

Demands of Globalization on Engineers as Perceived by UNP Engineering Graduates

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Abstract

This study was conducted to find out the demands of globalization on engineers as perceived by UNP Engineering graduates from SY 1975-1999.

Specifically, it aimed to describe the profile of the respondents in terms of year graduated, eligibility, employment, training/seminars attended, and work experience; identify the demand of globalization on engineers; and show the relationship between their profile and the perceived demands of globalization on engineers.

This study employed the descriptive survey design. Data were gathered by the use of questionnaire and an interview schedule.

Frequency count and percentages were used to describe the profile of the respondents. Mean and chi-square test were used to determine the relationship between the respondents profile and the perceived demands of globalization on engineers.

The results of this study revealed that most of the respondents have no other eligibility except for the engineering licensure examination; almost all of them work in the country both in the government and in the private sector; most of them have worked for more than seven years; and majority of the respondents have attended training/seminars in the country.

The respondents perceived that professional engineers who are the key players in the global industry must be engaged with competencies such as communication skills, computer skills, managerial skills, technical and construction expertise, environmental awareness, linkages with other agencies, internationalized engineering curriculum, faculty competencies, and information on new technology so as to be able to compete with their global counterparts. Regardless of their present profile, these competencies strongly contribute to the opportunities and challenges and help engineers meet the demands of the job particularly the delivery of effective and efficient services, quality products and goods and the development of human resources.

Introduction

Engineering is the key to the future. It is the engineers' responsibility to provide society with sustainable development not only on technological but also environmental terms (Griffin, 1996).

Engineers are always instrumental to modern civilization. They invent, design, and build roads, bridges, dams, buildings, computers and other things that make up modern civilization. Today, they are more important than ever because society depends on science and technology to keep it running and become more progressive.

In the Philippines, engineering has many undergraduate programs and large enrolments (Garcia, 2000). On average, some 200,000 young Filipinos enroll in the different engineering courses each school year and some 40,000 individuals graduate yearly (Ramos, 2000). This statistics show that many Filipino youths are inclined to the engineering profession. These aspirants, if given the proper motivation, guidance, educational assistance and training, and development will become competent engineers in the future who will be able to compete with foreign engineers. In fact, there are many foreign engineers who are now working here as consultants, project engineers and managers to big and multi-national projects. This breakthrough creates stiff competition among our local professional engineers.

Engineering graduates are evaluated through the licensure examination for engineers which is administered by the Philippine Regulatory Commission. Upon passing the licensure examination, they become qualified for engineering professional practice. Since global economy is becoming interdependent, the whole world becomes the market place for engineers.

Dumas, as cited by Green, wrote: "Competitors used to be firms down the road, now they are dotted around the globe." Companies have to be world class to compete effectively; so national commercial interests need to be seen in this wider context (Green, 2000).

According to Blas Opie (1997), the global market forces are now in a state of flux. It is therefore necessary for the Filipino manpower to be developed in terms of skill levels to make them competitive both here and abroad.

Global-scale operations have given rise to global-scale concerns such as concern about environment, capital flows, trade practices, human resource development, technical ability and others. So for Filipino engineers to be competitive, they must be fully aware of the nature and scale of these concerns.

The University of Northern Philippines is one of the schools offering engineering courses like BSCE, BSGE, and BSSE. Every year, there are about 100

graduates of BSCE and BSGE. Some of these graduates take the licensure examination for engineers. Upon passing, they join the working force either here or abroad.

The new trends in the engineering practice prompted the researchers to determine the demands of global competitiveness as perceived by the UNP engineering graduates. The researchers strongly believe that the findings of this study play a vital role in the updating and upgrading of the engineering curricula to keep abreast with the fast changing engineering practice.

Statement of the Problem

This study aims *to* find out the demands of globalization on engineers as perceived by the UNP Engineering Graduates SY 1975-1999.

Specifically, it seeks to answer the following questions:

1. What is the profile of the respondents in terms of
 - a. year graduated;
 - b. eligibility;
 - c. employment;
 - d. trainings/seminars; and
 - e. experience?
2. What do the respondents perceive as the demands of globalization on engineers?
3. Is there any significant relationship between their present profile and the perceived demands of globalization on engineers?

Review of Literature

Globalization is the trend associated with countries and organizations tapping into global networks of opportunity in the areas of marketing, manufacturing, finance and education. The global engineer is a key player in this paradigm and contributes directly to issues of product development, world competitive manufacturing and systems engineering. In particular, the global design engineer steps beyond regional role to facilitate the provision of world competitive products and this process requires the broadest possible understanding of international markets, cultures and race (Green, 2000).

Scope and Delimitation

This study was delimited to the perception of the respondents demands of globalization on engineers.

The respondents were the UNP engineering graduates who passed licensure examination from 1975-1999 and are working here and abroad. Eighty questionnaires (80) distributed but only forty-four (44) retrieved/returned.

Significance of the Study

This study is helpful to policy-makers for this may serve as guide in formulation geared towards the enhancement and upliftment of engine curriculum in their attempt to produce competent and quality graduates and engineers as well.

To the administrators, the findings of this study serve as pointers/reference to strengthen, update and revise the present engine curriculum in order to meet and cope with globalization.

To the faculty members, this study provides them insights and awareness how to meet the demands of the industry.

To the researchers, results of this study provide them information knowledge for the enhancement of their competencies to face the challenges new millennium.

To the students, this study gives them awareness of the need for skills global competencies.

Operational Definition of Terms

The following terms are operationally defined as to how they were this study.

Communication skills. This refers to the ability of the respondent communicate in oral, written and computer language.

Computer skills. This refers to the ability of the respondents to operate manipulate and program computers.

Eligibility. This refers to the Engineering Licensure Examination which respondent passed.

As the global economy continues to become increasingly interdependent, a great need for well-trained engineers to cooperate closely with their counterparts. In addition to a solid background in traditional engineering the engineers in the global marketplace will need to have foreign language cross-culture skills, and overseas experience to respond to the growing by the industry (Bauchspies).

In this connection, Michic and Smith (1998) have shown in a report that an important ingredient for achieving competitive success is the establishment of collaboration with other customers, suppliers, high education and so on. Such collaboration allows firms to expand their range of scope, develop specialized products and achieve other corporate objectives. Collaboration is also one of the most important means of fostering innovation and competition in international markets.

In the 21st century, the demand for engineers is not confined to those who possess technical expertise. Worldwide operation of multi-national companies and in telecommunication system create a demand for a "global engineer" who is a technologist and an internationally capable performer across the globe, a designer possessing technical expertise, language skills and cultural insights (Rialubin, 1995).

With the increasing demand for competent design engineers in the highly populated countries such as United States of America, Japan and the United Kingdom, academic institutions in the Philippines must provide their students the necessary attributes of global engineers. Some of the attributes that must be included are creativity, problem solving skills, basic and advanced engineering skills, effective written and oral communication skills, ability to work in a team, computer literacy, willingness to acquire new knowledge and highly ethical (Salazar, 2002).

As competition intensifies, education is required to measure and utilize human resources in order to acquire new skills, new knowledge, and attitudes to meet the demands of the environment. Joel Griffin (1996) acknowledges that it is continuing education and professional development that will ensure the engineering competency and versatility.

Rapid technology and industrialization development require well-skilled knowledgeable human resources. In particular, the development of quality infrastructure projects depends heavily on the availability of professional engineers and technocrats (Rialubin, 1998). Schridan (1993) agrees that an organization must evaluate the agility of its goals and the competitive environment in which it operates. There should be increased emphasis on highly knowledgeable and empowered workers whose talents will significantly increase the organization's flexibility to responsiveness.

Table 1. Distribution of respondents.

PROFILE		Frequency (n)	Percentage	
Year Graduated				
1975-1979		2	4.55	
1980-1984		12	27.27	
1985-1989		12	27.27	
1990-1994		6	13.64	
1995-1999		12	27.27	
Total		44	100	
Eligibility				
Eng'g Licensure Board Exam (RA 1080)		34	77.27	
Eng'g Licensure Board Exam with Career Service		10	22.73	
Total		44	100	
Employment				
A. Category				
1. Local		40	90.91	
2. Abroad		4	9.09	
Total		44	100	
B. Type of Employment				
1. Private		16	31.82	
2. Self-employed		6	13.64	
3. Government		24	54.54	
Total		44	100	
C. Position				
1. Consultant/Mgr./Proj. Supvsr		24	54.54	
2. Estimator/designer/foreman		8	18.18	
3. Other related jobs		12	27.28	
Total		44	100	
Experience		Local	Abroad	
1-3 years		14	0	14(31.82%)
4-6 years		8	2	10 (22.73%)
7 years and above		16	4	20 (45.45%)
Total		38	6	44 (100%)
Training/Seminar				
1-3		12 (31.58%)	4 (66.66%)	16 (36.37%)
4-6		7(18.42%)	1 (16.67%)	8(18.18%)
7 and above		19 (50%)	1 (16.67%)	20 (40.40%)
Total		38 (86.36%)	6 (13.64%)	44 (100%)

licensure exam, no longer took the career service exam while 22.73% of the respondents had a career service eligibility for this is considered for promotion and other future personal purposes.

According to employment, the table reveals that 90.91% of the respondents are working in the Philippines while 9.09% are working abroad. This implies that the respondents like to serve their country and it is very competitive and hard to work **abroad**. The table further shows that 54.54% of the respondents are working in the government, 31.82% are working in private companies while 13.04% are self-employed. The table also shows that 54.54% are already occupying high positions in both government and private sectors, 18.18% work as estimator/designer while 27.28% are not practicing engineers but have opted for other related jobs like teaching.

On experience, it can be seen from the table that 45.45% of the respondents have 7 years and more experience, 22.73 % have been working for 4-6 years while 31.82 are new in the service, having worked for only 1-3 years only. This implies that about half of the total respondents have more length of service which influences the performance of an employee and is considered as strong points in hiring/selection of new personnel.

On trainings/seminars, 86.36% of the respondents attended trainings/seminars conducted in the country while 13.64% have already attended international trainings/seminars. Out of the 86.36%, 50% have attended 7 or more trainings/seminars. This indicates that the respondents believe that the attendance to trainings/seminars is an important factor in their professional growth. They would like to upgrade their ability to organize, to plan, to measure and to achieve better results in quicker time. Many new workers increase their productivity by learning new skills and perfecting old ones while in the job. And more importantly, training consciousness is the most infallible sign of dynamism in an organization.

Perception of Respondents on the Demands of Globalization on Engineers

This section provides the result of the respondents' perception on the demands of globalization on engineers as presented in the table below.

The table shows that the respondents perceived all the items as very much needed factors for them to compete globally except communication skills and linkages with other agencies which were perceived to be moderately needed.

The perceptions of the respondents on the different items were analyzed singly and the results are presented in the succeeding tables.

Table 2. Level of perception on the demands of globalization on engineers.

ITEMS	Mean (a)	Description
1. Communication Skills	3.43	Moderately Needed
2. Computer Skills	3.58	Much Needed
3. Managerial Skills	3.84	Much Needed
4. Technical Expertise	3.925	Much Needed
5. Environmental Awareness	3.81	Much Needed
6. Linkages with other agencies	3.44	Moderately Needed
7. Internationalizing the Eng'g Curriculum	3.912	Much Needed
8. Faculty Competencies	3.92	Much Needed
9. Keeping abreast with new technologies	3.93	Much Needed
Average	3.754	Much Needed

Range	Description
3.501–4.000	Much Needed
2.501–3.500	Moderately Needed
1.501–2.500	Fairly Needed
1.000–1.500	Not Needed

The level of perception of the respondents on communication skills as a demand for global competitiveness is presented in the Table 2.1.

Table 2.1. Level of perception on communication skills as demand of globalization on engineers.

Communication Skills	Weighted Mean (O)	Verbal Description
a. Oral proficiency in English	3.795	Much Needed
b. Written proficiency in English	3.75	Much Needed
c. Oral proficiency in other foreign languages	2.68	Moderately Needed
d. Written proficiency in other foreign languages	2.73	Moderately Needed
e. Computer graphics	3.65	Much Needed
f. Good character and working attitude	4.0	Much Needed
Average	3.43	Moderately Needed

Table 2.1 shows that the respondents perceive communication skills as a moderately needed factor for competing globally. However, areas like oral and written proficiency in English, computer graphics and good character and working attitude have been perceived by them to be much needed. As for oral and written proficiency in foreign languages, the respondents rated them moderately needed. Although the respondents may think that the ability to communicate in other foreign

languages may be a plus factor in their job, their proficiency in the English language is already enough.

The level of perception on computer skills as a demand for global competitiveness is presented in Table 2.2.

Table 2.2. Level of perception on computer skills as a demand of globalization on engineers.

Computer Skills	Mean (D)	Description
a. MS Word	3.64	Much Needed
b. Computer Aided Engineering	3.89	Much Needed
c. Windows Excel	3.66	Much Needed
d. MS Power Point/Auto CAD	73.77	Much Needed
e. STAADS. Microstation and Math CAD	3.60	Much Needed
f. Intergraph	3.50	Moderately Needed
g. Internet Access	3.0	Moderately Needed
Average	3.58	Much Needed

The respondents perceive computer skills in general as a much needed factor for them to compete globally as shown by the weighted mean of 3.58. Moreover, the respondents think that all areas in computer skills except intergraph and access to Internet are very much needed in their job. This indicates that the respondents expedite their work and become productive.

The level of perception on managerial skills as one of the demands of globalization on engineers is shown in Table 2.3.

Table 2.3. Level of perception on managerial skills as a demand of globalization on engineers.

Managerial Skills	Mean (C)	Description
a. Leadership	3.89	Much Needed
b. Time Management	3.86	Much Needed
c. Communication	3.91	Much Needed
d. Ethics and Culture	3.61	Much Needed
e. Planning, Organization and Staffing	3.78	Much Needed
f. Financial and Resources Management	4.0	Much Needed
Average	3.84	Much Needed

It can be gleaned from Table 2.3 that all the areas/qualities under managerial skills have been perceived by the respondents as much needed factors in their job as engineers. Since most of the respondents are already occupying top positions, then they need all these qualities to be able to manage their people. This

signifies that they are able to cope with demands, new problems and new challenges.

Table 2.4 shows the different areas under technical expertise which the respondents perceive as much needed qualities for them to be competitive in the engineering field, here and abroad.

Table 2.4. Level of perception on technical expertise as a demand of globalization on engineers.

Technical Expertise	Mean (̄)	Description
a. Estimating	3.97	Much Needed
b. Designing	3.95	Much Needed
c. Supervising	3.93	Much Needed
d. Consultancy	3.84	Much Needed
e. Constructability	3.86	Much Needed
f. Flexibility attitude	4.0	Much Needed
Average	3.925	Much Needed

The table shows that all the items on technical expertise are much needed. This proves that engineers should have enough skills and knowledge in order to come up with quality infrastructure projects. In effect, they become competitive and productive.

Table 2.5. Level of perception on environmental awareness as a demand for globalization on engineers.

ENVIRONMENTAL AWARENESS	Mean (x̄)	Description
a. Ability to assess impact of project on the environment	3.95	Much Needed
b. Know how on the formulation of mitigating means	3.86	Much Needed
c. Ability to coordinate with government offices	3.40	Moderately Needed
d. Conservation and economics	4.0	Much Needed
AVERAGE	3.81	Much Needed

Table 2.5 shows that the respondents perceive environmental awareness as one of the much needed factors for global competitiveness. The areas under environmental awareness are perceived to be much needed in the engineering field except the ability to coordinate with government officials, which is moderately needed. This implies that the respondents do not see yet the importance of coordinating with other government officials in the preservation of the environment.

The respondents perceive linkages with other agencies as a moderately needed factor shown by the weighted mean of 3.44 in Table 2.6.

Table 2.6. Level of perception on linkages with other agencies as a demand of globalization on engineers.

Linkages with other Agencies	Mean (x)	Description
a. OJT before graduation (internship)	3.68	Much Needed
b. Networking of School with		
1. Entemrises	3.14	Moderately Needed
2. Government agencies	3.55	Moderately Nccdd
3. Private Finns	3.40	Moderately Nccdd
Average	3.44	Moderately Nccdd

Although the respondents perceive **OJT** as an important factor, networking of school with other enterprises, government and private agencies were rated moderately needed. This implies that the respondents are not aware of the relevance of the school's networking with other agencies in their chances to get a job.

In Table 2.7, the respondents' perception on the factor internationalizing the engineering curriculum is presented.

Table 2.7. Level of perception on internationalizing the engineering curriculum as a demand of globalization on engineers.

Internationalizing the Eng'g Curriculum	Mean (C)	Description
a. Updating and upgrading the existing curriculum	3.95	Much Needed
b. Upgrading the Eng'g lab and equipment	3.93	Much Needed
c. Procurement of the Eng'g technology	3.95	Much Needed
d. Revision of the Eng'g curriculum	3.73	Much Needed
e. Research	4.0	Much Needed
Average	3.912	Much Needed

Table 2.7 shows that the respondents perceive internationalizing the engineering curriculum as a much needed factor in the ability to compete for jobs here and abroad as shown by the weighted mean of 3.912. All the areas under this item have also been perceived to be much needed. This implies that the respondents acknowledge the importance of constant updating/revision of the engineering curriculum and the use of up-to-date lab equipment and technology in sustaining the engineering competencies and versatility.

Table 2.8. Level of perception on faculty competencies as a demand of globalization on engineers.

Faculty Competencies	Mean (a)	Description
a. Attending relevant seminars and trainings both local and international	3.84	Much Needed
b. Pursuing higher studies along the field of engineering	3.95	Much Needed
c. Use of latest trends, teaching methodology and strategies	3.91	Much Needed
d. Integrating ethics along Eng'g practice and education	3.81	Much Needed
e. Continuous education	4.0	Much Needed
f. Construction methodology awareness	4.0	Much Needed
Average	3.92	Much Needed

The level of perception of the respondents on faculty competencies as a demand for global competitiveness garnered a weighted \bar{x} of 3.92 indicating that it is a much needed factor as gleaned from Table 2.8. It can also be seen from the table that all the areas under faculty competencies are also perceived to be much needed for global competitiveness implying on the respondents' familiarity of the role of their mentors in preparing them for the field which they have chosen.

Table 2.9 presents the perception of the respondents on keeping abreast with new technologies as a demand of globalization on engineers.

Table 2.9. Level of perception on keeping abreast with new technologies as a demand for global competitiveness.

Keeping abreast with new technologies	Mean (x)	Description
a. Familiarizing and manipulating new engineering tools	3.93	Much Needed
b. Ability to understand and apply new problems	3.89	Much Needed
c. Awareness in practical and good construction	3.91	Much Needed
d. Awareness in roads, bridges, ports and harbors	4.0	Much Needed
Average	3.933	Much Needed

The respondents perceived keeping abreast with new technologies as a much needed factor for engineers in their field of work.

It can also be seen from Table 2.9 that all the areas under this item are also perceived to be much needed in their field. Since the respondents are in the

technical field then their responses indicate that they are aware of the fact that they have to be always familiar with the development of new technologies to be competitive.

Relationship Between the Profile of the Respondents and their Perceptions on the Demands of Globalization on Engineers

It can be gleaned from Table 3 that only the variable on eligibility yielded a significant relationship with the respondents' perception on computer skills and internationalizing the engineering curriculum while the other variables namely; year graduated, employment, experience and training did not yield a significant relationship with the respondents' perception on the demands of globalization on engineers such as communication skills, computer skills, managerial skills, technical expertise, environmental awareness, faculty competencies and keeping abreast with new technologies.

Table 3. Relationship between the respondents' profile and the perceived demands of globalization on engineers.

PROFILE	Com. Skdls	Comp Skits	Mgt Skdls	Techl Eperise	Entel Wareness	Linkages w/ Oher gencies	Inting the Eng'g Cu.	Faculty Compel-liveness	Keeping Areast w'New Technologies
Year Graduated	1.39	6.10	.964	2.85	359	13.01	346	4.63	27
Eliaability	0.2	10.65°	1.55	297	1.22	2.34	7.68	297	45
Employment									
Category	.171	55	1.46	.41	1.12	1.94	75	80	58
Type of Employment	39	2.56	2.05	252	.832	6.59	55	1.66	1.59
Position	4.74	6.41	1.35	324	1.13	3.43	28	3.52	1.82
Experience									
Local	1.15	211	25	3.60	4.50	898	75	942	20
Abroad	29	5.97	89	1.35	1.39	37	37	1.91	2.43
Training									
Local	4.36	2.11	1.0	381	95	5.56	1.29	124	1.63
Abroad	1.57	20	.59	1.2	89	5.78	1.02	95	.75

The findings imply that the growth of human knowledge has been so rapid that it is no longer possible to know all or even one of the major sciences. In this regard, the computer is useful as an extension of man's mind to perform "routine" mental work of handling data, recalling data, performing numeric operations on data and arranging data into patterns.

Engineering education plays a very important role in the technological and economic development of any nation. Aware of this fact, engineering educators all over the world are constantly adding reforms in their curricula to keep pace with the ever advancing technology. Hence, there is also a need for the Philippine engineering educators to internationalize the curriculum to enable all engineering graduates to acquire the necessary knowledge, skills, and technical know-how needed by engineers. Engineers who graduated from UNP have found work not

only in the country but also in other countries. And before they are accepted to work they have to pass the examinations or obtain eligibility. This is the reason why the engineers have a common perception that internationalizing the engineering curriculum and computer skills would make them more competitive in the global market for engineers.

Summary, Conclusions and Recommendations

Findings

From the data generated and analyzed, the following are the highlights of the findings:

1. The Profile of the Respondents

On Year Graduated. Out of the 44 respondents, 12 graduated in the year brackets 1980-1984, 1985-1989 and 1995-1999; six in year bracket 1990-1994 and two in year bracket 1975-1979.

On Eligibility. Of the 44 respondents, 77.27% passed only the Licensure Examination for Civil Engineers and the others 22.73% passed both the Licensure Examination for Civil Engineers and the Career Service Examination.

On Employment. 90.91% of the respondents are working in the Philippines and 9.09% work abroad.

Of the 44 respondents, 54.54% are working in the government sector, 31.82% work in private agencies while 13.64% are self-employed.

Twenty-four or 54.54% are occupying the position of consultant/manager/project supervisor, 18.18% work as estimator/designer/foreman and 27.28% are employed in other related jobs.

On Experience. There are 5.45% of the respondents who have seven or more years experience, 22.73% have 4-6 years experience and 31.82% have only 1-3 years experience.

On Trainings/Seminars. Of the 44 respondents, 86.36% have attended local/national trainings/seminars and 13.64% have attended international trainings/seminars.

There are 40.40% who have attended seven or more trainings/seminars, 18.18% have only attended 4-6 trainings/seminars and 36.37% have attended 1-3 trainings/seminars.

2. The Perception of the Respondents on the Demands of Global Competitiveness

The respondents perceive the following items as much needed factors for global competitiveness: computer skills, managerial skills, technical expertise, environmental awareness, internationalizing the engineering curriculum, faculty competencies and keeping abreast with new technologies.

The moderately needed factors for global competitiveness as perceived by the respondents are communication skills and linkages with other agencies.

3. The Relationship between the Profile of the Respondents and Perceptions of Engineers on the Demands of Global Competitiveness

Only eligibility and the respondents' perception on communication skills and internationalizing the curriculum yielded significant relationship when tested and analyzed using the X' test.

Conclusions

Based on the findings of the study, the following conclusions are drawn:

1. Majority of the respondents are working in the Philippines
2. Majority of the respondents are working in the government sector and most of them are occupying top positions
3. Majority of the respondents have attended local/national trainings/seminars
4. The respondents perceive the following factors as much needed factors for global competitiveness: computer skills, managerial skills, technical expertise, environmental awareness, internationalizing the engineering curriculum, faculty competencies and keeping abreast with new technologies.
5. Significant relationship exists only between eligibility and perception on computer skills and eligibility and perception on internationalizing the curriculum.

Recommendations

1. The UNP administration should provide more computers and other updated technology for the engineering students and faculty as well. They should motivate and support their human resources by sending them to relevant trainings/seminars for higher quality education. With these programs/measures, our engineering graduates and faculty are able to enhance their competencies to become productive and competitive.

2. Engineering curriculum should always be updated, revised, upgraded and internationalized according to the demands of time particularly the demands of engineering practice and profession in order that our product engineers will be equipped with necessary knowledge, skills and proper attitudes. Furthermore, on-job-training (OJT) should be offered/included in the course as early as possible as a response to the demands of the engineering profession.
3. It is highly recommended that our product engineers should pursue masteral degree and attend conventions and trainings relevant to their profession/work so as to have managerial knowledge and skills and technical expertise in order to achieve effectively and efficiently the organizational and individual goals and objectives.
4. Awareness on environmental conservation should be enhanced so as to know the mitigating measures and impact on the environment whenever a structure is built or constructed.
5. It is also recommended that there should be a follow-up study.

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