Public Perception of the Wood Products Industry in Malaysia and its Implication on the Future Workforce

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Despite contributing almost RM 20 billion (USD 4.9 billion) in exports earnings annually, the public perception of the wood products industry in Malaysia remains unknown. Therefore, this study attempted to assess public perceptions about the industry in Malaysia among the public, including teenagers, based on 3,010 reliably answered questionnaire-surveys. Generally, the public perceived the wood products industry to be a low-wage economy, labor-intensive, predominated by foreign contract workers, and unsustainable in the long-term. In essence, the public appear to have stronger negative images of the industry compared to the positive images. The main drivers for such negative perceptions, identified through the factor analysis, were the prevailing business environment in the industry and its workforce characteristics. Consequently, teenagers and school-leavers tend to be less interested in pursuing a career in the industry, let alone pursuing further studies in the wood-related fields. The main reasons cited for this were the limited career growth opportunity due to the predomination of family-controlled small and medium-sized enterprises (SMEs) in the industry and the discouragements from family members and friends. The provision of reliable, timely, and transparent information is important to boost the public's awareness and build positive beliefs and perception of the wood industry.

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INTRODUCTION

The Malaysian forests and wood products sectors have emerged as the pride of the nation, as the Malaysian forest and wood products industry's development model has become the envy of many throughout the world (MTIB 2020). The forest management practices in Malaysia have been credited to the British colonial masters since the late 1800's, whose focus was on timber extraction mainly for ship building and the construction of railways (Ratnasingam and Ioras 2006). During the colonial period, the forest management system evolved through the Gutta Percha system (1900 to 1910), and the Improvement Regeneration Felling system (1911 to 1942), both of which did not accord much importance to environmental conservation. The onset of the 2nd World War took a heavy toll on Malaysian forests resources, which led to the formulation of the Malaysian Uniform System (MUS), which was aimed at managing the forests intensively due to the high demand for wood

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materials throughout the British empire. Nevertheless, the MUS system was also considered unsuccessful as a forest management system. Among the deficiencies of the MUS systems were the uneven stocking of timber species in the forests, the lack of natural regeneration on the forest floor, and the excessive soil erosion in the hill Dipterocarp forests. Due to an increasing appetite for timber resources, especially from the booming timber processing industries, it became apparent that a new forest management system was needed to ensure sustainability of the forest resources in the future (Ratnasingam and Ioras 2006). The Selective Management System (SMS) was then introduced to address the shortcomings of the MUS system and to ensure that the forest resource in the country was managed sustainably (Thang 1987). Under the SMS, the forest manager has the flexibility to choose the minimum diameter of stems of the trees they wish to exploit. Characteristically, the SMS marked a drastic departure from the uniform, monocyclic felling system to a much more complex polycyclic system. In fact, the SMS laid the foundation for what would eventually become the world recognized Sustainable Forest Management System (SFMS), as extensively documented by ITTO (2020).

Forest management practices in Malaysia were subsequently attuned to meet the global environmental demands between 1970 to 1980. The focus shifted towards biodiversity conservation (1981 to 1990), especially since Malaysia was recognized as one of the leading mega biodiversity hubs of the world. Since 1990, the forest resources have been sustainably managed to cope with its multiple functions, although wood materials extraction from the natural forests have become increasingly less important (FDPM 2020). To offset the reduced supply of wood materials from the natural forests, harvests from man-made forest plantations, including rubber plantations, were increased to supply the relatively large wood products industry in the country (MTIB 2020). In essence, the evolution of forest management systems in Malaysia underlines the changing expectations of the forest resources over the years, driven both by domestic and global events.

Development of the Wood Products Industry in Malaysia

The Malaysian wood products sector did not gain prominence until the early 1970's, when the import-substitution of value-added products resulted in a policy shift, which was deemed necessary to spur local manufacturing activities. Even after the independence of Malaysia in 1957, the export of valuable primary wood products, particularly saw logs, sawn timber, veneer, and plywood, were the predominant activities. On the other hand, household items such as furniture and builders' joinery and carpentry (BJC) continued to be imported to meet the domestic demand. Most of these primary wood materials were exported back to the traditional market of the United Kingdom, but an increasing proportion found their way to Taiwan, South Korea, and Japan (MITI 2016). The ban on the export of sawlogs from peninsular Malaysia that was implemented in 1972 covered 10 main species and followed by a complete ban on the export of all species of sawlogs in 1985 (MTIB 2020), which were crucial steps for industrial development. To encourage further down-stream processing, export quotas and export levies were imposed on sawn-timber exports, which inevitably led to the transformation of the wood products industry into the value-added manufacturing industry. The ban on sawlogs exports, and the restraint on sawn-timber exports forced many large multinationals to relocate their operations to Malaysian shores. The first wave started in 1987, when South Korean and Taiwanese investments established large wood products manufacturing facilities in Malaysia. The important pull factors that made Malaysia an attractive destination for foreign direct investments (FDIs) were the implementation of a series of Industrial Master Plans (IPMs), *i.e.*, the 1st IMP (1986 to 1995), the 2nd IMP (1996 to 2005), and the 3rd IMP

(2006 to 2020), which helped transform the wood products industry into a huge exporter of value-added wood products. This also created a huge socioeconomic sector, providing thousands of employment opportunities (MTIB 2020). A report by Ratnasingam *et al.* (2018) highlighted that the availability of low-cost factor inputs (*i.e.* raw materials and labor), combined with the provision of favorable incentive schemes, policy, regulations, and fiscal instruments, bestowed Malaysia a cost-competitive environment for wood products manufacturing. The formulation and implementation of the National Timber Industry Plan (NATIP) further attested to the government's aspiration to transform the wood products industry into a high value-added, creative, and innovative products manufacturer, which ensured that the value fetched by the wood raw materials increased significantly through such high-value product manufacturing (Ratnasingam 2015). Since the end of the NATIP in 2020, the Malaysian Timber Industry Board (MTIB) has formulated the National Timber Industry Strategic Plan (2021 to 2025), which aspires to continue the momentum set out by the NATIP to achieve an export value of RM 28 billion (USD 6.87 billion) by 2025, while capturing a domestic market sale of RM 20 billion (USD 5.4 billion) (MTIB 2021). Table 1 provides the status of the wood products industry in Malaysia, and highlights the importance of the down-stream, value-added wood products manufacturing sector in the overall wood products industry.

Table 1. The Number of Wood Products Manufacturing Facilities in Malaysia

No.	Wood Products Manufacturing Facilities	Number
1.	Furniture mill	745
2.	Sawmill	587
3.	Molding mill	82
4.	Veneer, plywood, lamination mill	176
5.	Kiln drying and treatment plant	39
6.	Particleboard/chipboard mill	7
7.	Medium density fiberboard mill	7
8.	BJC mill	66
9.	Other mills	192

Source: MTIB (2020)

Against this background, it is apparent that the success of the Malaysian wood products sector since independence in 1957 has been realized through public-private partnerships (PPPs). Such PPPs have brought about a huge industrial transformation within four decades that has become the envy of many nations throughout the world (Ratnasingam *et al.* 2018). The resilience of the Malaysian wood products sector is well attested by its sterling performance over the years. Even in 2020, when the Coronavirus Disease 2019 (COVID-19) pandemic was ravaging throughout the world and causing huge economic hardship, the sector performed well. In 2020, Malaysia exported RM 22.02 billion (USD 5.4 billion) worth of wood products, and the ratio of value-added products to primary products stood at 60:40 (MTIB 2021). The sector also registered RM 8.5 billion (USD 2.1 billion) in domestic sales, while providing employment to almost 140,000 people.

Characteristics on the Wood Products Industry and its Influence on Public Opinion

Since the establishment of the MTIB in 1973, as the lead agency responsible for the development and regulation of the timber industry in the country, a myriad of activities, industrial

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guidelines, and policy instruments have been implemented to ensure that the sector grows equitably, sustainably, and befits the green economy. The development of the Malaysian wood products sector over the years has been a subject of extensive research and has been well documented (Ratnasingam 2015, 2018; MTIB 2020). The industry is characterized by its cottage-based perception and is predominated by small and medium-sized enterprises (SMEs) that make up almost 80% of the total number of enterprises operating within the sector (Ratnasingam *et al.* 2018). Such a structure may limit career growth prospects for young executives, as such companies are usually family-managed businesses, and inevitably, discourages many youths from venturing into this sector (Ratnasingam 2018). The fact that the industry's growth is driven primarily by incremental inputs rather than productivity gains is also well documented (Ratnasingam *et al.* 2014, 2018). On this account, there is continuous demand for low-cost factor inputs, including raw materials and labor from the industry that strive on cost-competitiveness rather than value-creation (Ratnasingam 2015). Consequently, the dependence of foreign contract workers, who make up almost 60% of the workforce in the industry, poses several problems, such as keeping the wage artificially low within the sector and the ensuing social problems (MTIB 2020).

Apart from the MTIB, the other related timber agencies in Malaysia include the Malaysian Timber Council (MTC), incorporated in 1992, and the Malaysian Timber Certification Council (MTCC), formed in 1998. The formation of the MTCC was deemed necessary to ensure that Malaysian forests and wood products are certified, and so Malaysia would be portrayed as an environment compliant nation, although cases of illegal logging, forest crimes, and forest conversion activities continue to gain limelight in the global media (MTIB 2020). Collectively, these agencies were tasked to bring about a strategic transformation of the country's wood products industry, in line with the national vision and the global trend. To reverse the perception that the industry operates in "sweat-shop" conditions, several existing regulations were extended and imposed upon the wood industry to improve the overall working conditions (MTIB 2019). These include the Factories and Machinery Act (1967), the Environment Quality Act (1974), the Clean Air Regulation (2014), and most recently, the Workers Minimum Housing Standards Act (2020). All these regulations aim to improve the prevailing working conditions in the wood products industry to meet international standards in compliance with global human rights conventions. In essence, these standards hope to shed the dirty, dangerous, and difficult stigmas associated with the wood products industry, while making the industry more attractive to the local workforce who continue to shy away from the industry. The implementation of the IR 4.0 Master Plan (Industry 4.0 Plan) by the government in 2018 is another timely effort aimed at infusing greater automation and technology into the investment-starved wood products sector, apart from increasing its productivity. In fact, it aspires to reduce the dependency on foreign contract workers by the wood products sector and create more equitable, knowledge-based employment opportunities for the locals in the industry (MITI 2018).

Despite such commendable efforts by the government as well proactive initiatives by the industry, the public continue to harbor negative perceptions about the wood industry in Malaysia, although no study has been undertaken to evaluate the extent of the situation (MTIB 2019). The employment records released by the relevant trade associations, such as the Malaysian Furniture Council (MFC), the Malaysian Wood Moulding and Joinery Council (MWMJC), the Malaysian Wood Industry Association (MWIA), the Malaysian Panel-Products Manufacturers' Association (MPMA), and the enrollment statistics for wood science and technology (WST) programs in several universities in Malaysia suggest that the problem appears ingrained and continues to impart a negative image of the sector. As a result, the employment of the local workforce within the wood products industry remains a challenge, and young school leavers do not show interest

to pursue a career in the wood products industry, or even pursue higher education in wood-related programs (Ratnasingam 2018). Inevitably, the subject of public perception and social acceptability of the wood products industry in Malaysia warrants in-depth research if this negative perception is to be altered and a future local workforce is to be available to actively participate in the sector. Within the context of this study, this research aims to develop an in-depth understanding of perceptions, beliefs, and awareness of the public towards the wood products industry in Malaysia. Therefore, the objective this study was to evaluate the public perception of the wood products industry and the value of the sector in Malaysia. This will provide information to gauge the social acceptability of the wood products industry, which is an important socioeconomic sector in Malaysia.

EXPERIMENTAL

To investigate the public perception of the wood products industry in Malaysia, the study focused on two important aspects: 1. the spontaneous perceptions of the wood products industry and its value as a socioeconomic sector, and 2. the specific image of the wood products industry and its attractiveness as a potential employment sector.

Target Respondents

Ideally a public perception survey should be conducted nationwide, but due to the concentration of wood products industry in specific areas, the study focused on the Kelang Valley in Selangor, Sungei Petani in Kedah, and Muar in Johor, which were three areas with the highest concentration of wood products enterprises in the country (MTIB 2020). These study areas are highly industrialized and host many different types of manufacturing and service industries. This was important to avoid biased responses.

The target respondents of the study were public citizens, comprised of adult men and women between the ages of 25 and 60. Teenagers that were between the ages of 17 and 24, from households in the same average socio-occupational categories as the adults surveyed, who were somewhat linked to the wood products industry, either directly or indirectly, were also included in the study as potential respondents. The study was conducted *via* a questionnaire-based survey implemented through Google Forms (Mountain View, CA, USA). The survey was sent to 7,000 potential respondents in the three aforementioned areas, with the assistance of the respective local councilor's office. This was particularly useful since the local council office kept records of the local population as well as their contact details. Efforts were made to ensure a fair representation of the local population, without bias towards any race or ethnic group. The response rate from the potential respondents was 43%, or 3010 respondents. The response rate for this study was considered good because the study was conducted during the COVID-19 pandemic, when the public were preoccupied with solving life and livelihood issues.

Questionnaire Design

A five-part questionnaire was designed to gather the required information to fulfil the objectives of this study. The questionnaire was prepared after discussions with industry experts, academics, mill owners, civil society groups, non-governmental organizations (NGOs), students, and several previous studies (EC 2002; MTIB 2016; Ranacher *et al.* 2020). The first part of the questionnaire compiled data on the background of the respondents, including information on their demographics, socioeconomic level, and

employment. The second part of the questionnaire required the respondents to reveal their spontaneous perception of the wood products industry and their overall awareness and knowledge of the industry. The responses to these open-ended, qualitative questions were grouped into key-word categories, such as wage structure, labor intensiveness, foreign workers, sustainability, and entry-barrier into the industry. The respondents were also asked to indicate their perceptions of the industry in terms of the five major themes, which included industry structure, management, business environment, workforce, innovation and technology application, and environmental friendliness. The responses to these five themes were either agree or disagree. The third part of the questionnaire transformed these perceptions into 21 characteristic attributes of the industry, such as uncompetitive wage level, labor intensive, foreign workers dominated, high skills dependent, knowledge worker dependent, technology intensive, high automation, high investment, value added and innovative products, sustainable industry, environmentally friendly, energy efficient, circular economy, certified materials, job security, limited career growth opportunity, SMEs dominated, unprofessionally managed, compliant to market standards, insufficiently regulated with no clear policy, and unlicensed facilities. These attributes were selected based on several previous studies by Ratnasingam *et al.* (2014, 2018). These attributes were then rated by the respondents based on the Likert's five-point rating scale, from 1 (least agreed) to 5 (strongly agreed). The fourth part investigated the respondents' image of the forest products industry and evaluated their readiness to encourage family members and relatives to pursue a career in the forest products industry. The respondents were required to rank the perceived images listed based on their opinion. These perceived images included labor intensive industry, low-tech industry, poor working conditions, low wage economy, foreign workers cause social problems, fashionable and innovative product, environment friendly product, natural and beautiful product, employment providing sector, and low carbon industry. The fifth part of the survey, which focused on the teenage respondents, required the respondents to indicate their preference for pursuing further education in wood-related programs, and rank the five main motivations by their importance, behind their preference.

Data Collection

The questionnaire was initially pre-tested among 50 randomly selected members of the public in the Kelang Valley. After obtaining the responses and comments from the respondents, the questionnaire was modified accordingly to ensure clarity and ease of implementation. The 21 variables that were scored using the Likert scale were validated with a Cronbach-alpha score of 0.69. The revised questionnaire, built into the Google Form, was then sent to the local councilor's office in Kelang Valley, Sungei Pertani, and Muar for online distribution to the randomly selected members of the public, including teenagers. After a period of three weeks, the responses from the survey were compiled for data analysis.

Data Analysis

The data from the questionnaires were compiled and tabulated using Microsoft Excel 2010 software (Redmond, WA, USA) to facilitate the analysis. The analysis of the data was conducted using the Statistical Package for the Social Sciences (SPSS) version 25 software (IBM, New York, NY, USA). The factor analysis of the 21 perceptive factors was carried out to simplify them into several smaller groups, which influenced the public perception of the wood industry in Malaysia.

RESULTS AND DISCUSSION

Part I: Characteristics of Respondents

In ensuring the reliability of the study, efforts were taken by the local council's office to ensure a fair representation of the local communities in both study areas. 89% of the respondents were adults between the age of 25 to 60 years, while the remaining 11% were mostly teenagers within the age group of 17 to 24 years old. Furthermore, 54% of the respondents were male, while the remaining 46% were female. In terms of employment, 33% of the adult respondents were employed in the public sector, while 67% of the respondents were employed in the private sector. Interestingly, only 6% of the total respondents indicated that they were either involved or know of someone involved in the forest products industry. The ethnicity distribution of the respondents also reflected the average Malaysian population, where 52% of the respondents were Malays, 29% were Chinese, 14% were Indians, and 5% were of other ethnic groups. The demographic and employment characteristics of the respondents in this study was somewhat parallel to the population census undertaken by the Department of Statistics of Malaysia (DOSM) in 2019 and reflected a fair representation of the demography and socioeconomic features of the respective communities in the study areas.

Part II: Spontaneous Perception and Awareness of the Wood Products Industry

Figure 1 show the five most common perceptions of the public about the wood products industry in Malaysia. It is apparent that most respondents thought the wood products industry was a low-wage economy and was highly dependent on foreign-contract workers to remain competitive. Inevitably, they did not perceive the industry to be sustainable in the long-term. This perception is in line with findings of the previous study by Ratnasingam (2018), who reported that the Malaysian wood products industry was losing competitiveness due to increasing input costs and stagnating value-addition within the industry.
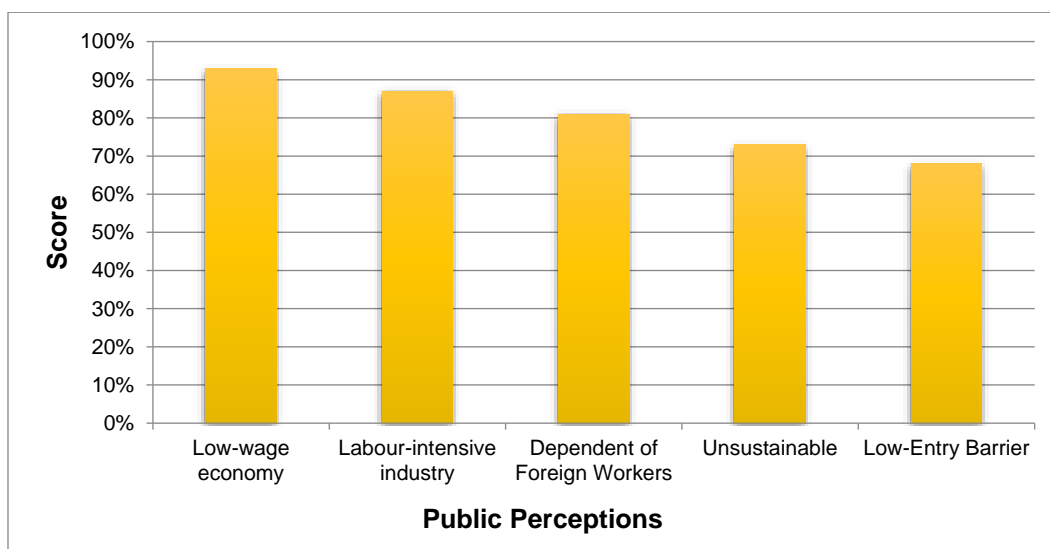

Fig. 1. The spontaneous perceptions of the wood products industry among the general public

Although 26% of the respondents agreed that the wood products industry was an important employment provider to local youths, a large proportion of the respondents (74%)

did not think that the wood products industry is an important socioeconomic sector at the national level. In fact, many respondents believed that the wood products industry will lose its importance in years to come. Such a negative perception may be fueled by the fact that the wood products industry has lost its prominence over the years, especially during the 1997 to 1998 economic crisis, which wiped out many of the large wood products manufacturers throughout the country due to insolvency (Ratnasingam 2015).

When asked about the overall perception of the wood products industry, the respondents were focused on expressing their perceptions along five distinct themes, as shown in Figs. 2 through 6. It appears that these perceptions were in line with the overall characteristics of the wood products industry in the country, as highlighted by Ratnasingam (2015). Furthermore, the responses from the adult and teenage groups did not differ significantly, clearly showing that both groups shared similar views.

The Malaysian public has many controversial, and sometimes even contradictory, opinions about the wood products industry in the country. In some areas, their views are quite accurate, but some publicly held opinions are not grounded in reality. The public generally views the wood products industry as a provider of employment to local youths, but they remain unconvinced with the industry's overall socioeconomic performance at the national level.
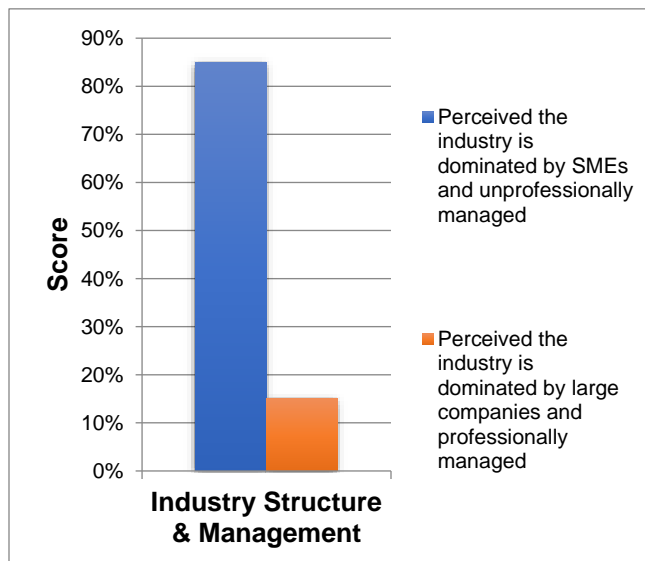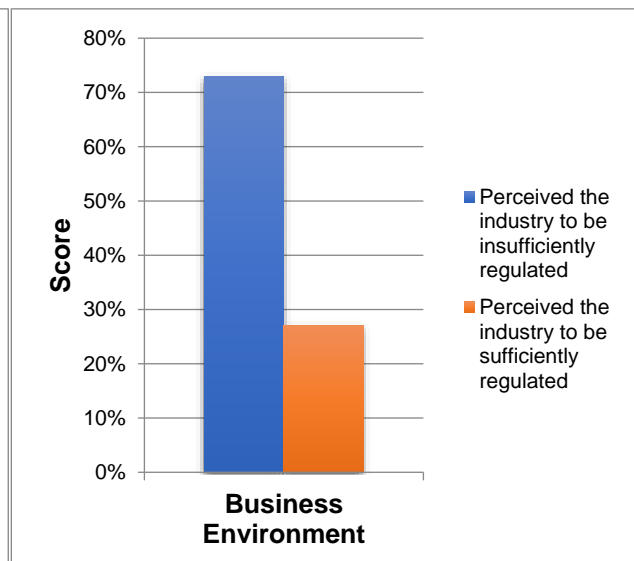

Fig. 2. Industry structure and management

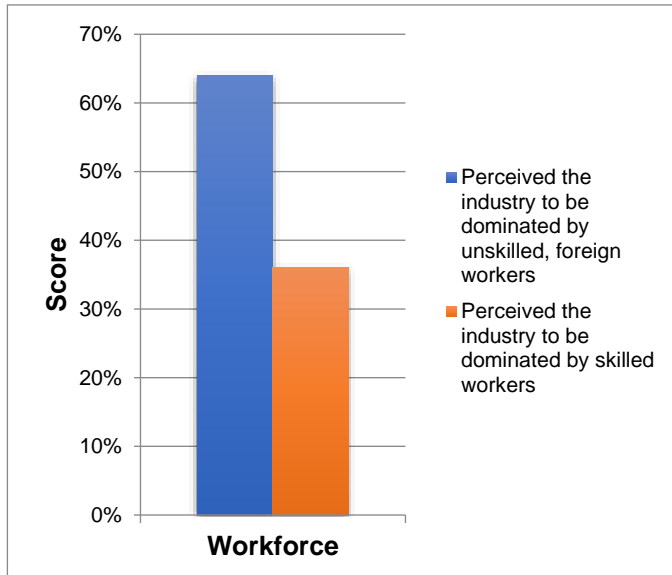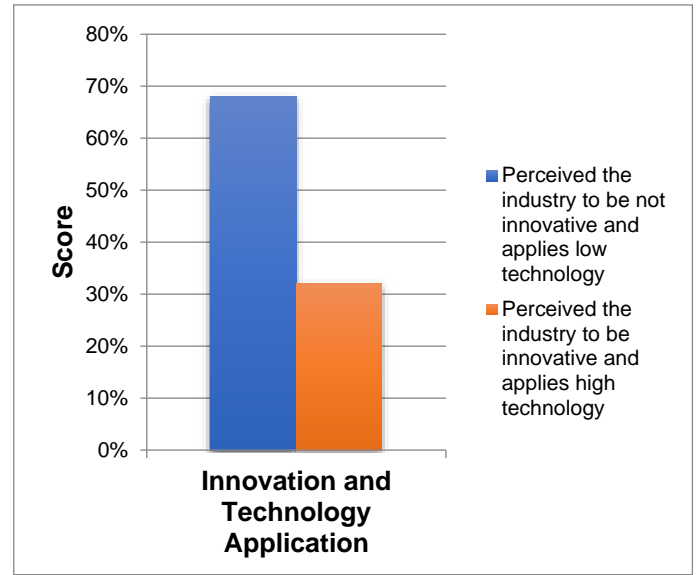**Fig. 3.** Business environment

Fig. 4. Workforce

Fig. 5. Innovation and technology application
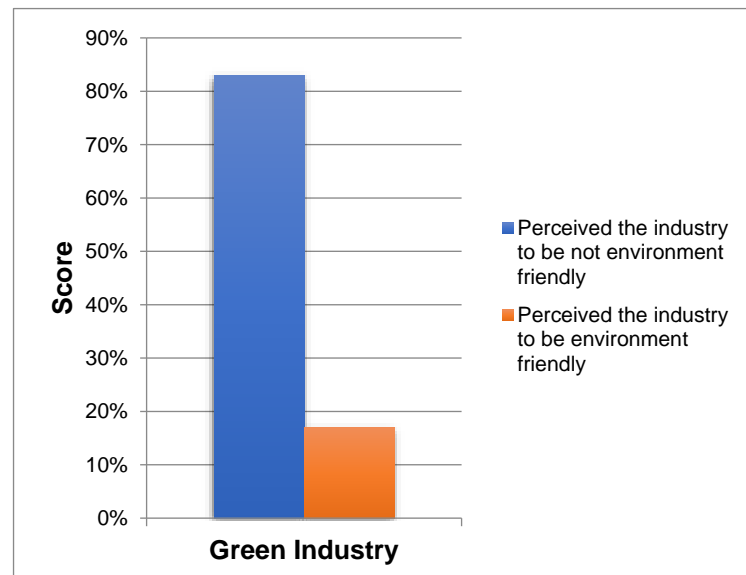

Fig. 6. Green industry

The respondents seemed unaware of the contributions made by the wood products industry to the socioeconomic sphere of the country. This corresponds to the actual performance of the forest products industry at the national level, where its contribution towards the country's economy has shrunk from a high of 7.5% in the mid 1980's to less than 2.0% in 2019 (MTIB 2020). In a study by Ratnasingam (2015), it was highlighted that the extent of value-addition within the industry has been stagnating over the last decade, which inadvertently resulted in constricting export growth when expressed in US dollars. Of course, the unfavorable exchange rate between the local currency, the RM and the US dollar, has adversely affected trade value. However, the industry's productivity and value-addition growth has also not kept pace with its overall growth (Table 2).

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Table 2. Performance of the Malaysian Wood Products Industry

Year	Export (RM billion)	Export (USD billion)	Employees	Productivity
2010	20.5	6.4	87,000	1.37
2012	20.2	6.5	89,000	1.36
2014	20.5	6.0	109,000	1.37
2016	22.1	5.3	128,000	1.34
2018	22.3	5.4	132,000	1.35
2020	22.0	5.4	140,000	1.35

Source: MTIB (2020)

Since the wood products industry in Malaysia is predominated by SMEs, the perception that the industry is not managed professionally is also well supported (Ratnasingam *et al.* 2020). In fact, the point that the general public do not perceive the wood industry to be a technology-driven sector, that deals with innovative products, is also obvious from this survey. This point corresponds with the earlier studies (Ratnasingam *et al.* 2014, 2018), which highlighted that innovation and value-addition within the wood industry in Malaysia is relatively low, especially when a large proportion of the manufacturing activities are focused on mass production or rather contract manufacturing. A further revelation of this study showed that most respondents (73%) believed that the wood products industry lacks clear policy direction and regulations. Inevitably, it may be inferred that the roles of the MTIB, the MTC, and the MTCC are not clear to the public, so their awareness of the functions of these agencies were minimal. This point is also supported by a previous study by Ratnasingam (2018), who reported that the timber-related agencies and trade associations in the country played over-lapping roles, and in many instances, failed to provide strategic direction for the overall development of the industry. The respondents also harbored the belief that the industry is also culpable to be designated as a "sweat-shop", due to its over-dependency on foreign workers and the extensive use of low-cost wood materials, both of natural forest and forest plantation origin. Perhaps, this is particularly related to the use of illegal and uncertified wood materials in some instances that were highlighted in the media, as reported by Ratnasingam *et al.* (2017). In essence, this study revealed that although the public did not have sufficient awareness and knowledge of the forest products industry in the country, their intuitive perception of the industry appears to be supportive of the publications on the overall economic performance of the sector (Ratnasingam *et al.* 2017). Furthermore, the public is also influenced by the negative reports in official and social media related to illegal logging and other unapproved activities. Therefore, efforts must be taken to ensure that a transparent representation of the wood products industry is made available promptly and regularly to the public.

Part III: Attributes that Influence the Public Perception of the Forest Products Industry

The major aspects of the wood products industry evaluated in Part II of this study were transformed into related attributes that may shape the perceptions and beliefs among the public, as outlined by McCool *et al.* (1986).

Factor analysis is based on the assumptions that all these attributes are correlated to some degree, and the extent of these correlations can be determined through the Kaiser-Meyer-Olkin method (Ho 2006). The analysis revealed that the correlation among the attributes were relatively low, with an index value of 0.313. The Bartlett's test of correlation matrix sphericity produced a value of 89.11 at a significance level of less than 0.001. Hence, there were significant correlations among some of the attributes, so the factor analysis could be used for the data set.

The factor analysis grouped the 21 attributes into five groups of factors, which could be categorized as follow: (1) industry structure and management, (2) business environment (3) workforce, (4) innovation and high technology, and (5) green industry (Table 3).

Table 3. Five Factor Solutions from the Factor Analysis of the Public Perception of the Wood Products Industry

| Attribute	Industry Structure and Management	Business Environment	Workforce	Innovative and High Technology	Green Industry
Uncompetitive Wage Level	0.14	-0.24	**0.78**	-0.18	-0.24
Labor Intensive	-0.33	**-0.67**	**0.61**	**-0.64**	-0.38
Foreign Workers Dominated	**-0.51**	0.33	**0.59**	-0.39	-0.44
High Skills Dependent	-0.63	0.16	0.46	0.29	0.28
Knowledge Worker Dependent	-0.04	0.21	0.32	0.36	0.27
Technology Intensive	0.13	0.19	0.23	0.33	0.34
High Automation	0.18	0.15	0.39	0.48	0.31
High Investment	0.29	0.26	0.42	0.46	0.29
Value-Added and Innovative Products	**-0.62**	-0.43	**-0.58**	**0.51**	0.35
Sustainable Industry	-0.41	0.48	-0.45	-0.29	0.48
Environment Friendly	0.28	0.31	-0.27	-0.27	0.39
Energy Efficient	0.09	0.35	-0.32	-0.09	0.45
Circular Economy	-0.06	-0.26	-0.32	-0.12	0.44
Certified Materials	0.31	0.45	-0.31	-0.19	**0.57**
Job Security	0.46	-0.31	0.39	0.19	-0.32
Limited Career Growth Opportunity	0.47	**0.87**	0.31	0.33	0.44
SMEs Dominated	**0.79**	0.48	-0.67	-0.16	-0.29
Unprofessionally Managed	**0.61**	0.29	-0.44	-0.24	-0.26
Compliant to Market Standards	-0.09	**0.61**	0.29	-0.48	-0.34
Insufficiently Regulated with no Clear Policy	0.39	**0.53**	0.33	-0.14	**-0.51**
Unlicensed Facilities	0.41	**0.59**	-0.42	-0.019	**-0.53**

Note: The cell entries are factor loadings, and the attributes were measured on a 5-point Likert scale.

Factor 1 included attributes such as SMEs dominated industry and unprofessional management, while factor 2 included attributes such as limited career growth opportunity, compliant to market standards, insufficiently regulated industry, and unlicensed facilities. Factor 3 included attributes such as uncompetitive wage level, labor intensive, and domination by foreign workers. Factors 4 and 5 included a single attribute each, which were value-added and innovative products and the use of certified materials, respectively. The variance accounted for 19.8%, 28.3%, 23.7%, 17.4%, and 12.8%, respectively, of the total variance observed among the various attributes. Factors 1, 4, and 5 could be discarded, as they involved only very few positive attributes to be relevant, which make it less important as factors that shape public perception. Based on the results, it is apparent that factors related to the business environment and the characteristics of the prevailing workforce have the largest impact on the public perception of the wood industry. Such a finding is parallel to previous studies (Ratnasingam 2015, 2018) that highlighted that the poor working conditions within the wood industry in the country serves as a strong deterrent that keeps the local workforce away from participating in this industry, while at the same time, giving it a negative perception among the general public.

In this context, this study showed that the main drivers of public perception of the wood products industry is the prevailing business environment and the workforce characteristics. This is in line with the narrative put forward by the Ratnasingam (2018), which is that employment of foreign workers will stifle industrial growth and dampen the business environment, which in turn may adversely affect the overall social acceptability of the wood products industry in Malaysia.

Part IV: Image of the Respondents About the Wood Products Industry

The survey also revealed that most respondents had some positive images of the wood products industry in Malaysia, although the negative images outweighed the positive ones (Fig. 7).
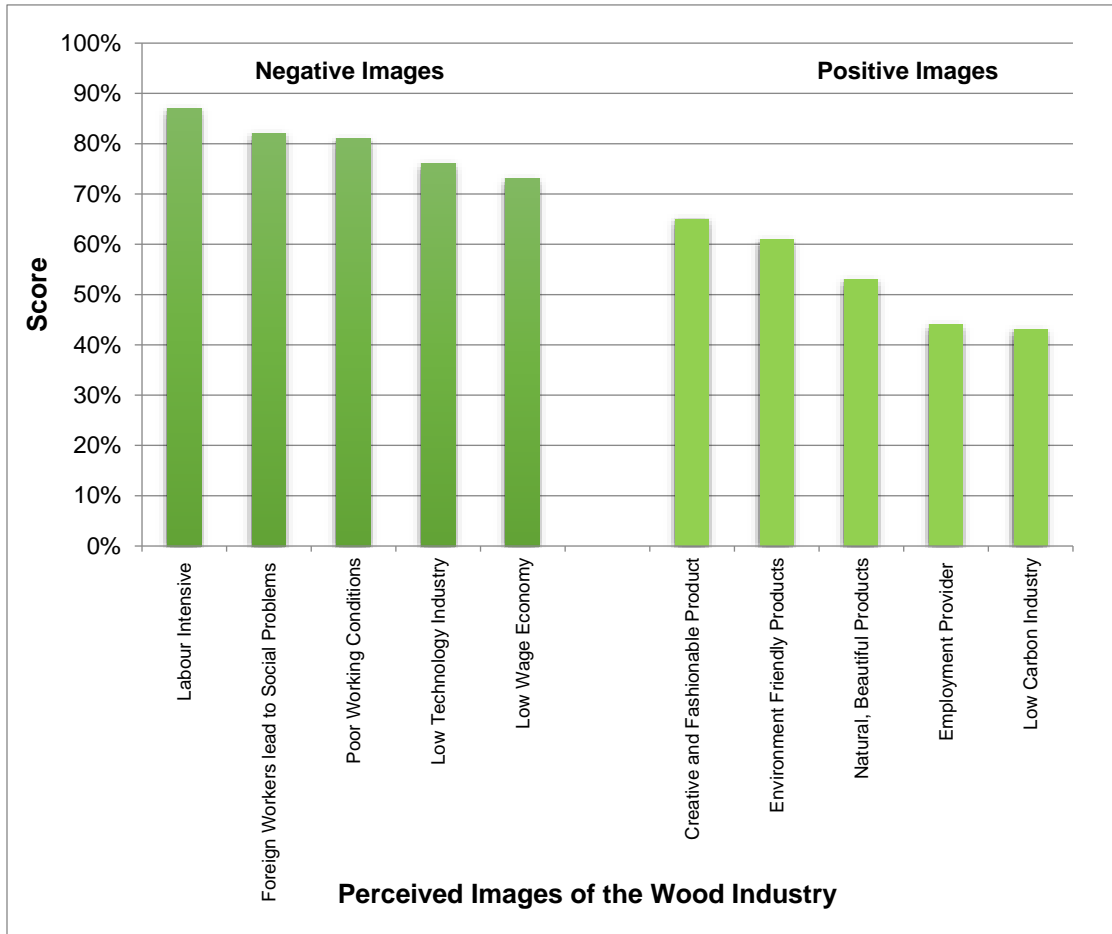
Fig. 7. The images of the wood products industry among respondents

The respondents' image of the industry was labor intensive, foreign worker dependent, and non-environmentally friendly operations. Therefore, it is no surprise that only 21% of the respondents indicated that they would not discourage their relatives or friends from pursuing a career in the wood products industry, or even pursuing higher education in the field of WST. In fact, the responses from the adult and teenager respondents were not significantly different, suggesting that these perceptions were shared by both respondent groups.

As suggested by the FAO (2007), many of the problems inflicting the industry are rooted in a deeply ingrained image problem. To many, the wood products industry lacks the sophistication, especially in terms of technology and digital applications, required to be a successful modern industry. Moreover, they consider it to be reckless and uncaring about the environment, valuing short term profit over longer term resource stewardship. In fact, the wood products industry's image problem has weakened its "social license." A poor image leads to public mistrust that, in turn, encourages the government to intervene with a costly, heavy hand, as the wood products industry is not a designated priority industry under the government's long-term industrial development strategy (MTIB 2019). Therefore, this image problem will also take far more than a clever advertising campaign to reverse it. There is a need for penetrating and substantial reconciliation of science, economics, and public policy, which unfortunately at this point, is not pursued by any of the related timber agencies and trade organizations to make a lasting impact (Ratnasingam 2018).

It appears that the lack of information, transparency, application of good science, and technology have taken a toll on the public perception of the wood products industry, despite the respondents coming from areas with sufficiently large presence of wood products enterprises. To accomplish this reconciliation and shift in public perception, the need for a supportive public policy on the wood products industry is important (FAO 2007; Ranacher *et al.* 2020). The public's negative perception was further heightened when several infection clusters of the COVID-19 pandemic were found in wood products manufacturing companies, which employed many foreign workers (MOH 2020). Furthermore, the method of regulating the wood products industry is cumbersome and inefficient, especially when it deals with unlicensed small and micro-sized operations. The government should therefore establish the public policy framework, define the desired outcomes, and establish a system of independent checks and balances to ensure standards are being met within the wood products industry. A clear communication strategy and free access to information will go a long way in shaping positive public opinion of the wood products industry, rather than simply carrying out clichés and spin doctoring (Mater 2005).

Part V: Motivations of Teenagers to Pursue Further Studies in Wood-Related Programs

The survey results clearly indicated that the younger respondents have a positive view of wood products, but they harbor ambiguous perceptions towards the entire wood products industry. Although they perceive wood products as being stylish, desirable, fashionable, durable, and environmentally friendly, they appear to be skeptical about the industry's claim of being sustainable, a good employer, and environmentally friendly. A similar observation was also reported by Ratnasingam *et al.* (2017). The presence of a large proportion of foreign workers and the ensuing social ills associated with the workforce, also imparts a negative perception of the industry among teenagers. Furthermore, because many companies in the wood products industry are SMEs, they offer limited career growth opportunities for these teenagers and even fresh graduates (Ratnasingam 2015).

The results of the survey revealed that only 14% of the teenage respondents will consider pursuing a further education program in WST related programs, and this is particularly attributed to prior knowledge of the industry or encouragement from family members and friends involved in the industry. This finding is in line with the trends observed in many of the wood-related programs offered by public universities, where enrollment has been in decline in recent years (Ratnasingam 2018). Figure 8 provides the main reasons cited by the teenage respondents for the limited interests to pursue higher education in the field of WST.
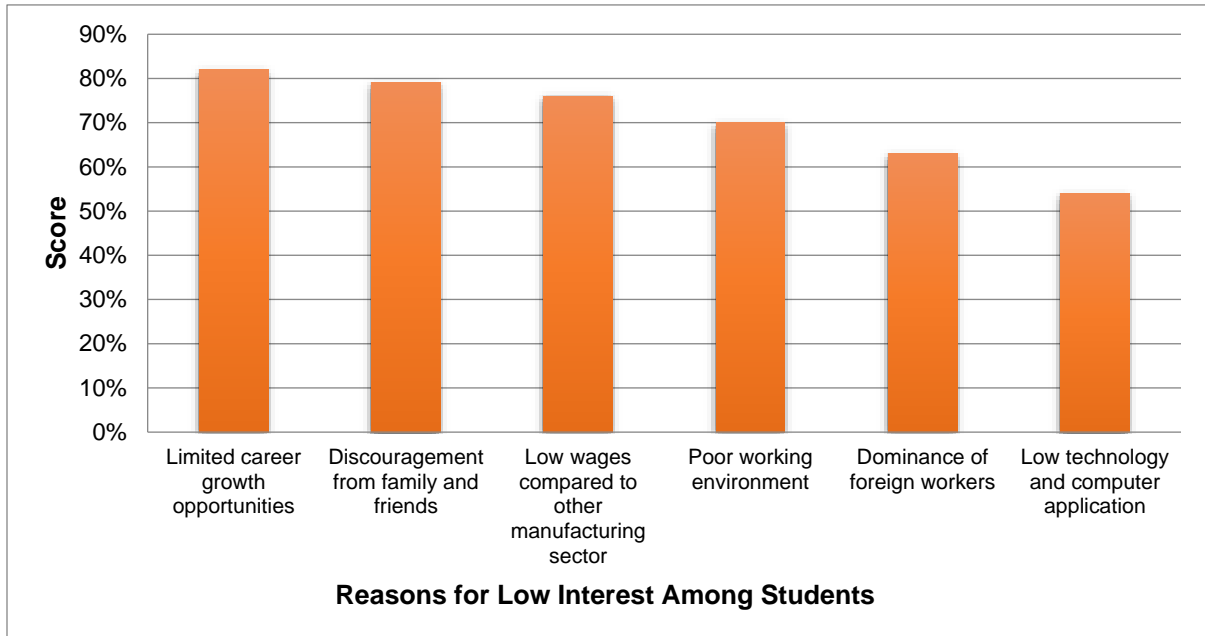
Fig. 8. The reasons for low interests among young adults in WST programs

The survey among teenagers also indicates that most of them do not perceive a career in the wood products industry to be "fashionable," and they would rather enter the "gig economy," which offers a myriad of opportunities related to information and computer technology (ICT) based on start-ups and entrepreneurship. In fact, the findings also suggest that traditional WST programs may no longer be fashionable, and integrated curriculums that incorporate technology, engineering, and computing skills appear to be more desirable in the future. Such narratives were also highlighted in the reports by Ratnasingam (2018) and Ranacher *et al.* (2020), who argued that the traditional WST programs do not seem attractive to the younger generation.

Socio-demographic and psychographic characteristics play a significant role regarding public perceptions of the wood products industry (EC 2002). This study also revealed that the respondent location was not significant, but prior experience and awareness of the wood products industry had a stronger influence on the public perception. The survey finding also suggest that youths in schools or colleges, were mostly unaware of the opportunities in the wood industry, as very little promotional information is passed on to them about the wood industry in the country. In the study by Ratnasingam *et al.* (2014), it was suggested that unless more relevant and accurate information about the forestry and wood industry in the country is made easily accessible to students in schools, the desire to change the overall perception of the industry as a whole may be impaired, if not difficult to achieve. In general, it is obvious that the social acceptance of the wood products industry requires higher awareness, a higher degree of information provision, and greater engagement with the industry (Ranacher *et al.* 2020). Without such efforts, it may be tough to alter the prevailing negative image and perception of the wood products industry in the country, which in turn, may severely hamper efforts to boost and encourage local youths to participate actively in the industry in the future, let alone pursue higher education in this field.

IMPLICATIONS OF THIS STUDY

It must be noted that the number of publications on the public perception of the wood products industry is limited (Baldwin 2004; Mynttinen 2009; Stout 2019; Ratnasingam *et al.* 2020), although there appears to be an increasing number of publications on the public perception of forest and the environment (Ranacher *et al.* 2017a,b). Compared to the previous studies on the public perception about forest products or the wood products industry (Rametsteiner and Kraxner 2003; Rametsteiner *et al.* 2007; Rametsteiner *et al.* 2009), the survey method employed in this study was different. Nevertheless, it must be emphasized that a wide range of different and elaborate survey methods have been used in many of the previous studies. However, some the findings from these previous studies were also confirmed in this study, such as the perception of teenagers and the overall public perception of the wood products industry. While acknowledging the country and regional specific industrial conditions and policy frameworks, this study provided very useful insights into the prevailing public perceptions, beliefs, and the degree of awareness of the wood products industry.

This study reaffirms the fact that it is necessary to communicate to the public the fundamentally important role the wood products industry has in the economy at the national, provincial, and local level, both now and in the future. Communications messages need to stress both the current strengths of industry and address the perceived weaknesses, in terms of industrial management, environmental performance, and the use of advanced technology. The existing gap in knowledge, belief, attitudes, and action of the wood industry has created the need for communication.

Information that is relevant, consistent, clear, continuous, honest, reliable, open, and transparent must be made accessible to the public if the public perception of the wood products industry is to be changed for the better. In the present digital world with easy access to information through social media and the internet, reliable information and experience are important factors to create awareness. Unfortunately, in the case of Malaysia such information about the wood industry is lacking and is somewhat muddled with information about illegal logging and forest encroachment activities (Ratnasingam 2018). As reported by Tindall (2003), it is important to tailor information to the audience that is being addressed. Furthermore, the target audience for the information is also important (Xu and Bengston 1997), as the "disinterested public" is more likely to make more affective judgments (*i.e.* based on emotions) in terms of the overall wood products industry, while the "interested public" may have more informed perceptions, and thus possibly draw positive images of the industry.

Nevertheless, as highlighted by Ratnasingam (2001), the social acceptability of forestry and the wood products industry is driven by information, which is credible, timely, and with a clear link between scientific and other forms of knowledge. Additionally, continuous engagement with the industry that will enhance awareness, shape beliefs, and form positive perceptions among the public is imperative. It must be emphasized that social acceptability is built on perception and public behavior. On one hand, a more passive public may support certain policies and actions, which can produce "social legitimacy" or "social license," where the behavior of industries is seen as "desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions." On the other hand, an active public may be less tolerant to some behaviors of industries, which may be construed as socially unacceptable (Tindal 2003).

This study underscored the importance that members of the public need to have a clear understanding of the wood products industry to make acceptable judgments. The public may

not be inspired to act on behalf of a given alternative, unless they strongly feel it is more acceptable than another (Nijnik 2004; Ratnasingam and Ioras 2006; Stout 2019). Further, it is equally important that youths in schools and colleges are provided with accurate and relevant information about forestry and wood industry, to ensure greater awareness, acceptance, and interests in the industry is instilled among them, so as to encourage greater participation among them in the industry in the long run.

In essence, this study revealed that the wood products industry in Malaysia may continue to be perceived in a bad light without the provision of credible, accurate, and honest information to gain social acceptability and legitimacy to influence the public accordingly. Therefore, increased provisions of information, knowledge, and experience to the public about the wood products industry would also go a long way towards shaping the social acceptability of the forestry sector in the country, as well as pave the way for greater local youth, teenager, and school-leaver participation in the industry.

CONCLUSIONS

1. The public perceives the wood products industry in Malaysia as a low wage-economy, a labor-intensive industry, predominated by foreign workers, and an unsustainable industry in the long-term.

2. The main drivers of the prevailing negative public perception of the wood products industry in Malaysia are the business environment and the workforce characteristics.

3. Although the public have some positive images of the wood products industry, the prevailing negative images outweigh them.

4. Teenagers and school-leavers tend to be less interested in pursuing a career or further studies in wood-related programs due to the perceived limited career growth opportunities, discouragement from family and friends, and the prevailing low wages compared to other manufacturing sectors.

5. To change the public perception of the wood products industry in Malaysia, it is imperative to ensure timely, reliable, and honest information is made accessible at all times to create awareness and build positive beliefs of the industry.

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