

Capacity building program in seaport engineering and operation at Makassar New Port

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I am delighted to share our findings from the Partnership for Australia-Indonesia Research (PAIR) project on young people and skills.

The research focuses on young people, aged 16-30, in the province of South Sulawesi. This is the largest demographic within the province which is undergoing significant economic growth. This research project is designed to assist in ensuring all young people are able to take advantage of its development opportunities.

The research will help identify the skills gaps and capacity building needs of young people across a number of sectors. Having this focus aligns with the Indonesian government's priority on human capital development.

These reports provide the policy community with timely access to the best available evidence. They also respond to the Australian government's Partnership for Recovery strategy which aims to understand and support Indonesia as it deals with and recovers from the COVID-19 pandemic.

Warm regards,



Dr Eugene Sebastian
PAIR Program Director
The Australia-Indonesia Centre

EXECUTIVE SUMMARY

Indonesia has ambitions to become a major sea power, and to do that, it will need to have an emerging workforce that has the skills and capacity to meet the demands of an international industry.

The Makassar New Port in the province of South Sulawesi provides a case study for this forward looking national policy.

The goal of this study is to identify gaps in the knowledge and skills of young workers in port engineering and operations by comparing their existing knowledge and skills with the industry's expectations. Our findings suggest that while the technical knowledge and abilities of young workers generally meet the basic requirements, there are still general skills and competencies that need improvement, particularly in promoting gender diversity and social inclusiveness to meet the Sustainable Development Goals (SDGs).

Our study has two key areas of focus, the first relating to demographics and the second relating to skills.

Our research found the port workforce is relatively young and male. The proportion of males is 75 percent among operational workers and 89.47 percent among those working in engineering. Workers aged 25 to 40 years represent half the number of operational workers, with a significant minority (12.5 percent) being aged between 15 and 24. Among engineers the proportion aged between 25 and 40 is 63.16 percent, confirming this trend towards youth. Our study found the majority (65 percent) of port operations workers were between 15 and 34 years old and that 75 percent of respondents were male. (as shown in Figure 3). When we look at engineering workers, the proportion of males is 89.47 percent. Our findings have led us to recommend that facilities for women and people with disabilities should be provided to enable them to participate more fully and work productively.

In assessing skill levels we found that young workers have good general capabilities including technical competencies and adaptability to technology, but are lacking in soft skills such as foreign language proficiency, discipline, responsibility, communication, time management, professionalism, work ethic, practical skills, teamwork, presentation, knowledge of regulations, attitude and self-confidence.

To address these skills gaps and promote inclusivity in the port sector, we recommend specific actions to be taken by education and training institutions, the port industry and central, provincial, and regional governments (see end of report for detailed list of recommendations).

- Recommendations for port education and training institutions include updating education curricula with emphasis on soft and hard skills, cooperating with elementary and secondary schools and including intellectual development, multicultural awareness, ethical reasoning and acceptance of diversity.
- Recommendations for the port industry include collaborating with educational institutions to promote the industry, opening a special recruitment program for women and other minority groups and collaborating with universities and training institutions to develop and run capacity-building programs for the young workforce.
- Recommendations for central, provincial and regional governments include developing learning facilities and port training centres in universities, regularising recognition and certification of skills as part of professional development and strengthening policies related to the recruitment of women and persons with disabilities in the port industry.

These recommendations are aimed at promoting the necessary skills and knowledge to create a diverse, inclusive, and skilled workforce in the port sector which will contribute to Indonesia's national policy of becoming a major sea power.



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Image credit: Rio Lecatompessy on Unsplash

1.0. INTRODUCTION

There are two main factors that make Indonesia a strategic area for international maritime activity. First, Indonesia's water, which occupies 3,273,820 km² in area, is larger than its land area which is 1,919,440 km². Second, Indonesia is geographically strategic as an international shipping lane with the country located between two continents: Asia and Australia, and two oceans: the Indian and the Pacific. Due to its position, Indonesia has many strategic ports. South Sulawesi, in the centre of the archipelago, is the gateway to eastern Indonesia. The government has confirmed Makassar port's status as a hub for eastern Indonesia. Moreover, South Sulawesi (known as SulSel) is the largest source of rice and corn and produces other food commodities that have high economic value². Unfortunately, poor infrastructure and connectivity between ports have resulted in commodity price disparities in Indonesia³.

It has been reported that more than 90 percent of international goods in Indonesia are traded via sea⁴. Indonesia already has strategic ports for sea transport and trade routes, including Pelindo (Indonesian Port) Regional 4, Paotere People's Port, and Tonasa Biringkassi Port. The Indonesian government, through Pelindo IV, built Makassar New Port (MNP) as one of the National Strategic Projects (PSN - Proyek Strategis Nasional).

1 M. Gilang Ramdya Nurchasan, 'Proses stereo plotting, pembentukan dem dan kontur di software summit evolution menggunakan data ifsar wilayah Sulawesi Barat', Universitas Pendidikan Indonesia, 2014, http://repository.upi.edu/11243/3/S_%20GEO_1002251_Chapter1.pdf

2 Peraturan Presiden (PERPRES) NO. 48, LN.2014/NO.118, Peraturan Presiden (PERPRES) tentang Perubahan atas Peraturan Presiden Nomor 32 Tahun 2011 tentang Masterplan Percepatan dan Perluasan Pembangunan Ekonomi Indonesia 2011-2025, June 2014: <https://peraturan.bpk.go.id/Home/Details/41537/perpres-no-48-tahun-2014>

3 S. Wahyuni, A.A. Taufik and K. Hui, *Revealing Indonesian Port Competitiveness: Challenge and Performance*, Open Book Publishers, 2019.

4 Shenntyara Mirtha and Melissa Chin, 'Indonesia: Asia's maritime gateway to the west', *The ASEAN Post*, 22 September 2017: <https://theaseanpost.com/article/indonesia-asias-maritime-gateway-west>

Makassar New Port is part of the national Sea Toll Program, a program of maritime investments and subsidies aimed at strengthening the connectivity between the major ports of the country with other ports especially those in the lesser developed eastern regions of the country⁵. The Makassar New Port will also include a 1,428 hectare industrial precinct. The great potential of the port in South Sulawesi should be supported by good infrastructure and human resources, since Makassar New Port will become the largest port in Indonesia outside Java. It has the potential to provide great job opportunities for the young people of South Sulawesi.

This project directly supports Makassar New Port and existing ports in South Sulawesi through a direct plan to develop the knowledge and skills of the younger generation in port engineering and operation.

Our project aims to analyse the skills and knowledge gaps of youth (aged 16-30 years) and provide recommendations for capacity-building programs in port engineering and operation. Marine engineering is currently a male-dominated industry, with women making up just two percent of the total workforce⁶. The development of prototype materials for capacity building also includes recommendations for inclusive teaching and learning activities. Therefore, this project has the potential to improve gender equality and the social inclusiveness (GESI) of the workforce⁶ in the port industry. The recommendations for the capacity-building program will include recommendations on teaching and learning activities that promote gender balance and social inclusion and how the teaching materials can be incorporated into the curriculum in educational institutions to motivate young people to pursue their career aspirations in port engineering and operations. This research focuses on the education and training needs of youth aged 16 to 30 years, according to the definition of youth by the Indonesian government.

The following are objectives of this research:

1. To understand the demographics of youth who join the labour force in ports.
2. To develop the level of knowledge and skills of young people entering the workforce.
3. To understand how education can contribute to shaping the aspirations and motivation of young people in their career.
4. To identify industry expectations in knowledge and skills for entry-level positions in port engineering and identify the gaps in knowledge and skills.
5. To provide recommendations for capacity-building programs in engineering and port operations based on identified gaps and provide delivery options.

5 'Mendesak, Rencana Induk Tol Laut', Supply Chain Indonesia, 13 September, 2016: <https://supplychainindonesia.com/mendesak-rencana-induk-tol-laut/>

6 J. Jeevan, M. Menhat, Mhd S. M. Ruslan and Ç. K. Cetin, 'Gender inequality: an outlook from a seaport sector', *Australian Journal of Maritime & Ocean Affairs*, vol. 12, no. 4, 2020, pp. 187-99.



Image credit: Arief Hidayat on Unsplash

2.0. METHODOLOGY

This study uses quantitative and qualitative methods involving a literature review, survey questionnaire and focus group discussions. We reviewed the literature to identify strategies to promote a career in port engineering and operations to young people, incorporate port engineering knowledge and skills into a university curriculum and involve gender equality and social inclusion in teaching and learning. We also reviewed university and polytechnic courses' content and intended learning outcomes to establish a base skill level.

We then carried out two separate surveys on the operational and engineering sections - because of the difference in the fields. Operational workers work in port operations, while engineering workers work in the construction and port facilities section such as civil engineers. But there are also mechanical or electrical engineers who work on handling port equipment such as operational

equipment. We surveyed port workers who mentor entry-level graduates, fresh graduates, port entry-level employees and stakeholders. We wanted to understand from the mentors the knowledge and skills expected from fresh graduates. We asked young people to evaluate their knowledge and skills based on what they consider is expected by the industry. Our survey questions directed at young people also sought to find out what aspects of their education and job motivated them. Surveys were conducted offline and online. We interviewed 23 participants offline and 21 young technical/operational personnel participated online.

While the survey questionnaire validates the literature study, the focus group discussions (FGD) provide a broader range of supplementary data and information. The purpose was to identify the knowledge and skills gaps and educational aspects that motivate young people. We engaged education and industry representatives - based on

gender, age groups, and socio-economic backgrounds. We targeted 50 participants, with 10 to 12 representing each group (students, graduates, entry-level employees, industry personnel, and educators). For example, our industry participants involved four leaders from the port industry: PT. Pelindo (Indonesian Port) Regional IV, Makassar New Port (MNP), Semen Indonesia (Semen Tonasa Port), and a consulting company PT. Suatri. There were also participants from educational institutions: the Department of Civil Engineering, Faculty of Engineering at Hasanuddin University, Department of Naval Engineering, Polytechnic of Maritime - Makassar (PIP), and the AMI Maritime Polytechnic Makassar (POLIMARIM). The focus group discussions were conducted both offline and online via Zoom and broadcasted on YouTube⁷.

⁷ Kampus Teknik Universitas Hasanuddin, Focus Group Discussion, Program Peningkatan Kapasitas dalam Kegiatan Teknik dan Operasional Pelabuhan di Makassar, January 2022: <https://www.youtube.com/watch?v=1C6Tc2MMYl>



Image credit: Maksym Ivaschchenko on Unsplash

3.0. LITERATURE REVIEW

To attract young people to the port engineering profession more needs to be done to address at least three existing barriers to entering the sector: lack of visibility, non-inclusive educational programs and inflexible entry opportunities.

One way to increase the visibility of engineering careers is by appealing to the desires of young people to find hands-on solutions that will improve people's lives and make a difference⁸.

Some examples encouraged by the US National Academy of Engineers include secondary school visits by professionals or university students, students engaged in hands-on problem-solving activities, and industry field trips.

The United Nations Sustainable Development Goals (SDGs) advocate that gender equality and

inclusiveness principles are applied in all planning and implementing activities to ensure an inclusive learning environment. This means that marginalised groups such as people with disabilities, women and those with low economic status can receive support to continue an education and obtain access to decent jobs.

Finally, policies should be adopted and enforced to promote equal opportunities in tackling inflexible entry opportunities. There are several ways to do this. These include introducing targeted scholarships and mentoring programs⁹, introducing special admission schemes and flexible enrolments with full-time and part-time options for those unable to access engineering programs through the traditional route. This also encourages people with a different educational or professional path who are interested in switching to port engineering.

These three barriers do require close collaboration between industry, government and educators to tackle them adequately and ensure the industry can attract students and keep them professionally motivated. This collaboration is also imperative to creating equal career opportunities and options to work part-time after their studies¹⁰.

8 D. Shields, F. Verga and G. A. Blengini, 'Incorporating sustainability in engineering education: Adapting current practices to mining and petroleum engineering education', *International Journal of Sustainability in Higher Education*, Vol. 15, no. 4, 2014, pp. 390–403; <https://doi.org/10.1108/IJSHE-02-2013-0014>

9 A. MacNeil and S. Ghosh, 'Gender imbalance in the maritime industry: Impediments, initiatives and recommendations', *Australian Journal of Maritime and Ocean Affairs*, Vol. 9, no. a 1, 2017, pp. 42–55. <https://doi.org/10.1080/18366503.2016.1271262>. J. Mills, M. Ayre, and J. Gill, *Gender Inclusive Engineering Education*, Routledge, 2010.

10 H. McLaren, C. Star and I. Widianingsih, 'Indonesian women in public service leadership: A rapid review', *Social Sciences*, Vol. 8, no. 11, 2019; <https://doi.org/10.3390/socsci8110308>

How Port Engineering Knowledge And Skills Can Be Incorporated Into University Curricula

The most common approaches to include knowledge and skills in university curricula are¹¹:

- providing coverage in existing modules or courses (built-in approach)
- creating a new course (additional approach)
- integrating materials across the curricula
- creating specialisation

Redish and Smith¹² observed that over the years, engineering programs had placed a strong emphasis on the theoretical development of students but lacked focus on the development of practical skills. Reviews of engineering course content and quality over the past decades has found the advice remains to improve integration of theory and practice and professional development. One approach that suits this comprehensive requirement of skills and knowledge is project-based learning¹³.

The general idea of project-based learning is that a group of students is assigned to solve or study actual problems. The nature of the problems is open, multidisciplinary, and usually obscure like most engineering problems¹⁴; this lesson promotes critical and solution-oriented thinking by students. Since port engineering is a multidisciplinary field in which engineers will face ecological, social, economic and legal challenges, it provides an opportunity to embed engineering skills and knowledge in the other fields' curricula as well while exposing students to related fields.

Project-based learning supports the intellectual development of the student

11 D. Shields, F. Verga and G. A. Blengini, 'Incorporating sustainability in engineering education: Adapting current practices to mining and petroleum engineering education', *International Journal of Sustainability in Higher Education*, Vol. 15, no. 4, 2014, pp. 390–403.

12 E. F. Redish and K. A. Smith, 'Looking beyond content: Skill development for engineers', *Journal of Engineering Education*, Vol. 97, no. 3, 2008, pp. 295–307.

13 D. Jonassen, J. Strobel & C. Lee, 'Everyday Problem Solving in Engineering: Lessons for engineering educators', *Journal of Engineering Education*, Vol. 9, No. 2, 2006, pp. 139–151.

14 *ibid*

by forcing them to consider best practices, the use of innovative technologies, effective collaboration within a team and communication with stakeholders. It also develops understanding and skills beyond that of traditional engineering, as the social and economic impacts of engineering choices need to be analysed from a regional to international setting¹⁵. If the assignments are well thought-out and guided, project-based learning enhances equality, and social inclusivity as students are required to collaborate and work together and reflect on the input provided by each student. The instructor plays to "promote student growth and autonomy"¹⁶ and has the important task of ensuring equal opportunities among students.

Project-based learning can be integrated into the curriculum, either as a final project of the theory-based course or integrated as an overlapping learning method between courses. The flexibility of project-based learning opens up the possibility of incorporating port engineering into the curriculum of related disciplines. However, how the curriculum is integrated depends on to what extent the curriculum can be changed or redesigned.

15 D. N. Huntzinger, M. J. Hutchins, J. S. Gierke and J. W. Sutherland, 'Enabling sustainable thinking in undergraduate engineering education', *International Journal of Engineering Education*, Vol. 23, no. 2, 2007, pp. 218–230.

16 *ibid*



Image credit: Zayyinatul Millah on Unsplash

Strategies for effective teaching and learning and a focus on gender equality and social inclusion

Supporting and promoting equality and inclusion is a societal challenge. While improvement requires broad societal changes through coordinated efforts between government, industry and educators, significant impact in equality and inclusion can be achieved through teaching and learning strategies at the university level. We make the distinction here between two topics: (1) training of soft skills and intellectual development of the students, and (2) reliability and improvement of equal opportunities for all demographics.

Research suggests that intellectual development leads to growth in multicultural awareness, moral reasoning and acceptance of diversity¹⁷. To tackle engineering and related social problems, students can use their intuition to perform objective analysis in order to make judgments and decisions. As individual thinking is thus directly related to the experiences of the students and their background, exposure to others' judgements and thinking exposes students to diversity. Education programs should thus teach students that "differing perspectives of fellow students or collaborators are an opportunity to expand their own learning while enriching projects themselves"¹⁸.

As mentioned previously, one of the most suitable teaching strategies is project-based learning. In this format instructors need to ensure all groups have diverse backgrounds and that all information (i.e. inputs from students) is seriously considered by collecting, evaluating and utilising information. Developing critical thinking skills is the key component in the students' intellectual development which creates a greater likelihood of an inclusive community.

17 P. M. King, 'Teaching to promote intellectual and personal maturity: Incorporating students' worldviews and identities into the learning process', *New Directions for Teaching and Learning*, San Francisco: Jossey-Bass, 2000.

18 M. Borrego and L.K. Newswander, 'Characteristics of successful cross-disciplinary engineering education collaborations', *Journal of Engineering Education*, No. 97, vol., 2, 2008, pp. 123-134.

Another important part of intellectual development is soft skills training¹⁹, including communication and presentation practices, teamwork and ethics. While the materials can be taught in separate targeted courses, the integrated and hands-on approach of project-based learning is considered more efficient. This learning method allows students from different backgrounds to work together. Examining real problems also means the students can relate better to the task at hand and allows students to examine technical problems together within a social and human context.

A clear barrier that currently exists in nearly all professions is the underrepresentation of minority groups in leading roles which makes minority groups less visible in the public eye. While this by itself may not necessarily mean that minority groups have directly unequal opportunities (although it usually is), it is perceived as one as it sends the message that minority groups cannot achieve the same career paths as the majority groups²⁰. A well-cited example is the lack of women in leadership roles which is often caused by various forms of discrimination.

19 A. Mohan, D. Merle, C. Jackson, J. Lannin and S. S. Nair, 'Professional skills in the engineering curriculum', *IEEE Transactions on Education*, Vol. 53, no. 4, 2010, pp. 562-571; <https://doi.org/10.1109/TE.2009.2033041>

20 J. Mills, M. Ayre and J. Gill, *Gender Inclusive Engineering Education*, Routledge, 2010.



Image credit: Nadhil Ramandha on Unsplash

Industry perspective

Port industries conduct business on marine service, freight service, port facilities management, port management, including supply chain management and packing and bag supply operation safety, draught and survey service and support other businesses in regulations and permit compliance and pollution control. Port industries' business also involves the planning, design, construction and maintenance of ports.

Because of the multidisciplinary nature of port businesses, people with varying levels of educational background are hired from those having a high school certificate to a master's degree. The areas of expertise also vary widely. These are logistics and supply chain, digital technology, construction and technology, marine services, port planning, port equipment, port services, engineering, management, administration, information technology, nautical, port management, transportation, finance and human resources.

The required knowledge has been identified and listed in the following. However, it should be noted that this is not a comprehensive list of what the port industry requires:

- regulations related to ships, waters, and ports
- detailed knowledge of ships and their operations
- safety of ships, waters, and ports
- ship and port management
- port administration and its activities
- port safety
- ship and port administration management
- port facility security (if International Ship and Port Security (ISPS) code is applied)
- pollution of port facilities
- operation and maintenance of port facilities and infrastructure
- design (geotechnical and structural) and construction of port structures
- safety health and environment (SHE) in port

For the identified knowledge required, the participants emphasise the importance of their employees obtaining the relevant certifications and permits.

Readiness of young people and how to increase their capability and aspiration

Port engineering and operation was viewed as a highly specialised profession and the industry does not view graduates as having the required skills when they join the profession. However, they thought that the students have generally acquired the knowledge from their general degree (for example Bachelor of Mechanical Engineering), and they are ready to receive further training in port engineering and operation. Some companies provide training programs to enhance the skill sets of their workers. For example, workers receive a yearly budget in the form of an e-wallet that they can spend on online training. This provides workers the autonomy to select the skills they want to develop independently.

Young people make up the majority of the workforce. With respect to how we build the capability of young workers and aspire them in the profession, a port consulting company stated that the development of the quality of human resources is a long-term process and should begin at an early age from the elementary education level to the secondary level and then mastering it at the higher education level. Alumni of the college institutions may play an important role in building the synergy between industry and education.

Diversity and gender equity

Despite providing equal opportunities for males and females to enter the workforce, it is still male-dominated. When questioned about perceived barriers for females in joining the

port industries, the participants did not see any barriers in terms of the opportunities provided but generally viewed that the profession of port engineer and maintenance is not yet popular among females.

Port engineering and operation training and educational institutions

In the session with training and educational institutions, the Polytechnic of the Maritime - Makassar (PIP), the Department of Civil Engineering and Department of Naval Engineering at Hasanuddin University, and the AMI Maritime Polytechnic Makassar (POLIMARIM) presented their curricula related to port engineering and operation. The topics, intended course learning outcomes and intended skills outcomes are summarised in this section.

Polytechnic of the Maritime (PIP) Session

PIP provides training and certification in port, maritime and logistics through formal (diploma) and non-formal (certificate) qualifications. PIP provides port expert certification through education and training held by the training institutions in collaboration with the Directorate-General of Sea Transportation. The program is open to the public with a minimum requirement of having experience working in ports. PIP also provides ISPS Code Certification training for Port Facility Security and the deputies, security officers, and personnel on duty at ports (such as operation and stevedoring companies).

Relevant competencies provided by the programs:

- Legal and permit: understand the relevant regulations and its applications, processing related permits, port safety, health and environment, port facility maintenance (facility,

infrastructure, and equipment on the jetty), port operations, capacity planning, pollution control.

Generic skills acquired:

- communication skills
- leadership skills
- attention to details
- lobbying/negotiation skills

Civil engineering, Hasanuddin University

The civil engineering degree at Hasanuddin University takes an “outcome-based education” approach, helping students meet the program objectives with a learning process that emphasises knowledge, skills and attitudes as required for an independent professional.

Course learning objectives in port engineering:

- Able to understand and recognise ports, ship characteristics, and port planning stages. Able to select locations and assess hydro-oceanographic conditions, design layouts, breakwaters, shipping lanes, harbour pools, piers, fenders, and mooring equipment.
- Able to carry out the duties and responsibilities in design according to team rules.

Learning objectives related to port engineering of civil engineering course:

- Able to apply an engineering design process that emphasises at least four major civil engineering fields using modern engineering tools to provide solutions to problems tailored to specific needs.
- Acquire management skills and perform effectively in a team to develop leadership, build a collaborative and inclusive environment, plan tasks, and set and reach goals.

Graduate skills:

- Professional skills in planning, design, construction, management, and maintenance in civil engineering.
- Communication and collaboration skills, ability to be creative and innovative in solving engineering problems while considering professional ethics, applicable standards, economic and environmental aspects.
- Leadership qualities and attitude for lifelong learning.

Naval engineering, Hasanuddin University

Naval Engineering at Hasanuddin University offers the following courses related to port operations:

1. sea transportation systems
2. port management
3. logistics management
4. supply chain management
5. shipping management

Course learning objectives:

- Able to perform as marine transportation planners and leaders of marine transportation planners.
- Able to plan and develop ship and port operations with the principles of Industry 4.0 and environmentally friendly.
- Understand and be able to forecast the supply and demand of transportation, ship financing and ship operations management, and the principles of Industrial 4.0 and ecology.
- Able to design, build, and repair ships and other floating structures.
- Able to optimise the planning and management of marine transportation systems.
- Demonstrate a good attitude in daily activities.
- Produce and improve high-quality research and conduct community services to contribute to the development of maritime technology.

AMI Maritime Polytechnic Makassar (POLIMARIM) session

POLIMARIM provides D.III (Diploma) in Port Management with the following competencies:

- Manager of stevedoring business activities: planning stevedoring activities, making stowage plans, arranging basic loading equipment, handling various types of conventional cargo, implementing IMDG-Code in handling cargo from stevedoring activities, delivering digital-based daily reports.
- Commercial port operational management leader: conducting port operations and governance, calculating port service rates, preparing port performance standards, developing loading equipment performance standards, planning and supervising the utilisation of loading equipment.
- Operations manager of shipping company: drafting contracts in shipping line management, resolving claims for compensation and marine insurance issues, processing the docking and departure administration of commercial ships, managing the frequency/pattern of the ship route business, making a storage plan, planning stevedoring activities and utilisation of loading equipment, managing sea transportation business documents and administration of ship maintenance and repair, creating reports, and collecting data and information on sea transportation activities using information technology.



4.0. RESULTS OF QUESTIONNAIRES

Knowledge, skills and gaps in port operations

In the survey responses from managers and workers, we identified the knowledge and skills needed and existing gaps in port operations (see appendix for details).

Key observations:

- Shipping and port management and port management are the most needed study programs for land, sea and general operations.
- Shipping and naval engineering is the most needed study program for sea operations.
- During the last five years, all operations managers reported that they hired graduates with varying background levels, D3 (Diploma 3), D4 (Diploma 4), S1 (undergraduate) graduates, and high school (including vocational school).
- Most are hired as staff and supervisors, and a smaller number are hired as assistant managers and managers. This finding correlates with our survey results, where port workers with D4 (diploma) and S1 (undergraduate) form the majority (See Figure 1).
- More than half of the participants graduated with non-engineering degrees (Figure 2).
- More young people are hired in land and general operations than in sea operations.
- The majority of the workers (65 percent) were between 15 to 34 years old (as shown in Figure 3).
- 75 percent of the respondents are male (as shown in Figure 4). Most young workers in port operations are men. Another interesting result is that managers reported that age and gender do not prevent young workers from working together.
- Although more than half of the managers have workers with disabilities, only one stated that there are facilities available for them.

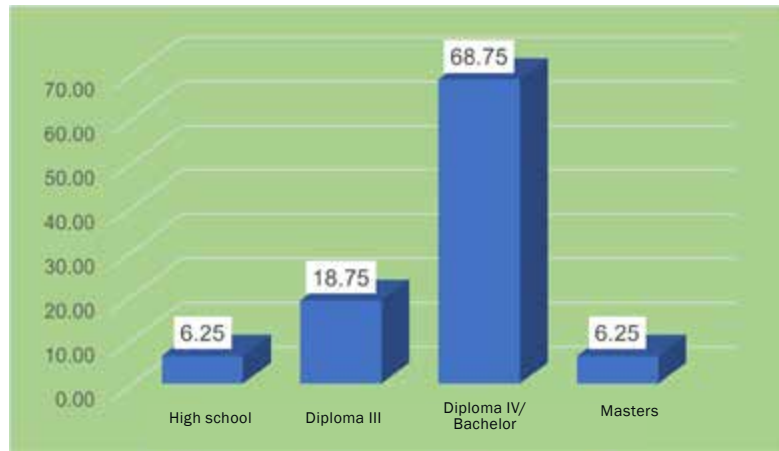


Figure 1. Education of operational workers

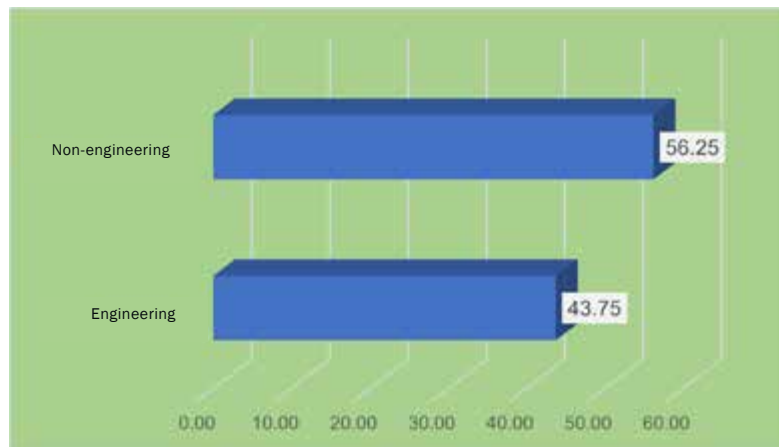


Figure 2. Operational workers' expertise.

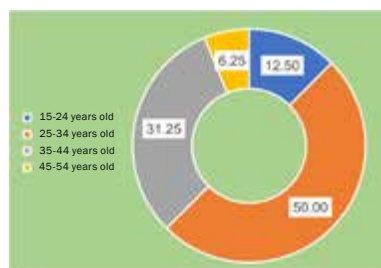


Figure 3. Age range among operational workers

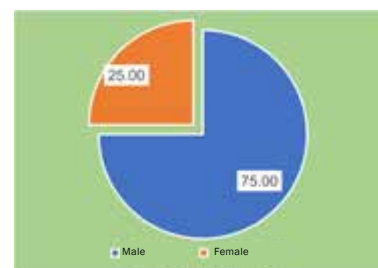


Figure 4. Gender distribution among operational workers

Port operations managers consider general knowledge as either very necessary or necessary in port operations. This knowledge consists of a general knowledge of the job, an understanding of sea transportation, logistics and supply chain management, maritime regulations, maritime safety, freight forwarding, stevedoring process, port warehouse operations and management of the work environment (see appendix for further details).

Both engineering and non-engineering workers think that the majors' subjects are useful. A smaller number of workers found that subjects unrelated to their majors are also useful (e.g. marketing, communication, computer science). Importantly, the following knowledge is still lacking amongst the young workers:

1. Operational permit (SIO), professional certificate, experience, port management and port management certification.
2. Port management, logistics and supply chain.
3. Knowledge related to equipment, driving licences (SIM B1, B2), knowledge of each tool for operational permit (SIO), knowledge of advanced modern equipment, operational knowledge of loading equipment, operating procedures for operating heavy equipment, knowledge of field conditions and operations and operational permit (SIO).
4. Ship piloting, port management, port operational management certification, knowledge of regulations and safety regulations.

Despite managers reporting that young workers still lacked the knowledge and permits mentioned above, port capabilities and technical knowledge are considered fair. Assessment of special competencies for young workers in port operations includes

the calculation of demand for port services and maximum port capacity requirements, operating and coordinating logistics systems and measuring logistics performance, managing supply chains, storage and cargo processing, traffic control at terminals for container and general cargo, and managing passenger accommodations and administration. It also assessed young workers' skills in BOR (berth occupancy ratio) on dock operations, controlling navigation and accommodation of ships in ports; and compliance with regulations for ship operations and security regulations, SOP for occupational safety and health and regulations for maritime environmental protection.

Managers reported that the workers are either very good or good on most of these special consistencies. However, a few managers took the view that the workers' competencies in the following aspects can be improved: calculating the demand for port services and maximum port capacity requirements, implementing regulations for the protection of the maritime environment, calculating pier berth occupancy ratio, implementing safety and health work environment (SHE), implementing ship operating procedures and safety regulations and controlling the ship navigation and accommodation in ports. In addition, these specific skills in port operations are still lacking amongst the young workers:

- skills to operate equipment, operational competence, knowledge of regulations, and personal safety
- operational skills for maintenance
- comprehensive understanding of container terminal operations
- practical skills in the field
- data analysis
- adaptation of technology and information technology/ internet

- information technology
- entrepreneurship

The questionnaire was also set to measure the general competencies of young workers in port operations. This includes ethics and attitude, the compatibility of the background field with the job, skills in communication, innovation, reporting, cooperation, problem-solving, operating the latest technology, negotiating skill, leadership and others. All respondents reported that the general competence of young workers is good.

A few managers viewed that some competencies, the ability to express ideas or innovate, the ability to solve problems and communicate effectively, the ability to use the latest technology, leadership skills, management and organisational skills can still be improved. Importantly, most managers reported that the ability of young workers to communicate in English is poor. Young workers surveyed also identified a lack of critical thinking, interpersonal skills, communication skills and English language proficiency to be skills that they are lacking.

Further, the managers viewed that the skills of young workers that are considered poor at the time of admission:

- discipline, responsibility, professional certification, foreign language proficiency, and experience
- knowledge of regulations, work ethics, fieldwork skill, and the ability to work in teams
- essential skills, especially in taxation and time management
- comprehension in science and technology adaptation
- presentation skills, creating good presentation materials
- self-confidence

Knowledge, skills and gaps in port engineering

In the survey responses from managers and workers, we identified the knowledge and skills needed and existing gaps in port engineering (see appendix for details).

Port managers need a workforce with engineering and non-engineering backgrounds. Most hire graduates from civil engineering, mechanical engineering, electrical engineering, and architecture. Few hire graduates from industrial and naval engineering. Social, economic and law graduates are hired from non-engineering backgrounds as staff and managers, while a smaller number are hired for managerial roles.

All managers reported that they hired undergraduates. However, some managers said that they did not hire D3 (Diploma 3) and D4 (Diploma 4) graduates. Several managers still hire high school graduates in the last five years. The survey questionnaire with young workers reveals that the majority of them have completed D4 and S1, while a smaller number of them completed D3 and S2 (master's degree) - See figure 5. The majority completed engineering degrees, as shown in figure 6, specifically in geodesy, architecture, marine, sea port, transportation management, information systems and civil engineering.

The majority of the workers are young and male. This finding also correlates well with the finding from the survey questionnaire with young workers (figures 7 and 8). Despite providing opportunities for workers with disabilities there are currently no facilities provided for them in the workplace. All managers reported that differences in age, gender and disabilities do not prevent young workers from working together.

Questions were also raised about the level of knowledge among young workers about ships, hydro-oceanography, harbour layouts, breakwaters, shipping lanes, harbour pools, construction of piers and dock facilities, fenders, mooring equipment, shipping guide equipment and port services. All managers considered them very necessary or necessary.

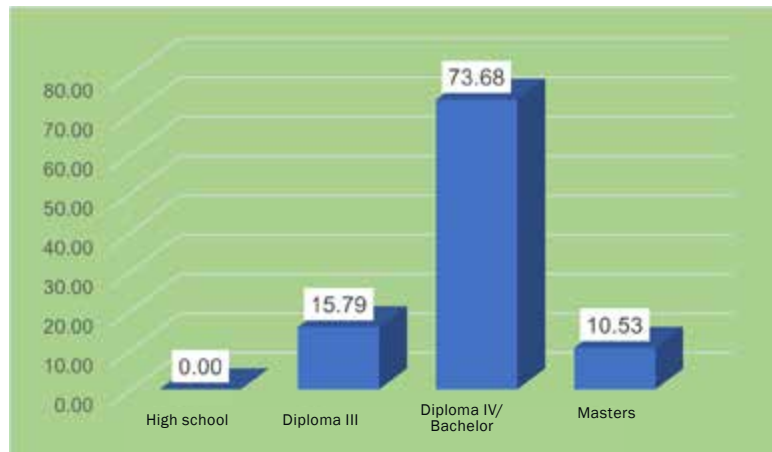


Figure 5. Education of engineering workers.

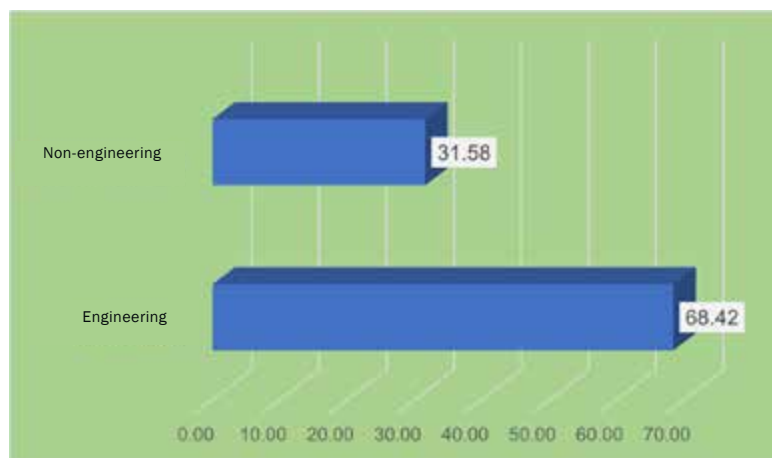


Figure 6. Engineering workers' expertise.

For knowledge of hydro-oceanography and dock construction and facilities, all managers considered them very necessary. General knowledge that is considered very necessary or necessary includes ships, port layouts, breakwaters, shipping lanes, port pools, fenders, mooring tools and shipping guide equipment.

The survey questionnaire involving young workers also indicates that what they have learned in their degrees is useful in their work specifically courses on the hydrographic survey, land survey, photogrammetry, digital cartography, construction management, concrete construction, geotechnics, computer system analysis, engineering mechanics, concrete structures, foundation engineering, steel structures and technical drawing. The young workers with non-engineering backgrounds identified courses in law, finance, risk management, corporate management, operational management, administration and engineering to be useful in their work.

Further, the following knowledge has been identified as still lacking among the young workers:

- knowledge of the utilisation of the tools in the port
- knowledge about Building Information Modelling (BIM)
- knowledge about construction modelling, port construction and construction management

- digital-based multimedia
- knowledge of automation, mechatronics, and port operational tools
- knowledge of machinery, safety, health and environment (SHE), and field condition
- certification
- knowledge of field conditions, applicable skills, and systematic flowcharts

Although young workers are lacking in some capabilities, the knowledge of general engineering is considered to be fair – this is consistent with the findings of focus group discussions presented earlier.

Assessment of young workers' special competencies in the port engineering section includes the preparation of a port development master plan, port facility construction design, preparation of port development master plan, analysis of port facility construction design, demonstrating the function of port facility construction design, assessing port facility construction design and considering non-technical aspects in the port facility construction design. For these competencies, all managers reported them as good or very good. However, some improvements can still be made in skills in preparing a master plan and port development.

Further, the following specific competencies are still considered lacking among young workers:

- general understanding of the field
- lack of knowledge beyond their field
- skills and understanding of automation and mechatronics
- ship automation/crane machinery systems
- container handling skills
- BIM and lean construction
- safety, health and environment (SHE) and the ability to apply new methods
- operational research
- lack of experience

The survey questionnaire also examines the generic skills of young workers in port engineering. These include ethics and morals, the compatibility of their field with the job, the ability to communicate,

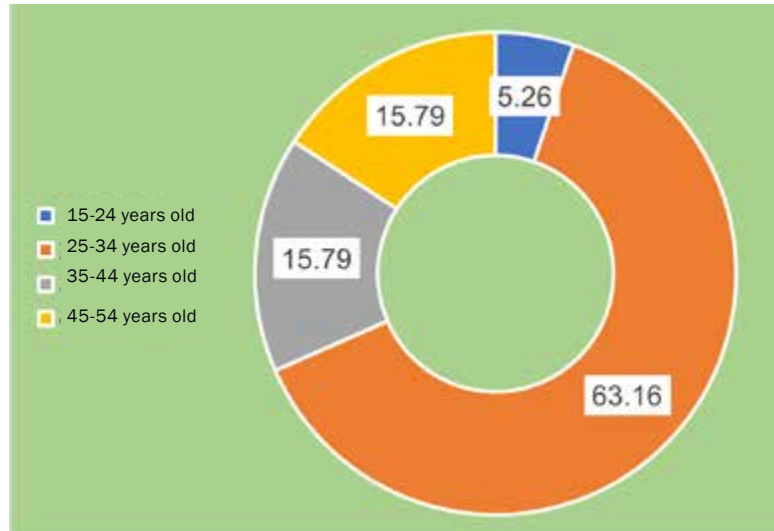


Figure 7. Age range among engineering workers.

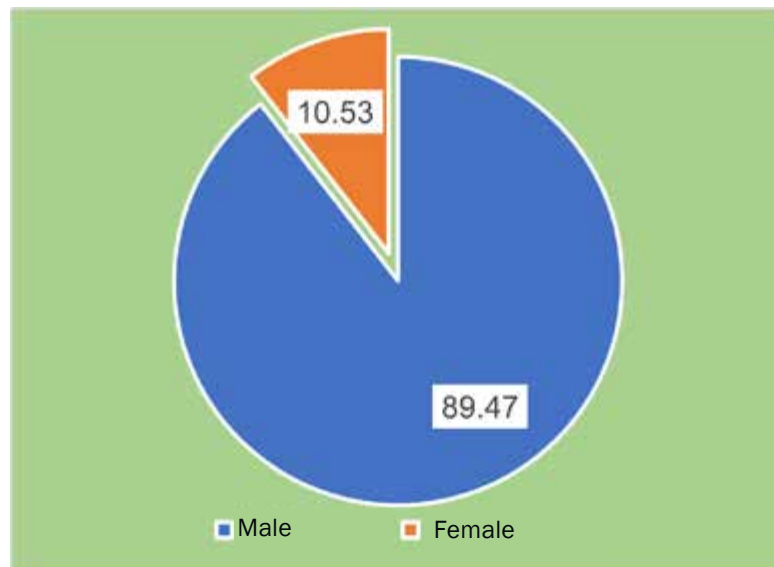


Figure 8. Gender distribution among engineering workers.

innovate, make reports, collaborate, solve problems, use the latest technology, negotiate, leadership skills, etc. All engineering managers reported that the general competence of young human resources is good. Some improvement can be made in young workers' capability in expressing ideas/innovations, solving problems, management, and organisational abilities, negotiating and leadership skills. Among all competencies foreign language proficiency, especially English, is considered poor.

From the perspective of the young workers, teamwork, leadership, communication, task management and foreign language proficiency were identified as important skills that should be acquired at schools.

The following generic skills are still lacking amongst young workers in port engineering:

- competence related to technology and information, especially building information management
- the ability to develop required computer programs
- digitalisation process

5.0. FOCUS GROUPS DISCUSSIONS

This section discusses interview results with leaders and managers about the capacity of young workers in the operational and engineering units of ports and several port companies.

The interview started with questions about the leaders' profiles (as respondents) and their roles in their organisations. The following questions are about the profile of young workers working in the port operations section of their companies. These questions were designed to identify workers' educational backgrounds, the number of employees and the proportion of gender and persons with disabilities among young workers in their organisations.

Port operations

We asked young workers in the operations department questions about inclusiveness, soft skills or general competencies and hard skills or special competencies. These three main areas are generally still lacking among young operational workers.

- **Inclusiveness.** Despite a program to recruit staff with disabilities there are no facilities available. There are facilities for passengers with disabilities at the port which could be expanded to include staff.
- **Competencies related to soft skills or general competencies.** Soft skills considered lacking among young workers are foreign language proficiency, discipline, responsibility, communication, time management, professionalism, work ethics and knowledge of regulations. The general competencies considered fair among young workers are morals and ethics, abilities related to their educational background, organisational management and leadership.
- **Special competencies or hard skills required by the industry are considered to be lacking.** These include the lack of Operational Permits (SIO), professional certification and certification for port management and port operations. Other than that, skills still lacking are capabilities about

ports and port equipment, including the ability to calculate optimal port capacity, and operational capabilities such as reach stacker (RS), driver's licence (SIM) type B1 and B2, ship guiding, equipment maintenance and practical field skills. Competence in customer service and presentations are also considered important but still lacking among young workers. General and specific skills that are highly required are ship guiding skills, problem-solving, integrity development, market knowledge (supply chain) and equipment maintenance.

The leaders suggest workers acquire skills that can be validated by a certificate, such as foreign language proficiency.

In port engineering there is a disproportionate number of men with jobs compared with women.

Port engineering

And again we find that the number of young workers is higher than the number of older workers. The soft skill that is reported to be lacking is self-confidence in contributing ideas and innovations. Hard skills or special competencies that are lacking are proficiency in equipment operation and work experience, knowledge of safety, health and environment (SHE), certification and systematic ability.

The leaders and managers identified competencies or hard skills that are highly required and need to be learned by young workers as: ships, hydro oceanography, port layouts, breakwaters, shipping lanes, harbour pools, jetty construction and dock facilities, fenders, mooring tools, ship guidance tools and port services.



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Aspirations of young workers in the port engineering and operations profession

One of the goals of education is to inform students so that they are able to plan and remain motivated during their careers and lives more generally. Our literature survey highlighted the need for increased visibility to promote port-related professions. This visibility can be achieved by field trips to ports, organised by industry or government, as well as visits to schools by professionals or university students. The importance of early-age education was also highlighted in focus group discussions, which revealed that educational development is a long-term process that should start at elementary level and receive further support during secondary levels.

Higher education students can use the gaining of a competency to shape their Independent Professional Profile in the early days of their career. The Independent Professional Profile (PPM) is a description of competence or a reflection of the quality achievement expected of graduates when starting a career in their profession within three to five years after completing undergraduate education. This profile is the main consideration in determining the contents of higher education courses. The Independent Professional Profile also includes broader values such as integrity, innovation and general wisdom in its wider educational goals.

Examples of an Independent Professional Profile for civil engineering undergraduates with a background in port engineering are:

1. Graduates with professional skills in planning, design, construction, management and maintenance in the field of civil engineering.
2. Graduates who can communicate and collaborate in teamwork, as well as be creative and innovative in solving engineering problems by considering aspects of professional ethics, applicable standards, economic and environmental aspects.
3. Graduates who have leadership qualities carry out lifelong learning and meet the requirements for further education.

The contribution of education in shaping the values of wisdom, aspirations and motivation of young people in their profession is reflected in the PPM number two and especially three. The PPM number three represents the premise that the civil engineering undergraduate study program provides graduates who will pursue lifelong learning by pursuing further education opportunities or obtaining professional competency certification. Lifelong learning motivation is essential to keep up with technological advancements and expand engineering practice.

To ensure that PPM remain in line with the development of industry, the economy, and the world of work, the independent professional profile must be evaluated periodically and involve constituents such as universities, alumni, and experts. In this case, we are referring to experts such as professional engineers who generally occupy top positions in technical and managerial positions in their respective companies. Input from each party becomes a reference in evaluating ongoing independent professional profiles.

In this study, to find out and identify whether the independent professional profile meets the needs of the industry, a survey was conducted among college alumni (young workers in the port industry) and employers and the survey results can be seen in this report. In addition, talks were held with constituents to measure the achievement of educational goals where they were asked to assess the relevance of independent professional profiles to the needs of the industry in the port sector.

This study found that the graduate skills and attributes described by the PPM are required in the industry. For example, the need for communication skills, interpersonal skills, leadership skills, discipline, responsibility, work ethics, teamwork, innovation, critical

thinking, self-development and self-confidence were identified by both the managers and young workers to be important and lacking among the young workers. It is therefore important to develop course learning outcomes and teaching and learning activities to ensure the graduates develop these attributes.

The development of graduate skills and attributes can be embedded in the university curricula in various ways. For example, subjects can be introduced to develop soft skills, such as teamwork, ethics and communication skills, in the context of the profession in port engineering and operation. These subjects can use case studies as examples and incorporate guest lectures by the industry that introduce the profession. This will help place their learning in context and motivate the students in their intended profession. Further, the development of graduate attributes (and as a consequence, the motivation of students in the profession) can be further enhanced by industry involvement in the curricula. This can include, but not be limited to, the following activities: guest lectures (expert talks), industry involvement in developing the assignments (e.g. projects that are set by the industry), having industry personnel mentoring the students in their projects, internship programs, and industry-sponsored capstone projects. Extracurricular activities to solve industry challenges to a broader community will also increase the profession's visibility while scaffolding students' development and motivation in their profession.

6.0. CAPACITY BUILDING PROGRAMS - FRAMEWORK AND OTHER RECOMMENDATIONS

A capacity building program is recommended to address gaps in knowledge and skills in port operation and engineering. Such a program would target current port workers who recently entered the workforce as well as current and potential students undertaking higher education.

Short courses on port operations and engineering

The aim of short courses would be to increase the capabilities of current young workers, particularly targeting port workers who have recently joined the workforce. Short courses would be delivered by higher education institutions, vocational education and training providers together with the industries involved.

Intended topics for additional learning

Port operations

- Training on equipment, including knowledge of equipment, operation of loading-unloading equipment, operational capabilities and equipment maintenance (requiring certification).
- Ship operating procedures and navigation.
- Port management and operation: including container terminal operation, calculation of demand and capacity of port services, pier berth occupancy ratio, market knowledge (supply chain) and logistics.
- Maritime regulations: including safety regulations, safety and health work environment and regulations for the protection of marine environment.

Port engineering

- Port construction and management: including port development master plan, port construction and construction modelling, construction management, project management, port business venture, international ports, port services, safety, health and environment, BIM and lean construction.
- Port operation, operational tools, automation, mechatronics, crane machinery, container handling skills.



Image credit: Gradikaa Aggi on Unsplash

- Ships and ship navigation.
- Port design, hydrography, and bathymetric survey, hydro oceanography, port layouts, breakwaters, shipping lanes, harbour pools, jetty construction and dock facilities, fenders.
- Port structural design, foundation engineering, land and topography survey, structural design.

Teaching and learning methods

Short courses are proposed to cover each of the intended topics to allow current port workers to undertake and complete the courses as needed. It is intended that the courses will consist mainly of online modules made up of videos and other interactive activities. The online modules will allow the course to be completed at any time, providing flexibility to learners. The flexibility and modularity of the short course are also hoped to attract more diverse learners (e.g. female, part-time workers) and allow them to build their capabilities.

The online modules will allow participation from higher education institutions and industries in Australia and Indonesia in developing and delivering the short courses.

Curricula in higher education institutions

It is proposed that the curricula in port education and training institutions be updated to address the gaps in knowledge and skills identified in this research. The updates aim to provide young workers of the future with the knowledge and skills required by the port industries. The recommendations are also proposed to address diversity and gender gaps and motivate young people in the profession.

The target audience is students and potential students in port engineering and operation with the courses delivered by higher education institutions, port industries, elementary and secondary schools.

The curricula in port education and training institutions need to address the following identified gaps.

In port engineering:

- Port development master plan.
- Port construction modelling, construction management, project management, port business venture, international ports, port services, safety, health and environment.

- Port operational tools, automation, mechatronics, crane machinery, container handling skills.
- Ships, ship navigation, mooring.
- Hydrography and bathymetric survey, hydro oceanography, port layouts, breakwaters, shipping lanes, harbour pools, jetty construction and dock facilities, fenders.
- Foundation engineering, structural design, land survey, topography.
- BIM and lean construction, artificial intelligence.
- Advanced port engineering.

In port operation:

- Operation of loading-unloading equipment, knowledge of equipment for operational permit (Surat Izin Operasi), operational capabilities (such as reach stacker), equipment maintenance, container terminal operation.
- Ship guiding, ship operating procedures and navigation.
- Port management and port operation, estimation of pier berth occupancy ratio, demand and capacity of port services, market knowledge (supply chain), logistics.
- Maritime regulations, including safety regulations, safety and health work environment, environmental protection.

As supported by the literature, the port engineering skills and knowledge can be incorporated into the university curricula by:

- Providing coverage in the existing courses – knowledge and skills in port engineering can be incorporated into existing civil and environmental engineering courses (for example, providing design problems related to port structures).
- Creating new subjects – if knowledge gaps in specific aspects warrant the development of a subject.
- Creating new subjects – if knowledge gaps in specific

aspects warrant the development of a subject.

- Creating new specialisations that allow students to complete more specialised subjects in port engineering and operation.

Further, it is also necessary to update the education curricula with a strong emphasis on soft skills. The following soft skills have been identified as lacking:

- English language proficiency
- presentations
- practical skills in the field
- problem-solving skills
- ability to innovate
- critical thinking
- interpersonal skills
- leadership skills
- software and programming
- Technology adaptation
- ethics

The development of soft skills can be embedded in teaching and learning activities in individual subjects. For example, a subject based on problem-based learning (using authentic assessments and field work) can support the students' development of practical skills, problem-solving skills and critical thinking. Project-based learning is commonly open-ended and multi-disciplinary and has been reported in the literature to promote critical and solution-oriented thinking, the use of innovative technology, collaboration and communication within a team and with stakeholders.

It is necessary to build a triple helix collaboration (higher education, industry, and government) for the implementation of the “Merdeka Belajar Kampus Merdeka” (MBKM) program by the Ministry of Education, Culture, Research & Technology, particularly to develop internship programs in port operations and port engineering, both in the office and in port facility development projects. This will especially address the gap in practical skills while also developing students' other soft and

hard skills.

Activities to promote diversity and gender equity, and motivate young people in the profession

The target cohort is current and potential students with a focus on under-represented groups, with delivery by higher education institutions (in collaboration with schools), industry and government.

Project-based learning

People of different backgrounds may have different engineering solutions to engineering problems. Project-based learning will expose students to views that are different from theirs. The study of real-world problems provides ways for students of different backgrounds to relate to them. It introduces different perspectives and interpretations from students.

It is important in a project that groups are of diverse backgrounds and all students' inputs are critically considered. Project-based learning also supports the development of soft skills, e.g. communication, teamwork, ethics, interpersonal skills, and critical thinking, and these soft skills should lead to a more inclusive society.

Mentorship program

A mentorship program for underrepresented groups by senior students and designated workers from the port industries to support and assist them in completing their studies and finding a pathway to work in the port sector. The mentorship program can take a couple of different forms such as a holiday program including fieldwork, skills training through student clubs and a buddy (with senior student) system.

Review of curricula

Curricula are often designed based on the assumed skills and knowledge of the majority of students. A review is needed to identify the assumptions to ensure that such assumptions do not restrict opportunities for the





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minority. Additional materials or modules may need to be developed to address the lack of skills and knowledge. Additional modules can be provided in online form to provide flexibility. Courses need to be reviewed to diversify and remove stereotypical content. This includes using inclusive language, improving the visibility of all demographics and ensuring all content is relatable and understandable to all students.

Promotion of port engineering and operation profession

It is necessary to cooperate with elementary and secondary schools (SD, SLTP & SLTA) to provide early promotion and socialisation of port knowledge, notably the significance of ports in Indonesia as a maritime and archipelagic country. This can be incorporated into the curricula of elementary and secondary school education. It can involve the introduction of the topic by the industry with site visits. One of the ways to promote the profession is by increasing its visibility. Activities that will improve visibility include visits by professionals or university students to secondary and elementary schools to introduce practical and social problems to young students

and field trips organised by the port industry. The port education and training institutions can also develop a holiday camp-style program in collaboration with industry and secondary (and elementary) schools to introduce hands-on activities related to port engineering and operation.

Collaboration between industry, government and education institutions

Teaching and learning activities alone may not be sufficient to attract young people and under-represented groups (including females) to the profession. To be attracted, the underrepresented need to see representations of their demographic. Hence, it is also important to promote diversity and gender equity in port industries and education institutions.

Barriers should be removed by adopting policies that will enable the underrepresented group to work in the profession.

For example, providing scholarships

specifically for underrepresented groups (e.g., female-only scholarships). Further, higher education institutions may widen the entry route for potential students (for example, by providing a continuing education pathway for potential students who do not meet the entry requirements) and offer flexibility in their programs (for example, by offering part-time enrolment, having intensive/night time/online modules). This will provide opportunities to those who followed different educational or professional pathway opportunities to join the profession. This proposal requires close collaboration between industry, government and educators to attract students and retain them professionally. It would include creating equal career opportunities and the option to work part-time after studies are completed.



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7.0. FINDINGS AND RECOMMENDATIONS

This study aimed to identify gaps in the knowledge and skills of young workers in port engineering and operations by comparing their existing knowledge and skills with industry expectations. The data obtained shows that technical knowledge and capabilities of young workers in port engineering and operations are generally considered to have met the basic requirements. Our study shows that there are still general skills and competencies that need improvement, however, particularly in meeting the Sustainable Development Goals (SDGs) such as the promotion of gender diversity and social inclusiveness. The study identifies two key highlights. The first concerned demographics and the trend towards a younger and male workforce, with young workers representing the majority in the study. In the operational sector, workers aged 15-24 years account for 12.5 percent, while those

aged 25-40 years account for 50 percent. For the engineering sector, workers aged 15-24 years represent around 5.26 percent, and those aged 25-40 years make up 63.16 percent. The majority of workers are male, with 75 percent of male workers in the operational field and 89.47 percent in the engineering field. To promote gender equality the port industry needs to provide facilities for female workers. The study found there is a program to recruit people with disabilities but the facilities don't enable them to work productively.

The second highlight is that young workers have good general capabilities, including technical competencies, technology adaptability, information technology/internet skills, operational and port engineering competence and other hard skills. There is a lack though of soft skills such as foreign language proficiency, discipline, responsibility, communication, time management, professionalism, work ethic, practical skills,

teamwork skills, presentation skills, knowledge of regulations, attitude and self-confidence.

It also found a lack of capability in several aspects of hard skills such as machinery system competence, skill/ability to operate and maintain loading equipment, operational skills in terms of maintenance, comprehensive understanding of container terminal operation, computer programming skills, digitising skills, diversification on technical and operational knowledge, automation and mechatronics, competencies regarding safety, health and environment and the ability to apply new methods.

The recommendations in this section are relevant to education and training institutions, the port industry and central, provincial and regional governments. The purpose of this section is to provide actionable steps that these different stakeholders can take to address the skills gaps and promote inclusivity in the port sector.

Recommendations for port education and training institutions:

1. Update the education curricula with an emphasis on soft and hard skills to minimise capability weakness among young workers in the port industry. Soft skills should include foreign language proficiency, discipline, responsibility, communication, time management, professionalism, work ethic, practical skills, teamwork skills, presentation skills, knowledge of regulations, attitude, self-confidence, and the ability to innovate. Hard skills should include understanding of general container terminal operations, computer programming and digitisation.
2. Competence in key software such as the Building Information System (BIM) program, technical and operational knowledge, automation and mechatronics, and competencies in safety, health and environment (SHE).
3. Cooperate with elementary and secondary schools to provide early promotion and socialisation about port knowledge, notably the significance of ports in Indonesia as a maritime and archipelagic country. Counselling programs for minority groups by senior, experienced students to support and assist them to complete their studies and work in the port sector.
4. Enrich the syllabus and courses with both soft and hard skills to minimise those areas of weak capability among young workers.. The Course Learning Outcomes (CPMK) program should also be undertaken to evaluate critical thinking processes with consideration of non-engineering aspects, including social, ecological, environmental, and economic issues.
5. Include intellectual development, multicultural awareness, ethical reasoning and acceptance of

diversity in the formulation of graduate learning outcomes to develop critical thinking.

6. Follow the industry's recommendations that every graduate has a professional certificate, and improve skills training related to container crane (CC) and rubber tyred gantry (RTG) equipment and other loading equipment.

Recommendations for the port industry:

1. Collaborate with educational institutions to promote the industry and professions so that young people are aware of the opportunity at an early age. Promotion could be in the form of outreach activities, hosting site visits, supporting student clubs and presenting at primary and secondary schools. It is equally important to have representation from women and people with disabilities in these outreach activities.
2. Open a special recruitment program for women and other minority groups and establish working arrangements that are conducive to female contribution in the workforce. These include flexible work arrangements, maternity and paternity leave arrangements and support for workers who have taken career breaks due to undertaking carer responsibilities.
3. Collaborate with universities and training institutions to develop and run capacity-building programs for the young workforce in the port industry. Completion of these capacity-building programs should be made mandatory to ensure the current workforce acquires the required knowledge and skills. Continuous dialogue between the industry and education and training institutions is needed to ensure that the curricula address the often evolving knowledge and skills required by the industry.

Recommendations for central, provincial and regional governments:

1. Collaborate to develop learning facilities and port training centres in universities to increase the capacity of young people who are ready to work in the port sector. Establish a framework for identifying current and emerging skills gaps in the port sector with a focus on equipping potential and current workers in the port sector with the range of skills identified in this report. Regularise recognition and certification of these skills as part of professional development, especially for existing workers, as part of their future career development.
2. Strengthen central and local policies related to the recruitment of women and people with disabilities in the port industry. Develop work opportunities based on capacity and identify the facilities needed to enable them to work productively. Conduct promotion about ports as centres for future careers.

By implementing our recommendations, ports, governments and training institutions can make progress in overcoming the issues identified and ensure a workplace that is both highly skilled and genuinely diverse.

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