the industry will form a cluster around the port with the most momentum in the emerging industry.

Emerging opportunity areas central to future port operations have been seen in renewable energy such as offshore wind, hydrogen power, and the harvesting of new ocean resources, such as minerals or ingredients key to marine biopharmaceuticals.

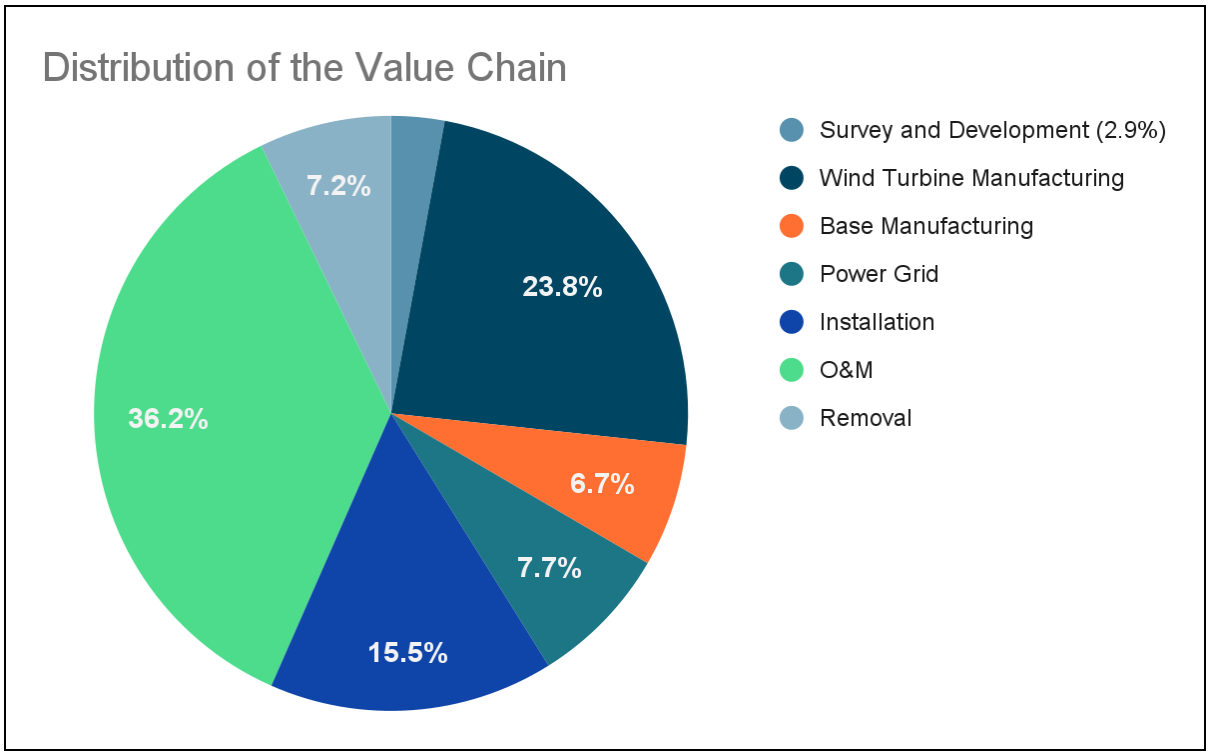
To decide on the innovations to support, ports should take a four-step approach:

1) evaluate emerging opportunities
2) identify innovations in those opportunity areas
3) determine how the port would need to change to support those innovations
4) determine the ability to support the changes, potential return on investment, strategic implications, and risks involved

Using offshore wind and seawater mining as two examples, we can walk through some of the factors in steps one through three (stay tuned for a future update for details on step four for each case).

Offshore Wind

1) Evaluate emerging opportunities. Many countries are committing to developing significant offshore wind capacity as a source of renewable energy. In 2021 the global offshore wind capacity was 50 GW with a project pipeline projecting over 700% growth to 368 GW. Offshore wind requires a complex value chain to site, build, operate and maintain the wind farm. According to the Global Wind Energy Council - Offshore Wind Report 2020, the value chain will need 17.3 jobs per MW of wind farm capacity to operate properly. According to research conducted by Mitsubishi Research Institute for the Japanese Government, the distribution of that supply chain which begins with Survey and Development and ends with Removal will be as shown in the below pie chart.



2) Identify innovations within the opportunity area. Each of these activities in the value chain may require specific infrastructure within a port to operate. Some of the more obvious are the introduction of Crew Transport Vehicles (CTV). But a less obvious innovation in the space is lowering the carbon footprint for wind farm operations through all-electric and autonomous CTVs.

There is also a large opportunity for efficiency gains in UAV (uncrewed aerial vehicles), AUV (autonomous underwater vehicles), and ROV (remotely operated vehicles) use cases for surveying, inspecting, and maintaining the facilities.

3) Determine changes needed to support innovation. Innovations in CTVs will require new shore power infrastructure that integrates with new all-electric charging systems such as the Stemman-Technik ferry charging system. Port operations policies that facilitate the advanced technologies that enable autonomous operations would need to be updated as would training of port operators on how to integrate autonomous vessels. Each type of autonomous vessel may also have unique docking considerations for launch and recovery operations.

Seawater Mining

1) Evaluate emerging opportunities. There are approximately 50 quadrillion tons of dissolved metals in the world's oceans, which is what makes the ocean so salty. This includes highly abundant elements like sodium, magnesium, calcium, and potassium. It also includes less common and much more valuable elements lithium, uranium, and

cobalt, among other valuable metals, a slew of rare earth elements (REEs), and several dissolved gasses.

These elements vital to industry and commerce exist in very low concentrations. Yet, if you consider the total volume of the ocean, there is more lithium and uranium in seawater than exists in all land-based mineral reserves. To put that quantity into context, we're talking about enough lithium for 3.3 trillion Tesla batteries, and enough uranium to produce carbon-free electricity to power the entire USA for 44,000 years (at 2021 electricity consumption levels). Additionally, salt ion concentrations in seawater are continuously replenished, making this a truly renewable and regenerative resource.

The oceans can also provide us with a nearly unlimited supply of certain elements whose only major sources are from politically unstable or non-ideal regions. Over 70% of the world's cobalt comes from The Democratic Republic of the Congo, while China currently produces 60% of the world's REEs. Cobalt is critical in modern batteries and REEs are essential in advanced magnets, which are used in many mechanically-driven electric generators (i.e., wind turbines, steam turbines in power plants, hydroelectric dams, etc.).

2) Identify Innovations within the opportunity area. Commercial processes for extraction of these elements from seawater do not exist yet, but the underlying technologies do. One approach is to place specialized passive adsorption materials in "seawater farms" for long amounts of time, which would process large volumes of seawater as it naturally flows by, slowly adsorbing the target element(s) from the surrounding seawater. These "crops" would then be collected, brought to a processing facility, and redeployed for additional harvesting.

The adsorbents would need to be manufactured and deployed on a sufficiently large scale to be able to process adequate volumes of seawater and "mine" enough of the target element(s), in order for the enterprise to be commercially viable. They will also need to be lightweight and durable to make deployment and collection as efficient as possible and to be able to withstand the tough ocean environment.

3) Determine changes needed to support innovation. Efficient harvesting and deployment systems and vessels will be critical. The facilities where the adsorbents are brought for mineral extraction would ideally be located on the coast, to minimize the amount of time that the adsorbents spend out of the water. Existing port infrastructure will need to be adapted and integrated to support transporting extracted minerals from processing facilities to the open market. It is also likely that most of the sea-side transport and operations could be done autonomously. Putting more pressure on policymakers to understand the risks and create safe and efficient environments for operations will be vital to facilitate the necessary changes.

Ports will not only benefit from anticipating the needs of these innovations but will create the conditions for the early-stage innovations to make it to market. Many startups that will drive the New Blue Economy will be focused on solving a problem, often in a space that does not have a robust value chain. Ports that become a home for advancing technology will be a central stakeholder in understanding the value chains that will support future innovations and become a builder of the connections that are required to get a new product to market.

How will sustainably extracted lithium get from the ocean into a battery production factory? The port will play a key role in answering that question.

Of course, the Blue Economy must be created in a sustainable fashion so we don't run into the problems we're seeing with our terrestrial resources such as rain forests. For example, a wind farm has an operating life of 25 years; companies need to be focused on the end of life of these massive structures. It may be something that creates new business models that will also be facilitated by new port infrastructures.

The ocean is a shared resource and exists primarily outside of the scope of any one government. Ports are already well-versed in international relationship management and have a view of the global ecosystem. Thought leadership from port managers and operators will be required to ensure humanity does better as we shift our natural resource consumption to a more balanced manner in line with the earth's capacity.

The New Blue Economy is promising, but ports must actively engage in policy change and investments that will play a key role in getting us there!