

Theme Paper: 2017 Asia Construct Conference, Seoul, South Korea

**DEVELOPING CONSTRUCTION
INDUSTRY HUMAN RESOURCES IN INDONESIA: ISSUES AND CHALLENGES**

Krishna S Pribadi¹, Biemo W Soemardi¹, Syahrial Ong¹, Akhmad Suraji²

¹Construction Services Development Board, Indonesia

²Faculty of Engineering, University of Andalas, Padang, Indonesia

Abstract

Construction industry in Indonesia has been a major economy sector. It is one of the top five, contributing around 10% of the national gross domestic product, growing steadily by 6.97 %, 6.36% and 5.22% respectively from 2014 to 2016. The total GDP of the construction sector in 2016 was IDR 1,287,659.30 Billion in current price (almost USD 100 Billion). In 2015, the total value of completed construction work was IDR 636 Trillion rupiah (almost USD 50 billion). As basically construction is a labor intensive sector, the Indonesian construction industry is currently employing more than 7 million workers, around 6% of the total working population.

In the globally competitive business environment, the Indonesian construction industry is striving to develop a strong, healthy and competitive industry as mandated by the newly enacted national construction service law No 2/2017. One of the major challenge in developing the industry is how to develop a pool of competent people in construction to manage, operate and develop the national construction industry to be able to compete with the global competitors, in providing construction excellence to execute the national infrastructure development program and to contribute to the national economy, as well as to prosper in the global construction market.

This paper will first discuss strategic issues of human resource in the construction industry in Indonesia, its problems and challenges, and the national policies in the human resource development of the industry, followed by proposed agenda for improving competency standard of construction people. In this paper, strategy set up in the national development plan related to the development of construction industry human resources will be presented. Various issues related to the structure and education background of the human resources, skill level, various schemes to ensure adequate competency of the workers and professionals that are in place, certification and registration of professionals and skilled workers, productivity issues, safety and health policy and institutional framework for the construction human resource development will be discussed. Research works related to productivity issues, typical working culture of the industry in Indonesia, including other issues such as leadership styles also will be highlighted. Based on the description of the situation, major challenges and strategic options to address the challenges, including opportunity for international collaborations, will be identified and discussed.

Keywords: Construction industry, human resource development, policy, skill level, competency

1.0 Introduction

Construction is a labor-intensive industry, where human is the most valuable asset, thus needs the utmost effort to manage it. It is people that realize the buildings, not the machine neither the money. As the construction industry is project based in nature, and construction projects are following where the buildings and infrastructure are constructed, people in the construction industry tend to move with the project location. The nature of construction industry is such that the product and services are mostly unique, delivered through projects in an open environment, usually awarded in short notice, in a male dominated culture (Loosemore, et al, 2003). It is characterized by a transient workforce consisting of a core of construction professional, usually permanent employees in nature, surrounded by a layer of semi-professional workforce which are usually employed on a project basis, and supported by a large number of outsourced and casual worker, skilled and unskilled. In term of skill level, they are extremely diverse and include different types of individuals working within construction such as; unskilled, skilled workers, craft, technician and engineers, managerial roles and administrative workers. However, unlike physical resources such as construction plants and materials, people have their own personal needs that must be fulfilled as well as habit that must be managed in order to contribute positively to the organizational growth and development. People also bring their own perspectives, values and attributes to organizational life, which should be managed properly in order to benefit the organization (Mullins, 1999). Loosemore et all (2003) argued that human resource management has the potential to eliminate more construction risks than any other management approach. Developing human resource as an essential part of human resource management in the construction industry is inevitable if construction organizations are to survive in the very competitive global business setting, where the clients tend to become more sophisticated and demanding,

The Indonesian construction industry has played an important role in the national economy in the last few decades. It is one of the top five sectors, contributing around 10% of the national gross domestic product, growing steadily by 6.97 %, 6.36% and 5.22% respectively from 2014 to 2016. The total GDP of the construction sector in 2016 was IDR 1,287,659.30 Billion in current price (almost USD 100 Billion). In 2015, the total value of completed construction work was IDR 636 Trillion rupiah (almost USD 50 billion) (CBS, 2017). As a labor-intensive sector, the Indonesian construction industry is currently employing more than 7 million workers, almost 6% of the total working population. Since the industry is growing constantly to fulfill the need of the nation in building and infrastructure, construction human resource need to be developed, both at the industry and business organization level.

Various factors related to the construction human resource development should be considered, such as the significant role of project manager in managing their human resource as a devolution of the HRM function; the fluctuation of demand in the product and services; the high employee turnover and low retention of human resource within construction organizations due to high mobility of the construction workforce; and the high tendency to outsource the works to subcontractors. All of these factors affect the willingness of business entities to invest strongly in training and knowledge development in the Indonesian construction industry. Construction human resource development in Indonesia need to be promoted due to the various issues faced by the country, such as the need of developing a large number of construction workforce to support the delivery of increasing number of infrastructure projects. On the other side, there is a lack of

institutional capacity for developing national construction human resource, which necessitate the development of adequate policy framework for expanding the capacity for training and education of construction workforce, curriculum development, quality assurance and certification procedure, etc. There is a need for enhancing the role of construction industry to contribute to the national construction workforce development, by providing a platform for on the on the job training and apprenticeship for thousands of young new graduates from universities, colleges and technical vocational schools in building and construction industry each year.

This paper discusses the strategic issues of human resource in the construction industry in Indonesia, its problems and challenges, and the national policies in the human resource development of the industry, followed by proposed agenda for improving the construction workforce in terms of quality and quantity, at the industry level, to fulfill the needs of the growing construction industry market in Indonesia as well as globally such as in the ASEAN region, Middle East and North Africa.

2.0 Structure and Trends of Human Resources in Construction

The current demand on the construction workforce can be reflected by the size of the construction market. The national mid-term development plan 2015-2019 allocate for infrastructure development a budget of Rp 5,519 trillion (~USD 415 bn), with funding from national government (40.1%), local government (9.9%), state owned enterprises (19.3%) and private sector (30.7%). Beyond that, there are private sector property market and oil & gas market, albeit declining. An industry report says that growing population, rapid urbanization, and increased disposable income is propelling a rise in construction market value from USD 102.64 billion in 2017 to USD 136.26 billion by 2021.¹

In the last three years, the number of people working in construction is fluctuating from 7,707,297 in 2015, 7,707,297 in 2016 and 7,162,968 in 2017 (record in February of each year) representing approximately 5.75% from the total workforce in Indonesia (CBS,2017). The formal education level of the workforce is shown in Fig.1 which shows that 1.3% were uneducated, 47.3% at elementary level, 47.0% at secondary level and 4.4% at the tertiary level, meaning that the education level of the construction workforce in Indonesia is generally low. From those educated workforce, only 210.829 are from the construction related education (Sumas S, 2017). This fact is actually showing that the ability of the industry to attract educated people in the sector is weak, in particular due to the low competitiveness of the industry in the labor market, influenced by the unattractive image of the sector to young university and vocational school graduates, compared to other industry such as information technology and banking, which presents a huge challenge for construction human resource development in the future.

¹ ([https:// www.thebig5hub.com/sustainability/2017/august/indonesia-s-construction-market-to-hit-136bn-by-2021/](https://www.thebig5hub.com/sustainability/2017/august/indonesia-s-construction-market-to-hit-136bn-by-2021/)).

Education of Construction Workforce in 2017

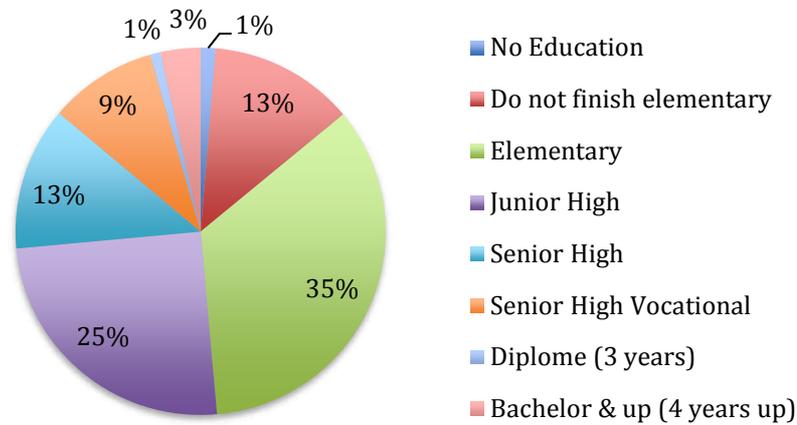


Fig.1 Education of Construction Workforce in Indonesia, 2017 (CBS, 2017)

There is no statistic available regarding the distribution of construction workforce age groups, but using similar information on the general worker in Indonesia as shown in Fig.2, it can be assumed that construction workers follow similar pattern. It can be concluded that about 4 % of workers are young, 80% are adult (20-54) and 16% are seniors (55 and above).

Distribution of worker according to age

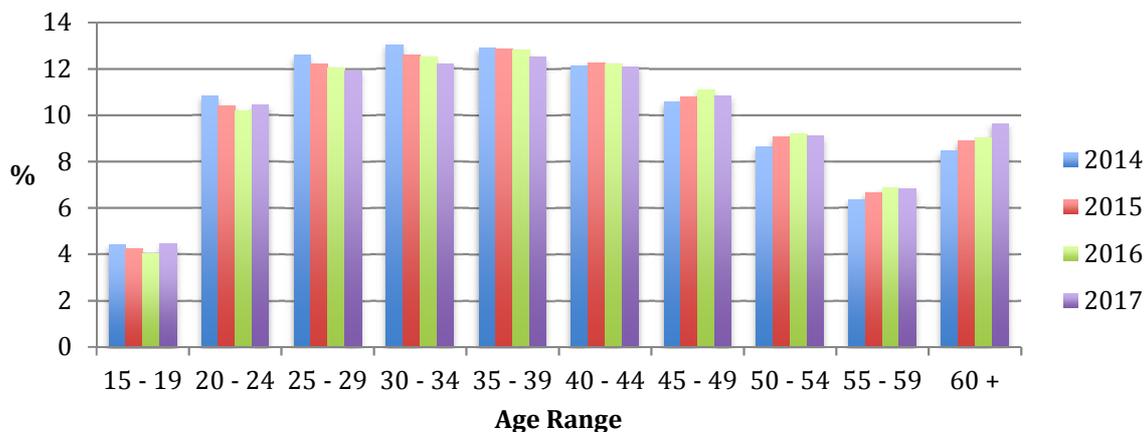


Fig.2 Distribution of Working People according to Age Group in Indonesia (CBS, 2017)

The construction workforce in Indonesia is divided into three categories, namely:

- construction professional or expert (engineers and architect, including field engineers)
- technician, operators and skilled workers (craftsmen)
- non-skilled workers

From the total of 7.16 million construction workforce in 2017, only 2.3% are certified as construction professional or expert, and 4.8% are certified as technicians, operators or skilled craftsmen, both are registered by Construction Service Development Board (CSDB) (CSDB, 2017), the rest (92.9%) are uncertified, either in the category of non-skilled worker or uncertified other categories, meaning that the ratio of professional to semi-professional (technician) level workers is 1:2. (See Table 1)

Table 1 Number of certified construction workforce and qualification

| Category | Qualification | Minimum Education Degree + years of experience | Number as of Sept. 2017 | Level of Responsibility | Ratio |
|---|--------------------|--|-------------------------|--|-------|
| Engineer/expert | Principal Engineer | Bachelor (Eng.) + 10 | 4,910 | Professional 87,261 | 1 |
| | Associate Engineer | Bachelor (Eng.) + 6 | 82,351 | | |
| | Junior Engineer | Bachelor (Eng.) + 1 D3 (Eng.) + 3 | 78,651 | Technologist/ Technician 314,886 | 3.6 |
| Total Engineer (2.3% of total workforce) | | | 165,912 | | |
| Technician/ Craftsman | Class 1 | D3 (Eng.) + 1 | 236.235 | Operatives 108,970 | 1.2 |
| | Class 2 | SHS vocational+2 SHS general + 3 | 46.388 | | |
| | Class 3 | JHS + 2 ES + 3 | 62.582 | | |
| Total Technician/Crafts (4.8% of total workforce) | | | 345.205 | | |
| Total non-certified (non-skilled worker) (92.9% of total workforce) | | | 6.651.640 | Non-skilled 6.651.640 | 76.2 |

Source: CSDB, 2017; MoPWH Regulation No 09/PRT/M/2013

Note:

D3 = Diploma 3, equal to Senior High School + 3 years in college

SHS = Senior High School

JHS = Junior High School

ES = Elementary School

A serious effort is needed to increase the number of certified construction workforce and to improve the ratio between professional, technologist/technician, operatives and non-skilled workers (1:3.6:1.2:76.2), which shows an unbalanced distribution of different level of responsibility (see Fig.3) In order to improve the efficiency and productivity of the workforce, it is important to have better ratio, and in particular the number of operatives need to be increased. Although requirement for certification is enforced by the current regulation, it is a challenge to attract people to participate in the certification scheme, in particular for the operatives level, as there is no clear incentive in terms of salary to those certified people compared to those non certified.

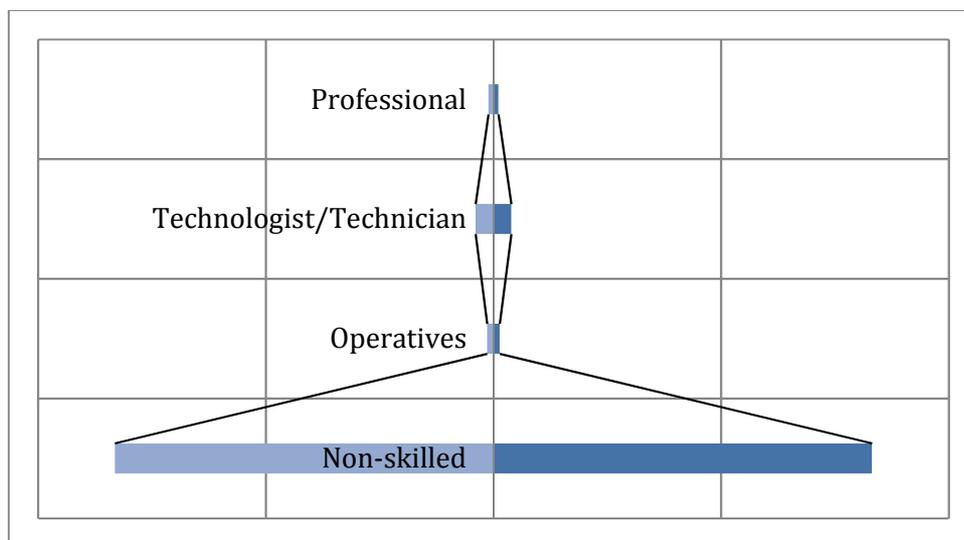


Fig.3 Construction Workforce Pyramid based on registration of certified personnel

To address the challenge in strengthening the construction workforce, the Directorate General of Construction Industry Development (DGCID), Ministry of Public Works and Housing (MoPWH) established a target up to 2019 to produce trained 10.000 construction professional or experts and project managers, 40.000 supervisors and or foremen, and 10.000 training instructor or competence assessor. It is projected that there will be 50.000 new certified construction professional engineers, 200.000 certified technicians and 500.000 certified construction skilled workers² by mobilizing MTUs (Mobile Training Units) which proactively visit (government) construction projects and Vocational Training Institutions spread all over the country (for construction technicians and craftsmen). The construction professional skill trainings are promoted by various professional associations supported by the CSDB and DGCID.

The pressing issue to the need of developing construction human resource in Indonesia is to increase the production of new engineers and their associates (technologist/technicians). Table 2 Shows a comparison of number (estimated) of engineers, number of engineers/1 million population, number of PE and number of ACPE (ASEAN Chartered Professional Engineer) among some ASEAN countries.

Table 2 Comparison of engineers among some ASEAN countries

| | VN | ID | PH | TH | MM | SG | MY |
|----------------------------|-------|-------------------------------------|--------|--------|-------|--------|--------|
| Est. Number of Engineers * | 800K | 750K | 500K | 276K | 205K | 150K | 100K |
| Engineers/1mi. pop.* | 8,917 | 3,038 | 5,170 | 4,121 | 3,844 | 28,235 | 3,375 |
| PE * | N/A | 87,261 *** incl.9,000 **** | 14,250 | 23,000 | 50 | 3,490 | 11,170 |
| ACPE ** | 204 | 962 | 260 | 187 | 299 | 257 | 304 |

VN=Vietnam; ID=Indonesia; PH = Philippines; TH=Thailand; MM=Myanmar; SG=Singapore; MY=Malaysia;

*) Source : AFEO, 2013 in Engineer Weekly, No.1, Week 2, February, 2016,

**) Source : 34th ACPECC Meeting Notes, Kuala Lumpur, May 2017

***) Experts + Senior experts certified by CSDB - Construction Service Development Board, as of Sept. 2017

****) certified by IEI (Institute of Engineer Indonesia);

Although Indonesia produces a significant number of engineering graduates annually, there is a need to produce more engineers to fulfill the gap which is estimated at 10,000 engineers per year starting from 2015 up to 2025 (DGCIT-MoC, 2015), assuming that 45% of the new graduates work in the engineering profession and 50% of them work in the infrastructure sector. Fig.4 shows the forecast of new engineering graduates from 2011 to 2022, while Fig.5 shows the forecasted gap between supply and demand of engineers to support the infrastructure development objective achievement.

² (<http://industri.bisnis.com/read/20151209/45/499964/ini-sasaran-peningkatan-sdm-bidang-konstruksi>)

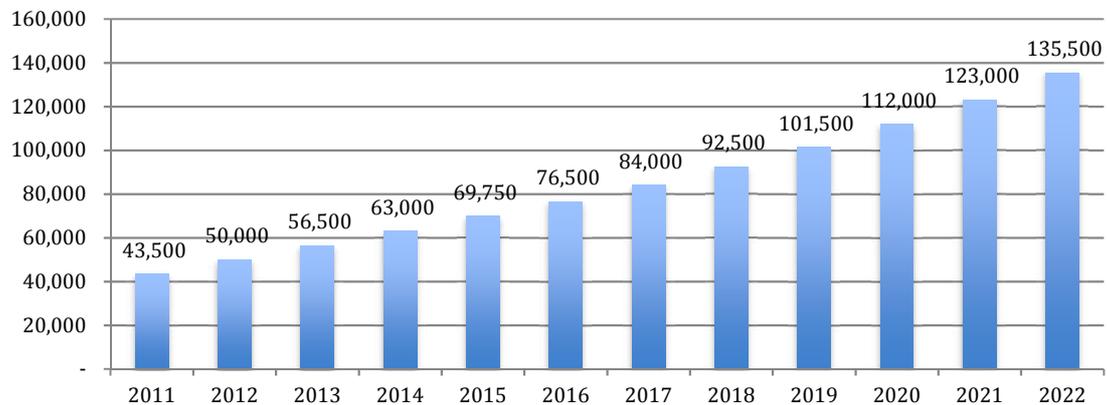


Fig.4 Annual forecast of new engineering graduates (Source: AG Mukti, 2017)

Another challenge to develop a productive construction workforce is to improve the ratio between engineers and their associates (technologists/technicians/analysts), by increasing significantly the output of the education system for these graduates (diploma).

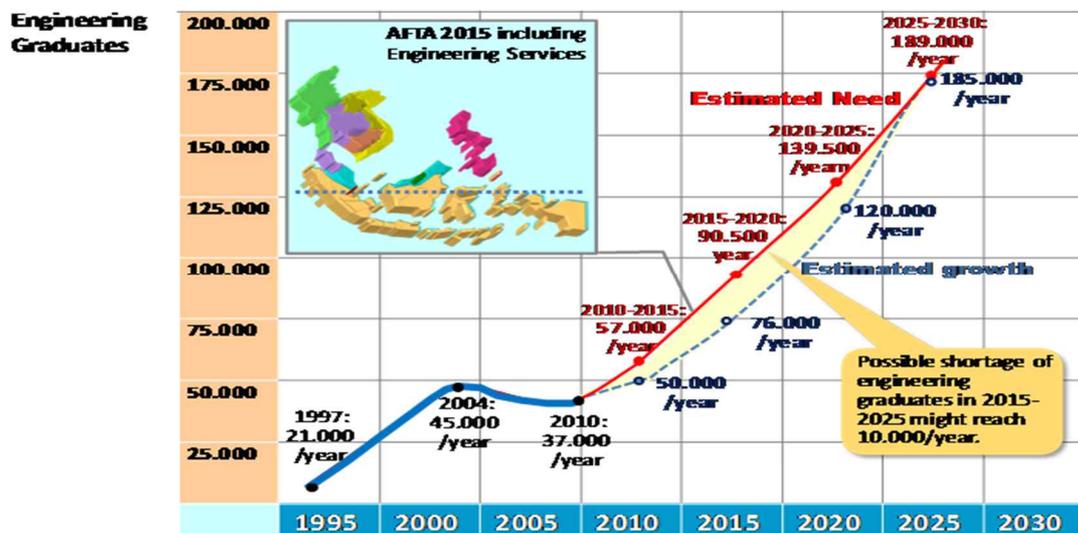


Fig.5 Forecasted need of engineering graduate, 2015-2025 (DGCIT, MoC, 2015)

Fig.6 shows the annual graduates for bachelor level and diploma level (1 to 3 years in college) which produce the level of associate and technologist and technician. It is assumed that engineering bachelor count for 10 % of overall university graduates, while for associate/technologist level, it is assumed that 40% are engineering diploma, based on observation of the past data. The figure shows that the ratio between engineering diploma level and bachelor graduates and diploma level is not significant, and in the period of 2013 and 2014 there were more engineering bachelor graduates than diploma level graduates. The challenge here is that there are only limited number of higher education institution offering diploma education (D1-D3), commonly named polytechnic institute (Politeknik) in Indonesia. Data from Ministry of Research, technology and Higher Education³ shows that in 2016, there are only 242 Politeknik among 4,445 higher education institutions in Indonesia, or 5,4% of total. Some universities and other higher education institution offers also D1-D3 programs, but mostly in non-engineering

³ (<http://kelembagaan.ristekdikti.go.id/index.php/statistik-5/>)

disciplines.

As human resource development for construction industry is considered as a long term capital investment, the industry being influenced by many economic and political issues is facing a relatively turbulent and fluctuating market and environment, and in many cases government projects are short term contracts within one fiscal year, hence there is a certain risk to human resource development investment for the industry, as they can not afford to invest in human capital development on this uncertain situation. This brings the HRD initiative in a tug of war situation between the industry and government, each side does not want to assume full responsibility for training of construction workers.

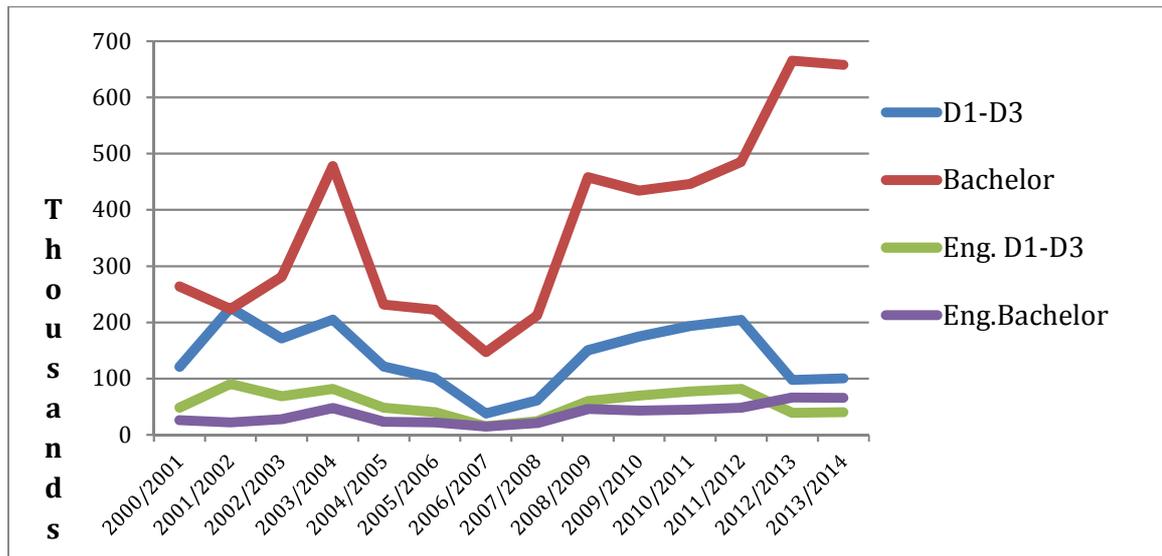


Fig.6 Comparison of bachelor and technologist level graduates in the period of 2001-2014 (Annon, 2015a)

Note:

- D1-D3 is diploma 1 to 3 years college (after high school)
- Engineering bachelor is assumed to be 10% of all university graduates
- Engineering D1-D3 is assumed to be 40% of all D1-D3 graduates

3.0 Legal and Institutional Framework for Human Resources Development in Construction

The legal and institutional framework related to human resource development for the construction industry is regulated by a somewhat complex system, consisting of several sector laws, as shown in Table 3. All the laws are supplemented by hierarchic implementing regulations in the form of national government regulations, presidential regulations, local government regulations, ministerial regulations etc.

The law No 2/2017 mandated the training of construction manpower, which are delegated mostly to local government jurisdictions. On the other side the law mandated a certification system to be implemented by a professional and skilled worker registration body, currently assumed by CSDB. The law No 13/2003 mandated manpower training through manpower training institutions, currently devolved to local governments as well. The same law also mandated a manpower certification system, implemented under the BNSP (National Professional Certification Board). Both CSDB and BNSP implement

competency assessment process based on ISO 17027 on Conformity Assessment for certification of persons, by delegating the assessment process to conformity assessment organizations (government/semi-government or private), which should be accredited by the National Accreditation Committee (KAN), mandated under the Law No 20/2014. The Engineering Law No. 11/2014 regulates the practice of engineers and mandates the certification of Professional Engineers, similarly the Architect Law No 6/2017 regulates the practice of architect as well as the certification of Professional Architect.

Table 3 Legal and Institutional Framework related to Construction Industry HRD

| Governing sector regulation | Responsible Ministry/Organization |
|---|---|
| National law on construction services, Law No. 2 Year 2017 | Ministry of Public Works and Housing - MoPWH Construction Service Development Board – CSDB (LPJK) |
| National law on manpower, Law No.13 Year 2003 | Ministry of Manpower - MoMp National Professional Certification Board – NPCB (BNSP) |
| National law on higher education, Law No. 12 Year 2012 | Ministry of Research, Technology and Higher Education - MoRTHE National Accreditation Board for Higher Education – NABHE (BAN PT) |
| National law on engineering, Law No. 11 Year 2014 | Ministry of Research, Technology and Higher Education - MoRTHE Board of Engineers Indonesia Institute of Engineer Indonesia - IEI (PII) Indonesian Accreditation Board for Engineering Education - IABEE |
| National law on architect, Law No. 6 Year 2017 | Ministry of Public Works and Housing - MoPWH Board of Architect Indonesia Institute of Architect Indonesia (IAI) |
| National law on national education system, Law No. 20 Year 2003 | Ministry of Education and Culture - MoEC National Accreditation Body for schools |
| National law on standardization and conformity assessment, Law No.20 Year 2014. | National Standard Board (BSN) National Accreditation Committee (KAN) |

For the education of engineers and architect, the Ministry of Research, Technology and Higher Education regulates the university and colleges implementing engineering and architecture study programs, while the vocational schools which implement construction related programs are under the responsibility of the Ministry of Education and Culture.

The most crucial issue related to construction industry development programs is the coordination and synchronization of policies and programs under different sectors in within the complex sector regulations and institutional framework. It is unclear who should be responsible for leading the construction human resource development. It is supposed to be led by DGCID (MoPWH), but in reality, it is a difficult task to be borne by the DGCID, as it has to coordinate and collaborate cross-sector with other ministries, sometimes beyond its mandate.

Along with the fundamental changes in the construction industry, the enactment of the 1999 construction services law has brought a shift of many aspects of development in the construction industry. While in the past this industry was predominantly influenced by the role and the government's policy, the law has given the opportunity to the private sector to play bigger roles, including the setting up the strategy, policy and framework for human resource development in the construction industry. However, after almost two decades of implementation of the law, no significant changes have been made, and the construction industry still has to deal with relatively the same problems. Early this year, Law no 18/1999 on Construction Service was replaced by Law no 2/2017. Although there is still no clear national policy on the direction of human resource development in construction industry, the needs for improvement and better managed human resource development remains apparent. As the industry is expanding, the need for more qualified and productive workers is also increasing. Yet, complaints and concerns about the ability of this industry to fulfill such a need is still voiced by both the government and the industry itself.

At the national level, the grand policy for human resources development in construction is driven by two ministries; the Ministry of Public Works and Housing (MoPWH) and the Ministry of Manpower (MoMp). At larger scope the Ministry of Manpower has the authority to set up the national policy on all workers, including for those who are employed in the construction industry. However, when dealing with more technical matters, the MoPWH has also the authority to develop and implement policy for human resources in the construction sector. This authority is granted by the Law no 2 – 2017 on Construction Services, that essentially stipulates: 1) all workers in the construction sector must be certified (licensed), and 2) The Ministry of Public Works and Housing is the ministerial entity that responsible for construction affairs, including policy on human resource development. These two indicate that the policy concerning human resource development in the construction industry is the responsibility of the Ministry of Public Works and Housing. Further, as also stipulated in the previous law, a board, in this case the Construction Services Development Board, is given mandate to assist the central government in executing parts of the government authority (see Fig.7)

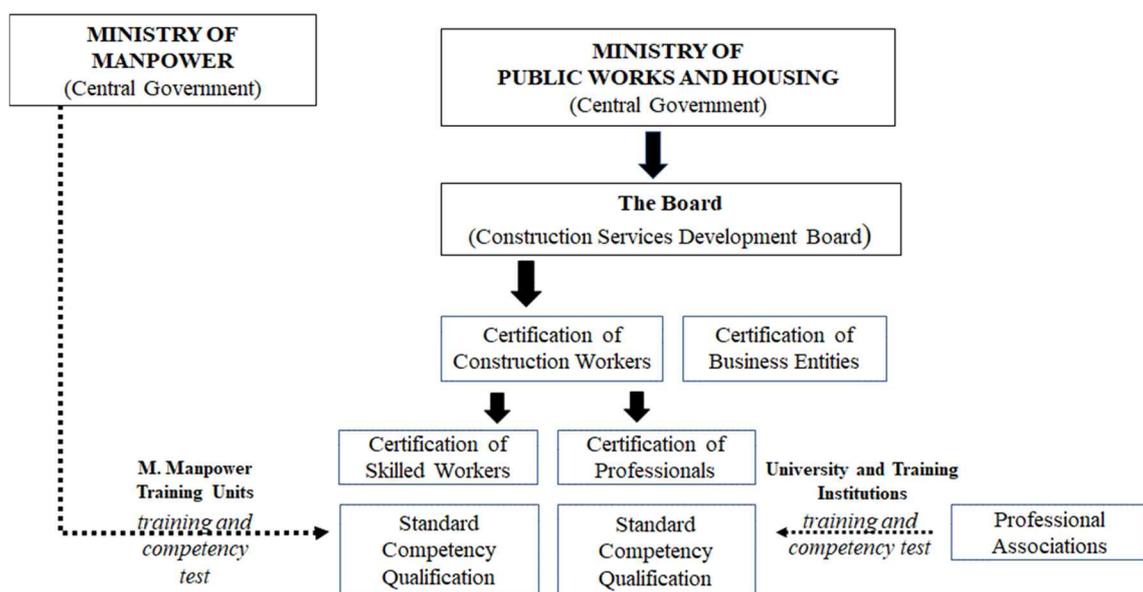


Fig. 7 Institutional Framework for Human Resource Development in Construction

With regard to the quality of the construction workers, the law stipulates that the central government is responsible for the advancement of competence, professionalism and productivity of national construction workers. This responsibility is reflected in the form of construction worker certification. To further assist the government, the Construction Services Development Board, as the manifestation of construction society's participation, has the responsibility to administer certification of construction workers and registration of construction business entities. Under the current law the certification is administered by board of profession certification, based on a set of standardized work competence. In this setting, the role of Construction Service Development Board is to administer the certification based on the evaluation and recommendation of board of profession certification. The certification is categorized into professional workers (experts) and skilled workers.

In practice, certification for professional workers is conducted by professional association. While professional certification can be relatively considered adequate and acceptable, the certification for skilled workers is still a challenge. Typically, professional associations, through its professional membership program, provide their members with various professional development program (training, workshop, seminars, etc.) that would enable their members to maintain and enhance their professional competencies in their respected engineering fields. Records of professional experiences, as well as result of competency tests are kept by the association, as will be used to determine the level of competency and qualification of professional workers, as required for certification. On behalf of the member, the professional association will submit recommendation to the Board of Construction Services Development to obtain professional certification.

As for skilled workers, on the other hand, the certification is administered by the government (i.e., Directorate General of Construction Development – MoWPH) through various scheme of certifications, with no alternative certification body is currently available. Considering the huge size of skilled workers, it is obvious that the government will not be able to properly handle this certification. The Ministry of Public Works and Public Housing in regular basis conducted training and certification for skilled workers of various trades its training and development units. Because the number of training units are limited and only available in provincial capitals, in order to reach out more workers, mobile training unit are also utilized. Recently cooperative efforts with vocational schools and polytechnics are being explored to provide preparation training and certification for construction skilled workers. Yet, again standard competency for skilled workers has yet to be adequately formulated completely.

As consequences of the implementation of open market policy, Indonesian construction workers must be able to compete with their counterparts from other countries. This means that workers, especially skilled workers must possess adequate competence, that otherwise will not be able to find jobs in even local market. Therefore, it is the government's duties to respond to these challenges. The government must first set the standard competence that relevance with international practices, and enhance capacity of local workers to meet those standards.

To make things more complicated, standard and certification of construction skilled workers is also influenced by the policy set up by the Ministry of Manpower. Though not

limited to, the scope of concerns of the Ministry of Manpower is to general classification of workers, including skilled workers in construction industry. The Ministry of Manpower has set its own standards of competence with least coordination with the MoPWH, hence often creating incompatibility and ineffective practices with the implementation of policy in construction human resource development from the MoPWH. Therefore, construction training provided by the Ministry of Manpower may sometimes become ineffective.

Unfortunately, with all standards and regulations that are now imposed for human resources development in construction industry, its applications are still far from expectation. Construction workers certification that is administered by Ministry of Public Works and Housing, which is guaranteed by law, often find itself ineffective when it comes to its applicability to industry or sector beyond the jurisdiction or scope of coordination of the ministry. Construction projects in energy or transportation sector, for instance, often impose its own standard and regulation for certified workers. And this, certainly remains a big problem.

Regardless of the institutions that provide training and certifications and/or types profession, by law all professional certifications must adhere to regulations and standards set forth by the National Agency for Professional Certifications. Up to this time coordination across ministerial levels remains another problem that needs to be addressed comprehensively. The agency must be able to set standard and regulations that are applicable and mandated for all sectors of industry, including construction.

Aside from certification and licensing, empowerment of human resources in construction cannot be separated from training and education. While in training, be it formal or informal, the goal is often to enhance practical mastery or expertise, the needs for advanced knowledge for self-professional development are typically obtained through formal education. From the education perspective, efforts to improve the quality and relevance of education has been going on for quite sometimes. Education accreditation is now mandatory as an attempt to provide assurance for quality education. In tertiary education, some engineering programs have also successfully obtained international accreditation. Such an achievement is a successful manifestation of internationally acknowledged quality of education, which in turns also means acknowledgement of professional competence. Various programs are offered by vocational schools and universities to educate potential construction workers, and to maintain the relevance of education, many schools and university have developed partnership with the industry. The cooperation between education programs and the industry is implemented in the forms of curriculum development, guest lecturing, apprenticeship programs, in-house training and other industrial exposures.

Reflecting back to the current state of development, in the future system and regulations concerning construction human resource development needs to be improved. There should be a comprehensive system which is developed over a solid framework, that would be able to cope with not only current problems but also future challenges in construction human resources. Such a framework shall provide guidelines, with adequate flexibility, that would enable the construction industry to adapt and to strive within the dynamic of construction sector. This framework shall also, in due time, be able to empower the private sector to self-regulate in order to enhance and excel the capacity of human resources (skilled and professionals) with less intervention from the government.

A condition and environment that is long idealized by stakeholders of construction industry.

4.0 Fundamental Issues on Human Resources Development in Construction

Indonesia infrastructure development has been in high demand since last decade, in order to fulfill the needs of the country's growing economy and to improve the nation competitiveness. Indonesia infrastructure competitiveness index is currently among the lowest in the ASEAN countries. Table 4 shows the position of Indonesia in the Global Competitiveness Index in the last three years, position of its infrastructure pillar and labor market efficiency, which needs a serious effort for improving its rank. The labor market efficiency, albeit progressing, constitutes another challenge for human resource development.

To catch up with the lag of infrastructure in order to improve its competitiveness, Indonesia needs a very strong construction industry to support the delivery of infrastructure projects across the country for this medium-term development agenda, which lead to the strong need of developing a lot of skilled workers, professional architects and engineers, strong consulting and contracting companies, vendors, suppliers and other construction actors.

Table 4 Global Competitiveness Index, Indonesia
(Source: WEF, 2017)

| Year | GCI | Infrastructure Pillar | Labor Market Efficiency |
|-----------|--------|-----------------------|-------------------------|
| 2015-2016 | 37/140 | 62/140 | 115/140 |
| 2016-2017 | 41/138 | 60/138 | 108/138 |
| 2017-2018 | 36/144 | 52/144 | 96/144 |

In the case of Indonesia, the construction workforce growth is 5.2% in average and if compared with construction value growth of 19.8%, it indicates the need for accelerating the development of the construction workforce. The big challenge is to accelerate certification of skilled workers and professional engineers and architects. Since we still have lack of human competency in the construction industry both number and the number of unskilled workers is still very high more or less 70% and certified workforce is less than 10%. Therefore, competency development has become a critical issue to cope with. Directorate General of Construction Industry Development (DGCID) has put a strategic target within five years plan (2015 – 2019) to improve human resource in construction by setting up a target to train 10.000 project managers, 40,000 supervisor and foreman, and also to certify 200,000 new construction engineers, then to certify 750.000 personnel consisting of 50.000 engineers, 200.000 technicians and 500.000 certified skilled workers, and also to train and certify 10.000 instructors and assessors⁴.

Another critical issue is lack of institutional capacity to develop human resource in construction. There are technical high schools, polytechnic and also universities in which many engineering departments produce undergraduate and postgraduate programs related

⁴ (<http://infrastrukturnews.com/2016/03/bina-konstruksi-akan-tingkatkan-kompetensi-lulusan-smk-melalui-sertifikasi/>).

to the construction industry. We also have construction training institutions both public and private. However, it still needs to improve institutional framework on how to link and match among those institutions and the industry to deal with balancing demand and supply of human resources. Lack of database and information system on human resource in construction shows institutional burden to tackle. Therefore, the government need to expand and improve collaborative networks, intensive cooperation and proactive empowerment among them as well as training and certification. Again, the competency development agenda must be set up properly.

Having the critical issues, the industry has to cope with, there is a need to set up a policy framework to improve institutional capacity for accelerating and expanding education and training platform, certification procedures, and also capacity building across the institutions related to human resource development in the construction industry. It is a time to consolidate among fragmented institutions. A policy is required to address a link between vocational education and professional competency for the industry. Link & match strategy is a must. On the vocational education side, the policy should focus on curriculum development, competency standard, modules and assessment. Industrial placement for practical internship of students should be part of training based competency and also certification for them. It would be more practical if every high technical school, polytechnics and also higher learning institutions are set up as a place of competency assessment. Selected teachers and lecturers are trained, certified and assigned as instructors and assessors. On the other hand, any construction project is set up to be a place of industrial placement and field based competency assessment for student while also provide trained and certified mentors or tutors or instructors and assessors.

The special agenda of apprenticeship program for accelerating competency development in the construction industry is required. Cooperation among stakeholders for education and vocational training process will produce competent and qualified skilled workers through apprentice scheme. The Link and Match between government institutions and construction associations is key of success for the program. Government institution such as related ministries, local governments and/or certification body or any associations such as Chamber of Commerce, groups of companies and/or industry sector, establishes the initiation of apprentice program.

The scheme of apprenticeship starts from preparing manpower planning using manpower balance sheet as a basis for the calculation of manpower gap need analysis. The information of manpower gap is used by labor affair regional office (under each local government authorities) and put in the labor information center to show to the job keeper and the training unit, such as Vocational Training Units and Construction Training Units. Base on the training need findings, training institutions in cooperation with selected company and funding institution are operating apprenticeship program, which finally follow up with certification process by competency certification body. The apprenticeship participants who are passing the certification process will be input to the labor information center and linking to construction companies who seek competent and qualified skilled workers under the coordination of labor affair regional office.

The implementation of apprenticeship scheme is divided into 3 (three) steps from pilot model, expanding the pilot and expansion. The success of these programs is depending on the readiness level of stakeholders particularly the industry players. We need to cluster

the industry players to make easier for monitoring, advising and co-managing while referring to the readiness status of those companies, especially related to the certification process.

Maintaining the program on the tracks requires some further actions, such as quality assurance, strengthen capacity of stakeholders, capacity building for people involved and information systems and well certification preparation. Commitment of different set of teamwork is of an important issue on the post launching action plan. The supervision team should be doing assessment, feedback, guidance; and monitoring. The empowerment team has to prepare the improvement program and

The government has to give a direction to the companies for improving program. The certification team has to guarantee certification standard readiness; to endorse certification mechanism; to prepare facilities; and execute certification program. The labor market information team has to deal with workforce supply and demand by establishment of updating database mechanism; and then inform regular labor market update.

5.0 Research Findings on Construction Human Resource in Indonesia

Efforts to improve the quality of construction human resource in Indonesia has been carried through various research and studies both at policy and regulations as well as technical-practice levels. Such efforts aim at determining current state development on human resource policy and practices in Indonesian construction industry. Research and studies are focused on: (labor) productivity, health and safety practices, labor management and labor relationships, as well as the structure and system of human resource institutional capacity building, also on construction personnel certification system.

Some examples of research on labor productivity issues such as research conducted by (Soekiman et al., 2011) on factors affecting labor productivity and project schedule performance, which identified that supervision, material, execution plan, and design are the most important factors influencing labor productivity thus affecting project schedule performance. Another research on human resource management issue by Soekiman et al ,2010 on the challenges in human resource management in Indonesia, which proposed on the needs to develop strategies to build qualified and competitive human resources aligned with market demand, high standard construction worker, construction labor training and development system, certification as quality assurance and acknowledgment of professionalism. Soemardi et al. (2010) assessed the role and competence of *mandor* (trade subcontractor) in Indonesia construction industry and identified twenty important attributes of *mandor* competence, which provided important information for developing the traditional construction human resource to adapt to the shift to more modern construction practices in Indonesia. Kaming et al (1997) studied the productivity of Indonesian labor and identified specific problem pertaining to productivity in Indonesia, i.e. lack of materials, rework, absenteeism, lack of equipment and tools and gang interference. Another study by Kaming et al (1997) also identified significant regional differences in production output, skill, motivation of artisan and operative's productivity in Indonesia. The severity of identified productivity problems significantly correlate with observed production output, artisan's working time, skill, and motivation, as well as

foreman's supervision and motivation. Kaming (2007) also studied the practice of human resource management in Indonesian construction industry and found that most of the surveyed construction organizations practices on human resource management were limited to personnel management, and that it was very rare that construction entities align human resource development with their business strategy.

A study by Allen ER (2016) shows an interesting fact on the productivity of construction labor compared to other sector, as shown in Fig.8, which shows that productivity is more or less related to average wage. At an average wage of Rp 1.7 million/month which is ranked 8th within the ten sectors compared, the productivity is ranked 5th, which explains that construction labor is less competitive compared to the other sectors. Allen recommended the strengthening of vocational training, apprenticeship as well as incentives for workplace training for improving productivity, which are also relevant to the construction sector.

In 2012 and 2013, CSDB commissioned studies on the practice and competitiveness of construction human resource in some of the regions in Indonesia, namely architect, engineers and operatives in various places in Indonesia, in facing the liberalization of trade within the ASEAN Economic Community 2020. The main finding is that construction human resource in Indonesia still need to develop and improve to be able to compete regionally, but on the other side as construction market in Indonesia is the largest, it is likely that competition will occur within the country.

Studies on construction workforce certification had also been conducted, mostly found that the current personnel certification system was to complicated and fragmented, causing difficult quality control to the process and product and needed a major improvement in order to ensure the quality of assessment for the prove of competence.

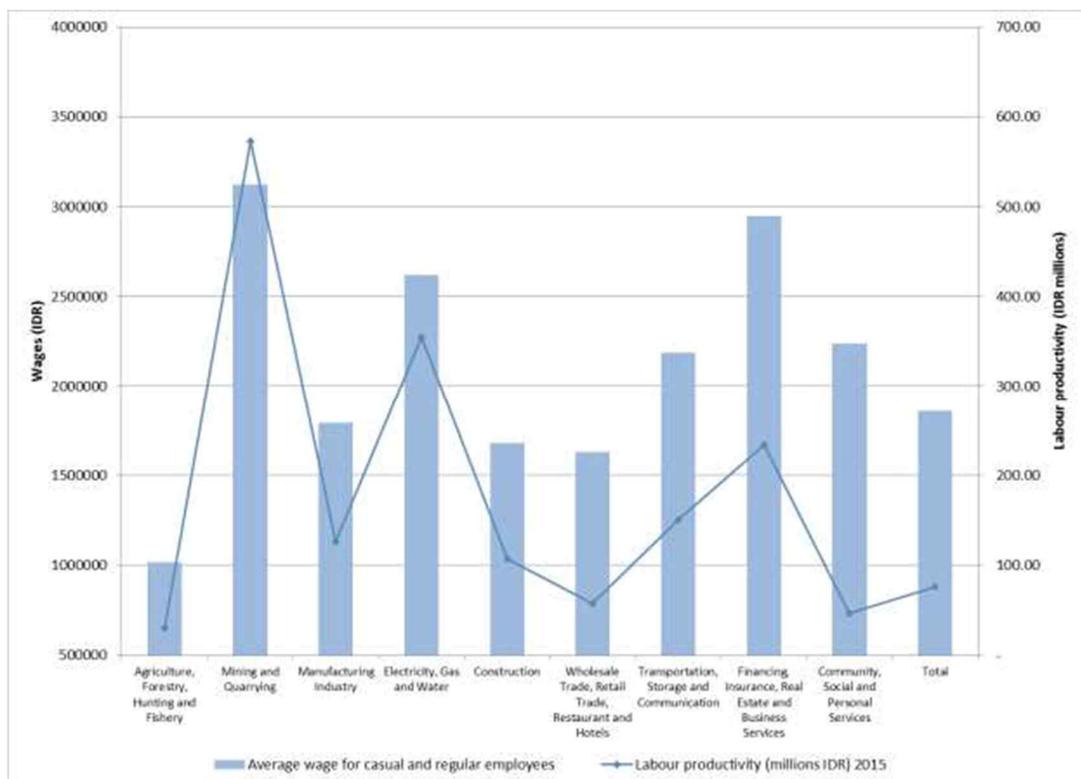


Fig.8 Average wages and labor productivity by economic sector, 2015 (Allen ER, 2016)

6.0 Strategic Options for Developing Human Resources in Construction

Human resource development in construction is very complex. There is a need to have strategic options. One of the options is to provide apprenticeship program. A quality assurance program is key task to guarantee the apprenticeship program producing high competent and qualified skilled workers. Therefore, every different team mentioned above has to have a strong action plan to guarantee the quality of each team mission. The supervision team and labor market information team should focus on preparing expansion of the programs. The strengthening team should deal with guarantee the program by drafting regulation changes if required. The certification team will prepare for certification activities, such as assessor, test place, test items, procedures, etc.

The ministries and other government institutions are to appoint person in charge for vocational development program, to recommend related association, to update Indonesia National Work Competency Standard, to prepare National Sectoral Manpower Planning and to establish Regional Sectoral Vocational Committee. Finally, to guarantee acceleration of certification program to be implemented successfully, the government and chamber of commerce should be establishing Sectoral Vocational Committee in the first chance. This committee has to propose joint working organization; preparing joint working plan; and preparing planning and funding resources;

To support the agenda already described, further policy framework is the development of single platform of human resource information system in construction. It will assist to connect among related institutions dealing with vocational education, training and certification as well as channeling the industry interest, particularly when the industry players want to engage and recruit skilled workers, technicians and engineers with professional competency certificate. This information system can become a single window information gateway for education, training, industrial placement, certification, and job placement, head hunting and also further cooperation link between education and training institutions and the industry.

Further recommended actions needed to implement the policy framework. Firstly it needs to set up national committee or task group or working groups consisting representative from education and training institutions and the industry to draft a national policy on human resource development in construction also to work for improving curriculum, module, certification procedure and pilot projects. Secondly, it needs a series of pilot projects to implement professional certification for those students who have finished internship or industrial placement. Thirdly, it also needs to establish construction industry training board representing stakeholders to develop, implement, monitor and evaluate link of vocational education and professional certification. Linking closely between vocational education and professional competency will provide solution towards human resource issues in the construction industry. It requires professional competency for making the most competitive industry to deliver best value for infrastructure development.

7.0 Opportunity for International Collaborations

Under the globalization, Indonesia seeks international collaborative networks to develop human resource in construction. The objective of this collaboration is to strengthen partnership for the construction industry development in Asia. The proposed collaborative network may cover capacity building in the form of training and certification of construction personnel, mutual recognition arrangement (MRA) for engineering and architectural professions, skill labors and also project management professionals.

The capacity building aims to improve knowledge and skills of engineers and architects as well as construction personnel. The objective of MRA is to facilitate engineer and architect mobility as well as to improve global understanding of best professional engineer and architect best practices. There is also a need for continuing professional development.

It also recommends any share program and agenda for training and certification as well as joint effort to improve engineer mobilization and also skilled worker engagement under business networks,

The recommended program and agenda for the human resource development in construction may include, such as:

- a. Summer courses for infrastructure planning and design,
- b. Short course for disaster risk reduction,
- c. Training for urban planning and design,
- d. Workshop on sustainable roads planning, design and maintenance.
- e. Workshop on infrastructure health monitoring,
- f. Short course on forensic engineering and management,
- g. Summer course for sustainable dam design and construction,
- h. Seminar on applied construction management for large scale projects,
- i. Workshop on quality assurance and quality control in the construction industry,
- j. Workshop on developing training policy and system for construction industry human resource development
- k. Workshop and comparative studies for improving construction personnel registration system
- l. Workshop on improving safety, health and environment protection in construction industry

8.0 Concluding Remarks

The paper has presented and discussed the situation related to construction industry human resource development, and the need to improve the capacity in terms of quantity and quality to fulfill the increasing demand due to progressive infrastructure development program has been presented. Various issues and challenges to strengthen the development program to fill the gap between supply and demand of construction manpower have been discussed and strategies for developing the construction human resource have been proposed. Finally, opportunity for developing international collaboration for mutual benefit in improving the productivity and the quality of human resource is proposed, which may open the road to a broader bilateral or multilateral collaboration for improving construction industry human resource.

REFERENCES

1. Annon, 2015a, Perkembangan Pendidikan Tinggi Tahun 1999/2000 – 2013/2014 Buku 1, Center for Data and Statistics on Education and Culture, Ministry of Education and Culture, Jakarta
2. Aries R Prima, 2016, MEA: Ancaman Bagi Indonesia, Engineer Weekly, No.1, W II, 2016
3. Ali Ghufron Mukti, 2017, Expose Material of Director General of Science, Technology and Higher Education Resources, National Working Meeting of Ministry of Research, Technology and Higher Education
4. Anton Soekiman, Krishna S. Pribadi and Biemo W. Soemardi, 2010, Challenges in Managing Human Resource in Indonesian Construction Industry, Proceeding of the 2nd International Postgraduate Conference on Infrastructure and Environment (2nd IPCIE-2010), the Hong Kong Polytechnic University, June 1-2, 2010, Vol. 1, pp. 314-321, Hong Kong, China. ISBN No. 978-988-17311-3-5
5. A. Soekiman, K. S. Pribadi, B.W. Soemardi, R.D. Wirahadikusumah, 2011, Factors Relating to Labor Productivity Affecting the Project Schedule Performance in Indonesia, The Twelfth East Asia-Pacific Conference on Structural Engineering and Construction, Procedia Engineering 14 (2011) 865–873, Science Direct, Elsevier,
6. B W Soemardi, , I Soenaryo, E Wahyudi, The Role and Function of Mandor in Construction Project Organization in Indonesia, The Twelfth East Asia-Pacific Conference on Structural Engineering and Construction, Procedia Engineering 14 (2011) 859–864, Science Direct, Elsevier.
7. Emma R Allen, 2016, Analysis of Trends and Challenges in the Indonesian Labor Market, ADB Papers on Indonesia, No.16.
8. Loosemore, Andrew Dainty, Helen Lingard , 2003, Human Resource Management in Construction Projects: Strategic and Operational Approaches, Spon Press, Taylor & Francis, London
9. Laurie J Mullins , 1999, Management and Organizational Behaviour, 5th ed, Financial Times/Pitman Publishing, Prentice Hall
10. Peter F Kaming, , Paul Olomolaiye, Gary D Holt , Frank C Harris, 1997, Factors influencing craftsmen's productivity in Indonesia, International Journal of Project Management, Volume 15, Issue 1, February 1997, Pages 21-30.
11. Peter F Kaming, Paul Olomolaiye, Gary D Holt , Frank C Harris, Regional, 1997, Comparison of Indonesian Construction Productivity, ASCE Journal of Management in Engineering, Volume 13-Issue 2, 1997
12. Peter F Kaming, Praktek Manajemen Sumberdaya Manusia (SDM) Pada Industri Konstruksi di Indonesia, Konferensi Nasional Teknik Sipil 1 (KonTekS1)- Universitas Atma Jaya Yogyakarta, Yogyakarta, 11-12 May 2007
13. Reini D. Wirahadikusumah dan Krishna S. Pribadi. (2011). Licensing Construction Workforce: Indonesia's Effort on Improving the Quality of National Construction Industry , Journal of Engineering, Construction and Architectural Management, Vol.18 No.5, pp. 431-443

14. Sumianto Sumas, 2017, KESIAPAN TENAGA KERJA NASIONAL DALAM EKSPOR KONSTRUKSI KE LUAR NEGERI, Ministry of Manpower, Presentation at Indonesian Construction Export Forum (FEKI), Jakarta 9 August 2017
15. WEF, 2017, The Global Human Capital Report
16. CBS (Central Bureau of Statistics), <https://www.bps.go.id/index.php>
17. CSDB (Construction Services Development Board), <http://lpjk.net/>
18. <https://www.thebig5hub.com/sustainability/2017/august/indonesia-s-construction-market-to-hit-136bn-by-2021/>
19. <http://industri.bisnis.com/read/20151209/45/499964/ini-sasaran-peningkatan-sdm-bidang-konstruksi>
20. <http://infrastrukturnews.com/2016/03/bina-konstruksi-akan-tingkatkan-kompetensi-lulusan-smk-melalui-sertifikasi/>