

INDUSTRY PROFILE

Maritime



Water Freight Transport ANZSIC 4810

Water Passenger Transport ANZSIC 4820

Seagoing and landside crossover. There is natural crossover between seagoing and landside jobs. Therefore this LDSC Maritime industry profile should be read in conjunction with the LDSC industry profile for Ports & Stevedoring.

Definition. The maritime sector is classified ANZSIC Division 1 category Transport, Postal and Warehousing. ANZSIC Industry Groups are:

- 4810 Water Freight Transport – for example in WA this is vessels moving iron ore, minerals and wheat.
- 4820 Water Passenger Transport – for example in WA this is ferry vessels transporting passengers.

Report Prepared July 2023

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Overview

- **Introduction.** The maritime industry carries 80% of Australia's imports and exports by value.¹ The industry annual revenue of \$5.48 billion in 2021-22 added \$1.95 billion to the Gross Domestic product. Australia is the fifth largest user of commercial shipping services globally. In contrast the Australian merchant fleet is approximately eleven ships. Switzerland has a larger merchant fleet than Australia with fourteen ocean vessels. Australia is outside the top 35 nations for fleet ownership ranked by carrying capacity in dead-weight tons. See Annex A.^{2 3 4}
- **Seafarers.** Australian Industry Standards report 25,390 employed in maritime in 2022 with 66,000 domestic seafarers reported by the Australian Maritime Association. Seafarers includes general purpose hands, coxswains, marine engine drivers, marine engineers, marine surveyors, cooks, integrated ratings, deck officers, ship masters, crew, volunteers and marina operations.⁵
- **The maritime sector.** The maritime sector covers international bluewater transport, inland and near coastal water transport, near coastal fishing/aquaculture, defence/navy, offshore oil & gas, environmental monitoring/scientific services, tourism industry, search and rescue. Maritime sector support to exports of ore, wheat, oil & gas is strategic to the economy of WA and Australia.
- **An example ship's crew.** An example ship's crew has a Captain or skipper qualified with a Masters Unlimited ticket. There are three or four technical officers under a Chief Engineer and three or four Deck Officers under a First Officer. There will be eight to 15 Deck Hands or Integrated Ratings. Ideally all Deck Officers are working through their AMSA ticket pathway to an international Masters Unlimited to Captain a ship. Equally the Engineer Officers should be progressing to AMSA Engineer Class 1. Technically the fastest this can be achieved is nine years. For example: Third Mate to Second Mate three years - Second Mate to First Mate three years - First Mate to Master three years. There is a high attrition rate. Realistically it takes 11 to 20 years to qualify Class 1.⁶ The cadetship training program in Australia ended circa 1997-98.

1. Industry background

- **Licensing and regulatory body.** The Australian Maritime Association (AMSA) is the licensing and regulatory body. Previously near coastal was managed by each State and Territory government. The mandatory requirements for certificates are issued under the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 (STCW). AMSA has responsibility for certification for all seafarers on Australian ships operating under the Navigation Act 2012. Crew certificates are issued under Marine Order 70 (Seafarer certification) 2014 and Marine Order 71 (Masters and deck officers) 2014. AMSA must certify to standards meeting Australia's obligations under STCW.⁷
- **Seagoing occupations.** ANZSCO codes for seafaring occupations include:
 - 231212 Ship's Engineer - seagoing. Includes seagoing maritime specialisation Electro Technical Officer (ETO)
 - 231213 Ship's Master - seagoing. Includes Ship's or Marine Pilot
 - 231214 Ship's Officer - seagoing
 - 899211 Deck Hand - seagoing. See Annex B.
- **Landside occupations.** The Harbour Master is typically a former Master Mariner with extensive seagoing experience. Fremantle and Pilbara Ports have a team of Vessel Tracking Service Officers (VTSO) to support shipping traffic approaching port and when under pilotage to dock. The Waterside Worker loads and unload cargos. Tasks of Ship's Surveyor include certification of loads and ship worthiness to Australian Law.
 - 139999 Specialist Managers, nec for specialisation Harbour Master and Deputy Harbour Master - landside maritime occupation in ports
 - 231299 Marine Transport Professionals, nec - for landside maritime specialisation Vessel Traffic Service Officer (VTSO)
 - 231215 Ship's Surveyor - landside maritime occupation in ports
 - 891113 Waterside Worker - landside maritime occupation in ports
- **WA ports.** Demand for the maritime occupations that work with ships is geographically related to the five WA port authorities responsible for the 13 WA ports. An additional eight ports are overseen by the five WA port authorities under the Shipping and Pilotage Act 1967 and six ports are proposed as follows:
 - Fremantle Port Authority responsible for:
 - Inner harbour Port of Fremantle
 - Outer Harbour in Kwinana.
 - Westport will open circa 2030

- Southern Ports Authority responsible for:
 - Albany
 - Bunbury
 - Esperance
- Mid West Ports Authority responsible for:
 - Port of Geraldton
 - oversees Carnarvon that comprises of port facilities at Cape Cuvier and Useless Loop.
 - proposed port at Oakajee
- Kimberley Ports Authority is responsible for:
 - Broome
 - Derby (leased and managed by the Shire of Derby West Kimberley)
 - Wyndham (leased and managed by Cambridge Gulf Ltd)
 - Yampi Sound (comprises port facilities at Cockatoo Island and Koolan Island)
 - proposed port at James Price Point
- Pilbara Ports Authority is responsible for:
 - Ashburton
 - Dampier
 - Port Hedland
 - Varanus Island (operated by Santos)
 - oversees Cape Preston
 - oversees Barrow Island
 - oversees Walcott
 - oversees Onslow that comprises port facilities at Onslow, Airlie and Thevenard Islands
 - proposed port at Anketell
 - proposed port at Balla Balla
 - proposed port at Cape Preston East
 - proposed port at Cape Preston West
 - proposed port at Urala.⁸

- **Maritime skills crisis.** Prime maritime occupations require qualification as a Ship's Master ANZSCO 231213 with prescribed seagoing experience as a Ship's Captain. The tiny Australian flagged merchant fleet means training berths have disappeared. The loss of the training pipeline means that the maritime workforce is aging out. Australia is reliant on charter of foreign flagged vessels and an international maritime workforce.⁹ The Australian merchant fleet has shrunk from 100 to thirteen ships in three decades.¹⁰ Calculations by Peter Court of Court Marine in 2023 list eleven Australian flagged vessels. Four are decommissioning. Some are not bluewater. The Bass Strait roll-on/roll-off vessels are currently the only Australian flagged sizeable container-capable vessels operating under a General Licence. See Annex A. International vessels carry the majority of coastal container shipping in Australia.^{11 12}
- **Maritime Skills Crisis Workshop.** Maritime Industry Australia Limited (MIAL) and the Australian Resources and Energy Employer Association (AREEA) conducted a stakeholder group Maritime Skills Crisis Workshop in Melbourne on 21 June 2023. Key challenges were *the costs of training, the time it took, the difficulty in securing berths (for those without access to ships) the lack of industry coordination.*¹³
- **Downstream shortages in landside maritime occupations.** Ships Master and Ship's Engineer are 'feeder' occupations into landside maritime jobs such as Harbour Master, Marine Surveyor, Marine Assurance, Marine Superintendent, Cargo Planners, Regulators, shore based Marine Project Management and Trainers. The acute shortage creates persistent workforce shortages in the downstream occupations. For example Harbour Master and Deputy Harbour Master (classified under ANZSCO 139999 Specialist Managers nec). Engineers traditionally went to technical jobs like surveyor or port facilities manager. The Australian seagoing training pathway has virtually disappeared. Stakeholders commented that there are now WA marine fleet managers with no seagoing experience.¹⁴

2. Workforce opportunities and challenges

2.1 Workforce opportunities

- **Global demand for WA iron ore.** WA seafaring and landside maritime workforce make a strategic contribution to Australia through the value of iron ore exports to the Australian economy. Iron ore accounted for 89% of WA royalty revenue and 28% of general revenue in 2020-21. Over 60% of WA iron ore sales volume was exported from Port Hedland in 2020-21 followed by Cape Lambert (20%), Dampier (15%) and all other ports (5%). WA accounted for 39% of global iron ore supply in 2020.
- **Global demand for WA wheat.** WA generates about 50% of Australia's total wheat production with more than 95% of this exported predominantly to Asia and the Middle East. Wheat is the major grain crop produced in WA making up 65% of annual grain production and generating \$2-3 billion for the State economy each year. Wheat is moved by Heavy Hail Rail to port and loaded on ship. The war in Ukraine has boosted world demand for WA wheat. The 2022-2023 WA harvest set a new record. This is the second successive record harvest beating the 2021-2022 harvest. That harvest was still being moved by Rail from storage to port in 2023.
- **WA resources, oil and gas projects.** WA Oil and Gas sector projects will require more maritime workers to crew ships particularly for LNG. Modelling by the Australian Resources and Energy Group (AREEA) projected 57 projects 2022 to 2027 to create approximately 11,250 new workers overall by 2027 growing the WA resources workforce by 7.5%. AREEA identified WA projects in the Kimberly, Pilbara, Goldfield-Esperance and offshore regions of WA. Workforce shortages may impact the awarding of new projects particularly in the remote Northwest of WA.¹⁵

- **WA Example: Woodside Energy Scarborough Gas and Pluto Train 2.** The first LNG cargo is expected from Scarborough in 2026. Sub-contractors include McDermott Australia marine engineers, SubSea7 seabed-to-surface engineering, Boskalis Australia dredging and construction, Saipem Australia engineering, Bhagwan Marine offshore services, MMA Offshore marine and subsea services and Shearwater marine geophysical services . These will employ Australian Seafarers from deck to engine room and Masters. There will also see demand for Pilots, locally Pilot exempt Masters, Surveyors, shore based Marine Managers, Marine Project Managers and Sub Sea personnel.¹⁶



Pilbara Ports Authority: WA accounted for 39% of global iron ore supply in 2020.
Photo credit to Pilbara Ports Authority¹⁷

2.2 Workforce Challenges

- **International vessels conduct coastal shipping of containers in Australia.** Shipping is booming for internationally chartered foreign vessels. International vessels conduct the majority of coastal shipping of containers in Australia. Australia is not in the top 35 Countries by ownership of world fleet ranked by dead-weight tons.¹⁸ Solutions for domestic long distance freight to be carried by coastal shipping between Australian ports must consider whether Australia creates a merchant fleet or continues to outsource to foreign flagged vessels on the international market. This is a sovereign issue that relates to control of the supply chain.
- **Acute workforce shortage.** Every WA maritime company has acute workforce shortages. All stakeholders over the WA LDSC Maritime Industry Advisory Group meetings acknowledge that the training pathway is not working due to lack of seagoing training berths.¹⁹

- **Sovereign capability.** Establishing an effective Australian Training Pathway for Ship's Master, Ship's Engineer and Ship's Officers in a global shipping market is one part of Sovereign capability: For training berths there must be Australian merchant ships. Investment in an Australian flagged merchant fleet must include discussion of investment in port infrastructure and shipbuilding for that fleet. The marketplace is international. Review of tax and cabotage laws relating to international wages in coastal waters is a Commonwealth issue. Royal Australian Navy requirements from a merchant fleet in time of Indo-Pacific or domestic emergency operations is a Commonwealth decision. Planning factors demonstrate this requires Commonwealth coordination -- ultimately Australian foreign and defence policies will dictate Australian projection into the Indo-Pacific and policy on sovereign control of ports and shipping will follow. Coastal shipping reform continues to be on the Australian Government agenda.²⁰ The Commonwealth must lead for results in a global market. For example on Seafarer Tax, Corporation Tax, Tonnage Tax and the Australian International Shipping Register.²¹
- **Decline of maritime training.** The virtual collapse of maritime training in Australia is well documented. The lack of bluewater Australian flagged merchant vessels that carry training berths means that not enough young people are entering the maritime sector to achieve higher level occupations like ANZSCO 231213 Ship's Master.²² Shipping is booming for internationally chartered foreign vessels. The lack of Australian Merchant fleet is recognised at Commonwealth and State level as a sovereign issue. Establishing an effective Australian Training Pathway for Ship's Master, Ship's Engineer and Ship's Officers in a global shipping market is one part of networked relationships around Sovereign capability. Australian maritime trainers face the constraints of completing AMSA sea time requirements and the TAE40122 Certificate IV - Training & Assessment Course.
- **The Australian cadetship training system ended circa 1997-98.** The Australian cadetship training system ended circa 1997-98. The industry therefore utilises two streams for workforce: First the aging 50 year old (+) cohort from the defunct Australian cadetship training. Second chartered or skilled migration of international crew: That is Ship's Master, Ship's Engineer and Ship's Officers hired on the international market.
- **WA Shipping and Supply Chain Taskforce.** The WA Government formed a Shipping and Supply Chain Taskforce to examine the state shipping industry and supply chains that link WA with the east coast and international customers. This was in response to the cutting of the East-West rail link by floods in February 2022. The WA Shipping and Supply Chain Taskforce recognised that maritime supply-chain factors are global and national. The discussion paper emphasised that maritime training solutions must be coordinated with the Commonwealth. The Taskforce acknowledged the subsequent Australian Government Strategic Fleet Taskforce.²³
- **Australian Government Strategic Fleet Taskforce.** The Australian Government Strategic Fleet Taskforce will report in quarter 4 of 2023 on the establishment of an Australian maritime fleet of 12 Australian-flagged and crewed vessels. Naturally WA training and migration policy requires coordination with Commonwealth policy for success in the global maritime market.²⁴
- **Fly-in-Fly-out.** Highly qualified maritime occupations have international mobility. This means that WA ports utilise Fly-in-Fly-out (FIFO) staff rosters. For example Marine Pilots and LNG vessel crew fly from metropolitan WA, interstate or overseas. The remoteness of the Pilbara is an obstacle for employment of permanent maritime workers. Factors include living conditions, amenities, working conditions, the seasonal nature of work and Australian Taxation Law. Employers must decide between the cost of training local entrants or the characteristics of rostering qualified FIFO shift workers. The COVID-19 pandemic has affected FIFO. Long term effects are to be determined including analysis of any COVID-19 retirement wave.^{25 26}

- **Lack of affordable housing/shortage of housing and Available local childcare services.** Non market factors affect recruitment in the Pilbara. Factors are a lack of affordable housing, housing shortages, remoteness and lack of childcare services. Efforts by WA regions are well-documented. Metropolitan lifestyle naturally gives mature professionals access to housing, childcare and tertiary education options that match income expectations. This creates FIFO. State Government efforts to support regional day-care and housing are acknowledged but the pros and cons of FIFO are well known.
- **International migration and international charter.** Shipping is a global marketplace. Job opportunities for seafarers are international. As the supply of Australian qualified seafarers drops so the demand for overseas trained migrants increases. International migration and international charter are used in WA for maritime professionals like 231213 Ship's Master because the acute and persistent workforce demand is not matched by the training pipeline. A Fremantle stakeholder said that most applicants were from India, China, UK and The Philippines.²⁷
- **Coordinated migration and training plan.** WA Stakeholder view is that migration must be available for ANZSCO codes used for maritime occupations as a short term stop-gap that must be combined with training developments in WA. WA stakeholders understand this is a sensitive maritime workplace issue. The way forward must be linked to the Commonwealth investment in ships resulting from the Commonwealth Government Strategic Fleet Taskforce.²⁸
- **COVID-19 legacy.** The maritime sector trades internationally. The effects of COVID-19 continue to interrupt global maritime supply chains. WA needs to be responsive to pandemic changes since seafarers move between ports of countries with COVID-19. Australia's health response to the COVID-19 pandemic has been successful relative to comparable countries. This success has had an economic cost. The restrictions to control the spread of the virus have disrupted trade. COVID-19 has closed ports. COVID-19 has affected shipping, demand for imports and exports, the use of national and international FIFO workers, seasonal workers, overseas workers and skilled migration. The global situation is dynamic and world economic circumstances will change. For example short notice closures of Chinese ports.^{29 30 31 32}
- **AMSA extension of National Law general exemptions.** AMSA extended all expiring National Law general exemptions to the 30 June 2025 to permit crews to continue to work on domestic commercial vessels.³³ The psychological stress of the COVID-19 pandemic is creating discussion on resilience training for workforce mental health. AMSA have released health guidance for seafarers.³⁴
- **Defence veterans.** Identifying the transferability of skills of Defence veterans to the maritime roles would be well regarded by industry. The largest concentration of Defence veterans in WA is in Rockingham vicinity Fleet Base West. This workforce has maritime skills founded on RAN veterans. Working Spirit and RSLWA have established a Veterans Employment Program to connect companies and Defence veterans funded through the State Government Anzac Day Trust Grants. The WA Government has established a Defence Industry Veterans Employment Scheme (DIVES) scholarship program. Competition for maritime Defence personnel is strong given the global mobility of the workforce and the relatively small Defence footprint in WA.³⁵

2.3 Workforce supply

- **Workforce supply and demand factors.** The key to the maritime skills crisis is the shortage of Ship's Master ANZSCO 231213. The Captain or skipper is the seagoing occupation that traditionally transitions to land based roles. Ship's Master is an entry to Harbour Master, Deputy Harbour Master, Marine Pilot, Marine Assurance, Marine Superintendent, Cargo Planner, Regulator, Trainers and Marine or Ship's Surveyor. The decline of bluewater Australian flagged merchant ships has cut training berths. This has cut pathways from the sea to land based jobs. Employers must seek skilled migrant workers. Workforce shortages are reflected in the WA Skilled Migration Occupation List (WASMOL) and the Commonwealth Skilled Occupation list. Australian mariners must seek expensive overseas training to gain the required sea time. Many do not return to Australia to work in part due to taxation laws.³⁶
- **Supply factors.** Factors affecting workforce supply for seafaring and landside maritime workforce in WA are listed and developed below:
 - Limited training berths on Australian ships
 - Aging out of maritime workforce
 - Cost of training
 - Long lead time to obtain licence
 - AMSA regulations and compliance requirements
 - Additional sea time experience for AMSA endorsements eg Oil Tanker, Gas Tanker and Chemical Tanker. From 2024 Australia will have few tanker vessels so the number of qualified Australian Masters and Pilots will decline. See Annex A.
- **Limited training berths on Australian ships.** The strategic issue with maritime training is that there is effectively no Australian flagged merchant fleet to provide training berths for the mandated sea time. There were thirteen Australian flagged ships in 2018-19. There are now eleven per Annex A. The four tankers are due for retirement. The four Bass Strait roll-on/roll-off vessels are currently the only Australian flagged sizeable container-capable vessels operating under a General Licence. These do not offer bluewater experience. International vessels conduct the majority of coastal shipping of containers in Australia.³⁷
- **Aging out of maritime workforce.** The Seafaring Skills Census report 2018 shows 52% of Seafarers aged over 46 years.³⁸ The workforce is 5% female. All data shows the maritime workforce is aging with crisis point in 5 to 15 years as the final 1998 cohort of the Australian cadetship program age out. The average age in WA continues to rise. Companies retain skilled workers longer due to lack of replacements. This retention may be subject to the COVID-19 retirement wave. The shortage of the specialisation Ship's Pilot in WA is an example. One Port Authority in WA has lost four pilots to retirement in two years. That is 30% of the workforce. Pilot is a landside job that seafarers transition to from experience at sea. Pilots require specialist ship handling skills for high risk navigation situations. Hence the pilot workforce is older and aging out. Naturally the AMSA medical test failures increase with age.³⁹
- **Cost of training.** The cost of training is a training pipeline factor. The cost of training is the opportunity cost: As seafarers progress along the AMSA pathway it is a prohibitive loss of pay to stop work and return to training. The Seafaring Skills Census 2018 named cost as the number one barrier to training. The WA government *lower fees, local skills* initiative has boosted traineeships. For example a Marine Engineer can complete the theoretical training. However many maritime occupations face a loss of income while training.

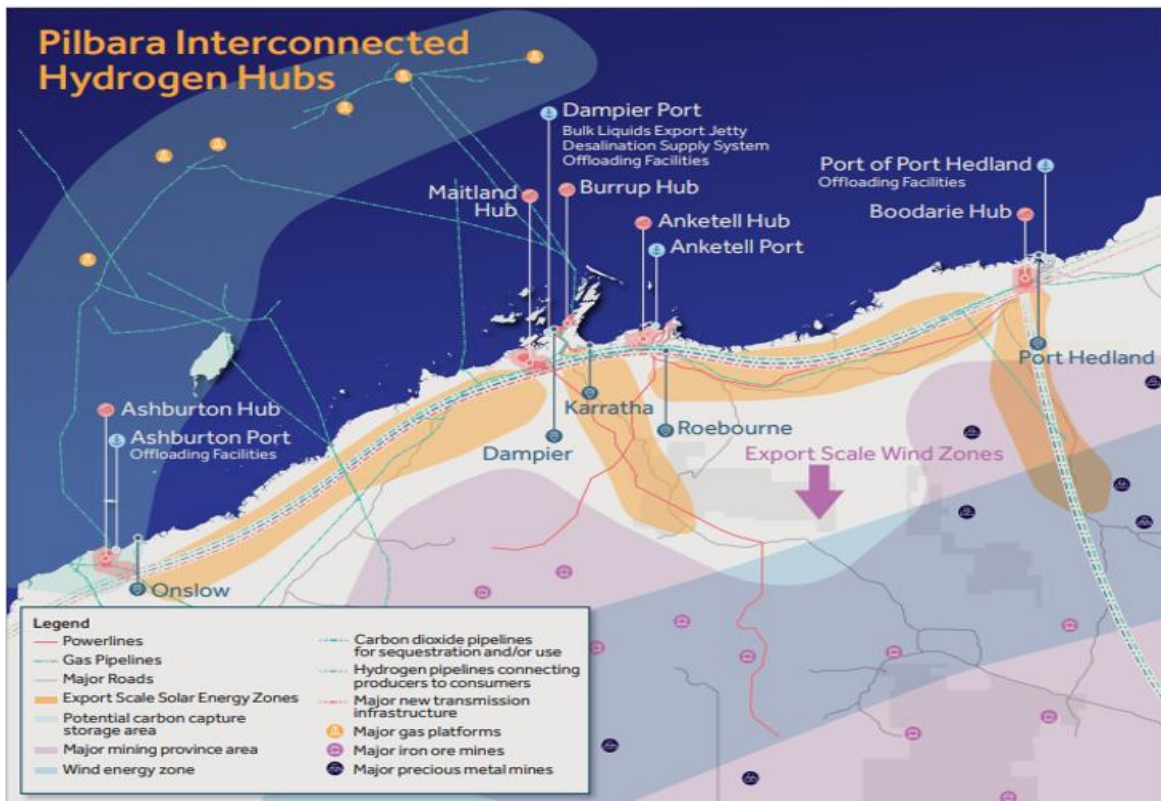
- **Long lead time to obtain ticket.** Sea time makes the fastest time to qualify to Ship's Master nine years. Generally seafarers would take 11 to 20 years to qualify. Many divert to landside jobs or ceiling along the qualification pathway.⁴⁰
- **AMSA regulations and compliance requirements.** AMSA certificates require currency. Accredited courses are required for upgrades in technology and changes to International Law. For example advances in automation require training in Dynamic Positioning for specific vessels. There are Masters based in WA that require the specialisations needed by the oil & gas sector.
- **Additional sea time experience is required for some skipper roles.** Additional sea time experience is required for some skipper roles. For example companies look for 10+ years of experience when recruiting for large vessels like LNG Tankers in the industry.

2.4 Technology and innovation

- **Technology.** International technological changes will impact maritime workforce. Developments continue in the automation of equipment and systems with particular reference to port automation. For example automatic load and unload, cybersecurity, autonomous vessels, dynamic positioning, E-navigation and digitisation. Equipment developments like surface and underwater autonomous vessels will require specialist operators and maintainers.⁴¹ Systems developments in automatic load and unload will require Data Analysts for planning. The developments in automation will require legal work clarifying responsibilities along the supply chain and rulings on unmanned vessels.
- **Autonomous maritime systems.** WA deploys unmanned maritime vessels called Autonomous Underwater Vehicles (AUV) and Autonomous Surface Vessels (ASV). Autonomous vessels operate in the offshore oil & gas, ports, Defence and Defence industries sectors. Vessel size can vary from an unmanned surface patrol boat under trial at Henderson with Austal to an underwater inspection vehicle that inspects pipelines to direct dive teams. In WA the Subsea Innovation Cluster Australia (SICA) has become a leading professional network.⁴²
- **Westport.** The Westport Taskforce was established by the State Government in 2017 to determine a long-term integrated freight transport plan for WA. The State Government has endorsed the Westport Taskforce proposal for a conventional land-backed container port in Cockburn Sound South, vicinity Ankertell Road, called Westport. The Westport Taskforce recommends two port options with the same design at Kwinana called D2 and B. Both options construct a new land-backed port in the Kwinana Industrial Area serviced by an upgraded Ankertell Road freight route. Option D2 sees the existing port and a new Kwinana port split container traffic before transitioning all freight to Kwinana over 15 years. Option B moves all freight from Fremantle to Kwinana in one step by 2032.
- **Fishing fleet downsize.** There has been a significant reduction in the number of WA fishing vessels with a parallel growth in fishing vessel tonnage. Fleets are smaller but more powerful. Resources are being pooled by companies to achieve quotas determined prior to the season. This is driving fleet consolidation. For example in the rock lobster fisheries for WA there has been a decrease of 850 boats in 1990 to 200 boats in 2020.⁴³
- **Oyster farming.** Oyster farming in the Aquaculture sector may see moderate workforce growth in the Pilbara, Gascoyne, Mid West and South West dependent on COVID-19 effects and access arrangements for large scale aquaculture.. These roles will not require significant numbers of Master Fishers nor specific qualifications for engineers nor crew on support vessels. Local talent is preferred. The seasonal demand drives pressure for visa arrangements to provide a temporary workforce.⁴⁴

3. Environmental, social, and governance

- **Climate change.** The Commonwealth is committed to reduce greenhouse gas emissions by 43% by 2030 under the Paris Agreement. The WA State Government target is net zero greenhouse gas emissions by 2050. Governments and corporations follow environmental policies to comply with environmental law and promote an image of social responsibility. Private corporations must act to protect shareholder value and support investors. Shipping is typically more carbon efficient than rail or road for moving large quantities of goods although the International Maritime Organisation has failed to implement legally binding measures for Net Zero Emissions in the world shipping fleet by 2050.^{45 46 47 48}
- **Sustainability strategy information pack.** The WA government has published the *Western Australia's Environmental, Social and Governance (ESG) Industry Information Pack*⁴⁹ An example of a maritime sustainability strategy is the Westport Environmental, Social and Governance Strategy.⁵⁰ A Sustainability Strategy or ESG proposition' may include:
 - Environmental (E) criteria such as climate change, carbon emissions, energy use, renewables, green technology, waste, recycling, decommissioning and resource use
 - Social (S) factors like community relationships, reputation, labour relations, indigenous policies, diversity and inclusion
 - Governance (G) covers the procedures to make effective decisions to comply with the law and relate to stakeholders.
- In July 2023 the WA government published a Climate Adaptation Strategy called *Building WA's climate resilient future*.⁵¹
- **Pilbara Ports Authority (PPA) and the Green Iron Corridor.** Pilbara Ports Authority (PPA) is in a unique position to coordinate action between the maritime, ports, energy, rail and resource sectors to develop a green corridor for transportation of iron ore between Australia and the Indo-Pacific. The Pilbara is a centre for renewable energy projects including hydrogen, ammonia plus renewables solar and wind.⁵² This postures PPA to become a global centre for green fuel production, use and export.⁵³ The PPA vision parallels developments in the WA Government Green Steel Value Chain Model.^{54 55} PPA decarbonisation action includes:
 - work with Yara Clean Ammonia to assess ammonia as a shipping fuel
 - net zero emission initiatives with the Japanese Port of Himeji on the green iron corridor
 - infrastructure planning across the Pilbara ports of Ashburton, Dampier, Port Hedland and Varanus Island for inter-connecting hubs to service a hydrogen fuel export industry. For example the development of a new multi-user facility at Lumsden Point.⁵⁶



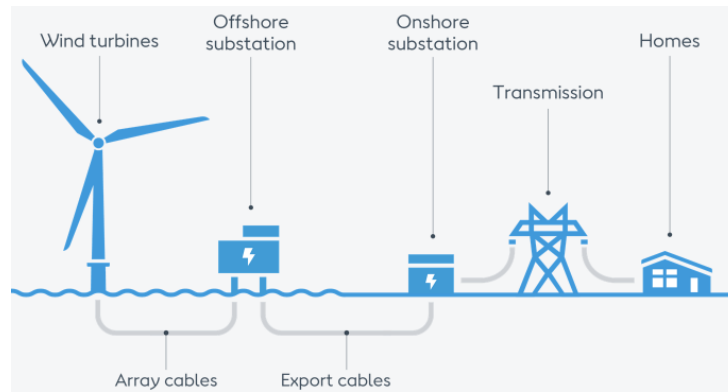
Pilbara Interconnected Hydrogen Hubs
 Diagram credit to Department of Jobs, Tourism, Science and Innovation ⁵⁷

- **Offshore windfarms for renewable energy generation.** The Clean Energy Council considers offshore windfarms the cheapest source of large scale renewable energy. Offshore windfarms boost the maritime industry in the provision of offshore service vessels for construction, operation and maintenance.⁵⁸ WA has potential for large scale offshore windfarms due to:
 - suitable WA wind and weather patterns
 - the transferable workforce, technology and experience available in WA offshore oil & gas.
- **Proposed WA offshore windfarms.** Three examples of proposed offshore wind farms in WA are Leeuwin, Samphire and Midwest:
 - **Leeuwin Offshore Wind Farm.** 200 wind turbines approximately 130 km south of Perth between Mandurah and Bunbury. Construction proposed to start 2026.⁵⁹
 - **Samphire Offshore Wind.** An area 60 to 120 km north of Perth between Lancelin and Two Rocks. Construction proposed to start 2029.⁶⁰
 - **Midwest Offshore Wind.** Construction proposed to start 2028 Kalbarri 500 km from Perth.⁶¹



Offshore support vessels constructing an offshore wind farm in Yangjiang, Guangdong Province, China.
Credit Liang Wendong, Getty Images

- **WA offshore oil & gas sector transferable skills.** The WA offshore oil & gas sector has developed significant expertise in designing, installing and operating facilities in the unique marine environment of Australia. For example corrosion rates are different to the North Sea. In WA the Subsea Innovation Cluster Australia (SICA) is a professional network advocating for utilisation of WA offshore oil & gas experience in the construction and maintenance of offshore wind farms and oil & gas decommissioning. Transferable skills include:
 - regulatory approvals for ecologically sensitive areas and shipping routes
 - design and construction for ocean depth, corrosion, pile driving and seabed clearances
 - maintenance programs including offshore service vessels, FIFO rosters of service technicians and environmental impact monitoring of bird life and underwater noise
 - asset management programs for major engineering works including lifecycle considerations of shut-down and decommissioning. This includes structure removal, waste, recycling options, well plugging and environmental legacy consistent with international standards.
- **Complexity of the renewable energy supply chain.** The Commonwealth commitment to reduce greenhouse gas emissions 43% by 2030 requires infrastructure investment across the supply chain. For example consider the planning and construction factors to deliver offshore power to WA homes per 'transmission' in the diagram below. The transmission infrastructure will likely be new-build in remote areas. Construction will require land rights negotiations and environmental planning. Transmission will likely require battery storage. Battery storage will require rare metal extraction. Transmission must be connected to a grid supporting an energy plan with an energy mix from alternate sources. Strategic capital infrastructure of this capacity must be coordinated by Government for success.



The power flow from Offshore Windfarm to Home: Diagram credit to Orsted.⁶²
Consider the implied planning and construction factors.

4. Training

4.1 Training

- **Australian Maritime Safety Authority licences.** Maritime crews operating in international waters are regulated by the Australian Maritime Safety Authority (AMSA) which administers the Seafarer's Training, Certification and Watchkeeping Code (STCW 95).⁶³ Marine Crew in the offshore oil and gas industry support vessels, tugs, barges etc are regulated by AMSA, Department of Mines, Industry Regulations and Safety (DMIRS), Department of Transport WA (Commercial Vessel Safety Branch) plus WorkSafe WA for those crew working in Port.⁶⁴
- **South Metropolitan TAFE.** South Metropolitan TAFE in WA is one of only three nationally recognised AMSA accredited training centres for the delivery of Master qualifications with TAFE NSW - Newcastle and Australian Maritime College – UTAS – Tasmania. The cost and duration of training combined with the lack of training berths on the shrinking Australian flagged merchant fleet has reduced the numbers of applicants and Masters upskilling through the levels. The WA government *lower fees, local skills* initiative has boosted traineeships.⁶⁵
- **231213 Ship's Master.** A Ship's Master must hold the qualification MAR60220 Advanced Diploma of Maritime Operations (Master Unlimited). Extensive seagoing experience of 10+ years is required to command large vessels. Historically, Ship's Masters trained on bluewater international vessels. A lack of Australian flagged vessels has cut training opportunities. Seafarers must train on foreign flagged ships. Few return.⁶⁶
- **231212 Ship's Engineer.** The pathway to Engineer Class 1 is prescribed by AMSA based on international regulations. MAR60215 Advanced Diploma of Maritime Operations (Marine Engineering Class 1) is the VET qualification. Sea time is required at each training level.⁶⁷

4.2 Training challenges

- **Australian Maritime Safety Authority is the regulatory body.** The Australian Maritime Safety Authority (AMSA) is the licensing and regulatory body. Previously near coastal was managed by each State and Territory government. The mandatory requirements for certificates are issued under the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 (STCW).

- **Example qualification: Ship's Master.** The Master Unlimited or Master 1 is the highest Australian Maritime Safety Authority (AMSA) ticket. A 'Master Mariner' is an industry term for occupation 231213 Ship's Master: the Captain or 'skipper' of the ship. The mining, oil and gas industry seek Ship's Masters with 10 years sea time plus specialist tickets above the MAR60220 Advanced Diploma of Maritime Operations (Master Unlimited). To be eligible for a Master Unlimited certificate of competency requires medical, sea service and course requirements. AMSA requires five courses plus an oral examination. The industry expectation is that a Harbour Master is an experienced Master Mariner who has captained large vessels.
 - Master certificate of competency
 - Security awareness training
 - Advanced fire fighting
 - Proficiency in survival craft and rescue boats other than fast rescue boats
 - Medical care on board ships
- Additional requirements:
 - GMDSS radio operators certificate or GMDSS certificate of recognition (Global Maritime Distress and Safety System)
 - ECDIS endorsement on an ECDIS equipped ship (electronic chart display and information system)
 - Endorsements appropriate to vessel eg Oil Tanker, Gas Tanker and Chemical Tanker.
- **Competition for Engineers and supporting technical workforce.** Ship's Engineer and technical officers and crew are in acute shortage. WA competition for the small labour pool of applicants is fierce. METRONET, the Naval Shipbuilding Plan and the construction of remote railways for Heavy Haul Rail are creating competition for a small WA annual graduation of engineers and supporting technical workforce. There needs to be a coordinated training plan to generate the engineers and related technicians required by the Defence industries, maritime supply chain, civil construction, METRONET, heavy haul rail and the resources sector. Naturally migration must be considered as a short term fix. A long term training plan may include:
 - Engineering career pathway information
 - Partnerships with industry and university
 - Internships
 - Apprenticeships and Traineeships
 - Institutional Based Training (TAFE and other Training Providers)
 - Pre- apprenticeships and school based traineeships
 - Coordinated migration and training plan.

- **Training berths.** Seafaring training berths are generally not available for the work experience or work placement requirements for mandated sea time for AMSA registration since Australia has virtually no merchant fleet. See Annex A.

4.3 Training opportunities

- **Jobs and Skills WA training.** The WA government *lower fees, local skills* initiative has boosted maritime traineeships. For example a Marine Engineer can complete the theoretical training. However many maritime occupations face a loss of income while training and there is a shortage of seagoing training berths.⁶⁸
- Traineeships subsidised under Jobs and Skills WA include:
 - Integrated Rating MAR30220 Certificate III in Maritime Operations (Integrated Rating)
 - Maritime Operations—Coxswain MAR20321 Certificate II in Maritime Operations (Coxswain Grade 1 Near Coastal)
 - Maritime Operations – Marine Engine Driving (Grade 3) MAR20421 Certificate II in Maritime Operations (Marine Engine Driver Grade 3 Near Coastal)
 - Maritime Operations – Marine Engine Driving (Grade 2) MAR30821 Certificate III in Maritime Operations (Marine Engine Driver Grade 2 Near Coastal)
 - Mobile Crane Operations (Level 3) TLI30122 Certificate III in Mobile Crane Operations - for landside occupations
- **Priority Industry Qualifications List 2022.** The MAR50115 Diploma of Maritime Operations (Engineer Watchkeeper) is a transitional qualification on the WA Priority Industry Qualifications list 2022
- **Pilbara Ports Authority cadetship program.** Pilbara Ports Authority started a cadetship program in 2018 for high school graduates to train as seagoing officers. Eight cadets have been engaged including the three females. Two cadets have graduated with six in the training pipeline. This model uses foreign vessels for sea time. The trainees are not employed on training wages but on a training scholarship. A similar model is running in Sydney Ports and has run at Fremantle Port Authority. Trinity House UK has a similar model. This may be a template for national use.
- **Pilot training program.** In WA a project team inside the Fremantle based Maritime Simulation Centre has developed a Ship's Pilot Training Course. The Australasian Marine Pilots Institute (AMPI) convened the National Pilot Training Advisory Board on 22 March 2023 to consider this initiative. The project team will present at the national Australasian Marine Pilots Institute conference in Perth 1 to 5 Oct 23

5. Your input

- **Why this report?** The WA Government has 8 skills councils to engage stakeholders to advise the State Training Board and the Department of Training and Workforce Development on the training and priorities of industry with particular reference to skills development.
- **Input.** LDSC welcomes input on 08 9388 8781 or <https://www.ldsc.asn.au/contact.html>
- **Industry Advisory Group.** LDSC invites stakeholders to join our Maritime Industry Advisory Group 08 9388 8781 or <https://www.ldsc.asn.au/contact.html>

TABLE OF AUSTRALIAN MERCHANT FLEET 2021

2021 Australian merchant fleet. This is a table of the Australian merchant fleet in 2021 produced in 2023 by Peter Court of Court Marine. Court marine assess approximately eleven cargo ships registered in Australia. pcourt@courtmarine.com.au ABN: 487 5441 4806

Summary. Four gas tankers are approaching decommissioning. Six roll-on/roll-off (ro-ro) fully utilised as Highway One on Bass Strait and one cement carrier.

	Ship name	Year	Type	Notes
1	Northwest Sanderling	1989	LNG Tanker	About to be decommissioned
2	Northwest Sandpiper	1993	LNG Tanker	About to be decommissioned
3	Northwest Snipe	1990	LNG Tanker	About to be decommissioned
4	Northwest Stormpetrel	1994	Liquified Gas Carrier	About to be decommissioned
5	Victorian Reliance II	2018	ro-ro	Highway 1 Bass Strait
6	Tasmanian Achiever II	2018	ro-ro	Highway 1 Bass Strait
7	Liekut	2020	ro-ro/General Cargo	Highway 1 Bass Strait
8	Spirit of Tasmania I	1998	ro-ro Ferry	Highway 1 Bass Strait
9	Spirit Of Tasmania II	1998	ro-ro Ferry	Highway 1 Bass Strait
10	Searoad Mersey II	2016	ro-ro /General Cargo	Highway 1 Bass Strait
11	Goliath	1993	Bulk Carrier	Cement carrier

Analysis. Note there are no new tankers, no container ships and no general dry bulk carriers. The Bass Strait ro-ro vessels are currently the only Australian flagged sizeable container-capable vessels operating under a General Licence. International vessels carry the majority of coastal container shipping in Australia.⁶⁹

- **Cargo categories.** The five main categories of cargo transported by sea are:
 - roll-on/roll-off eg vehicle
 - dry bulk eg iron ore loaded loose
 - liquid bulk eg liquified gas
 - break bulk eg metal drums or machinery loaded individually
 - container.

- **Ship categories.** The seven main categories of cargo ship are:
 - container
 - general cargo
 - tankers
 - dry bulk carriers
 - multi-purpose vessels
 - reefer ship (refrigerated cargo)
 - roll-on/roll-off.

KEY WA MARITIME ANZSCO OCCUPATIONS CODES

- **Key ANZSCO occupations codes.** Key ANZSCO occupations codes for seafaring maritime workforce in WA are
 - 231213 Ship's Master - seagoing. Includes Ship's or Marine Pilot
 - 231214 Ship's Officer
 - 899211 Deck Hand - known as Integrated Rating in WA
 - 231212 Ship's Engineer - Includes seagoing maritime specialisation Electro Technical Officer (ETO)
 - 231211 Master Fisher.
- **231213 Ship's Master.** The Ship's Master is the Captain or 'skipper' of the ship. The Master Unlimited or Master 1 is the highest Australian Maritime Safety Authority (AMSA) ticket. The mining, oil and gas industry seek Ship's Masters with 10 years sea time plus specialist tickets above their MAR60220 Advanced Diploma of Maritime Operations (Master Unlimited). The limited training berths creating the acute shortage of Ship's Master naturally creates persistent shortages of the related occupations Dredge Master, Ship's Pilot (Marine Pilot), Tug Master and downstream occupations Harbour Master and Deputy Harbour Master (classified under ANZSCO 139999 Specialist Managers not elsewhere classified) and feeder occupation 231214 Ship's Officer. WA stakeholders report the workforce shortage as acute and persistent.⁷⁰
- **231214 Ship's Officer.** The maritime occupation 231214 Ship's Officer navigates and controls the safe operation of a ship and supervises and coordinates the activities of deck crew. Licensing is required through the Australian Maritime Safety Authority (AMSA). An alternative Title is Deck Officer. The Ship's Officer works under command of the Ship's Master ANZSCO Occupation 231213. Ship's Officer is an occupation on the nine to 20 year professional pathway to becoming the higher level occupation ANZSCO 231213 Ship's Master. On a large ship the Ship's Officer may be First Officer. The First Officer may hold a Master Unlimited but may not have the AMSA licensing or compliance requirements to be Captain. The limited training berths on Australian ships create the acute and persistent workforce shortage.
- **231212 Ship's Engineer.** There is an acute shortage of Ship's Engineer and feeder occupations 712911 Boiler or Engine Operator or Marine Engine Driver (MED) caused by the lack of Australian seagoing training berths. The Engineer requires skills to understand the complexity of different engine types to maintain and repair vessels at sea. The larger vessels in the Offshore Oil and Gas sector demand a Ship's Engineer Class 1. There are many experienced Ship's Engineers based in WA however the oil and gas specialisations mean that the offshore sector has sourced workforce elsewhere. Many Ship's Engineers are employed on work visas from countries like New Zealand. There is a persistent shortage of the downstream occupation 231215 Marine or Ship's Surveyor. WA stakeholders report the workforce shortage as acute and persistent.⁷¹
 - **Electro Technical Officer (ETO) or Electrical Engineer.** Particular vessel manning documents require a seagoing Electro Technical Officer (ETO) or Electrical Engineer. This is classified by AMSA in Marine Order 72 (Engineer officers) 2014. The ANZSCO classification is 231212 Ship's Engineer.

- ETO role.** ETO work on vessels with complex propulsion systems such as diesel electric. The ETO reports to the Chief Engineer Officer on the operation of the ship's electrical and electronic systems. This role has no watchkeeper duties. This position has developed from the tradition of the Ship's Electrician. There is currently no specific qualification that provides Australian Maritime Safety Authority (AMSA) certification for ETO. AMSA requires an approved course with a 'program of workshop skills training from an approved training organisation for an Electro-technical officer'. The Australian Maritime College in Tasmania is the only AMSA approved ETO course. South Metropolitan TAFE previously undertook the Training for ETO but do not currently offer it on scope. WA stakeholders report the workforce shortage as acute and persistent. A complication with transition to landside roles is that ships use direct current. Recognition of electrical licences for landside work in alternating current is difficult.^{72 73}
- 899211 Deck Hand - known as Integrated Rating in WA.** The Integrated Rating (IR) is the crew level entry into the maritime industry. The Skills Priority List June 2021 lists IR nationally as No Shortage with Moderate future demand. The projected growth in the WA Oil and Gas sector is expected to increase the demand for IRs. However IRs are easily up-skilled so this does not generate a WA workforce shortage. Stakeholders report the workforce shortage for 899211 Deck Hand in WA as stable not acute. There are grades of certificate for Deck Hand within the AMSA qualifications under Marine Order 73 (Ratings) 2014 as follows:

 - Navigational watch rating
 - Engine room watch rating
 - Able seafarer - deck rating
 - Able seafarer - engine rating
 - Integrated rating
 - Chief integrated rating.^{74 75}
- 231211 Master Fisher.** The Master Fisher controls a fishing vessel and fishing operations. WA has a surplus of Master Fishers. This is not a growth area in WA with a decrease in the number of vessels.⁷⁶ Improved technology achieves the sustainable catch limits with less ships. Improved fisheries management measures have driven significant economic efficiency. The COVID-19 pandemic and the China trade tensions have created an uncertain economic future for some fish exports. For example China accounted for 91% of Australian rock lobster exports in 2019 and 2020. The resumption of rock lobster exports to China is the key uncertainty in forecasting. Producers have sourced alternative markets. Domestic demand has been high. The market situation is dynamic.⁷⁷
- ANZSCO review of maritime occupations codes.** The ABS is undertaking a review of ANZSCO maritime occupations codes under Water Transport in Consultation Round 3 from 1 Nov 2023 to 27 Feb 2024. Maritime stakeholders acknowledge that technological developments mean that ANZSCO codes for Signals, Data and Communication technicians will have to be reviewed in Consultation Round 2 from 15 Jun to 6 Sep 2023 under Telecommunication or Electricity, gas, water and waste services.
- Seagoing and landside crossover.** There is natural crossover between seagoing and landside jobs in port. For example Harbour Master is generally qualified Master 1. Therefore this Maritime industry profile should be read in conjunction with the LDSC profile for Ports & Stevedoring.

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