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Change Space for Green Production in Vietnam: The Case of Brick Production

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Abstract

Green production of bricks need to be promoted to reduce greenhouse emission gas. Nevertheless, best practices of green brick production are being slowly adopted by local brick producers. The paper discusses the emerging adaptive leadership theories for environmental sustainability. A qualitative study employing tools of change space analysis and stakeholder analysis revealed localized barriers to green production. Overall, it is hard to change traditional production processes in all firms. But there is increasing demand for this change from environmental and social consumers and governments are committed to this cause. A strategy for institutional collaboration with identified priority partners has been drawn up to integrate best practices with local knowledge and initiatives for sustainable production.

Keywords: Sustainability; Greenhouse gas emission; Change space; Green production; Stakeholder analysis.

1. Introduction

1.1. Background

High-carbon industries including traditional brick production are attributed to emitting large volume of carbon dioxide, worsening greenhouse gas (GHG) problems, leading to global warming and negatively impacting human health, livelihoods and environment. To curb carbon dioxide aims to achieve some key sustainable development objectives of the United Nations. One of the UN global ambitious targets for sustainability is net zero emission of greenhouse gases. Businesses must share responsibilities to achieve this target. Three of UN Global Compact Ten Principles are directly about business responsibilities towards environment: to take precautionary approach to environmental challenges (Principle 7), promote greater environmental responsibility (Principle 8) and to diffuse environment-friendly technologies (Principle 9). According to a report by Yale University, poor air quality was responsible for 10% of all global deaths (about 5.52 million) and over 3.5 billion people - half of the world's population – are exposed to unsafe air quality (EPI, 2016). In the context of Vietnam, due to increasing production volume to meet growing population, air pollution and carbon dioxide emissions are getting worse. Vietnam ranked 131 out of 180 participating countries, worse than many regional countries (EPI, 2016). In 2012, Vietnam's government approved the country's National Green Growth Strategy with the goal of reducing greenhouse gas emissions and boosting growth in "green" sectors. Vietnam is committed to an 8 percent reduction in emissions by 2030 compared to a business-as-usual scenario, with the potential to increase this to 25 percent, conditional upon international financial and technical support (UNDP, 2013). By 2030, the target should have reduced GHG emission by 20%-30% and by 2050 this annual target should be 1.5-2% (UNDP, 2013). Among the efforts to curb the carbon dioxide, the solution of low-carbon production is being focused because it is easier to control than other solutions. Traditional brick production in Vietnam is considered as a high-carbon industry, which emits too much carbon into the atmosphere and needs to be transitioned to energy efficiency or low-carbon (Hoa, 2012). The traditional brick-making industry in Vietnam has been polluting the environment because it has consumed too much coal and firewood emitting carbon dioxide and flue gas hence environment-unfriendly traditional brick kilns should be replaced with a greener production process (Jensen, 2004); (Le and Oanh, 2010); (UNDP, 2013). "Average emission factors per 1,000 bricks were 6.35–12.3 kg of CO, 0.52–5.9 kg of SO2 and 0.64–1.4 kg of particulate matter (PM) … Simple kiln technologies used for brick firing and the lack of emission control devices often result in a large amount of released air pollutants" (Le and Oanh, 2010), p. 381).

1.2. Challenges to Non-Fired Brick (NFB) Production as Green Practice in Vietnam

The demand for construction brick in Vietnam, of which over 87% was fired clay brick (FCB), has steadily increased approximately 6 percent per year since 2005 (UNDP, 2013). The fired clay bricks (FCBs) and standard brick units (SBU) were estimated to consume about 2.2 million tonnes of coal equivalent (tce) per year or an annual emission of 6 million tonnes of CO2 into the atmosphere (UNDP, 2013). Vietnam needs to transform polluting fired brick-making technology into cleaner non-fired brick (NFB) technology. The Prime Minister's Decision No. 121/2008/QD-TTg in this programme, the share of NFB production is targeted to increase between 20 and 25% by 2015 and up to 40% by 2020 and all traditional FCB making plants will be gradually replaced by NFB production facilities (UNDP, 2013). Decision No. 1469/QD-TTg dated August 2014 on the master plan for building materials to 2020 and orientation to 2030 provides specific requirements in capacity, technology and even energy performance for development of brick products as follows:

- No investment in traditional brick kiln, continuous vertical shaft brick kiln, Hoffman kiln using fossil fuels (coal, oil, gas).
- Encouraging investment in large size fired brick, high porosity to save natural resources and reducing environmental pollution. Investment in non-fired brick production with high automation and energy savings.
- Investment in fired brick kiln must be aligned with local master plan on construction materials and raw materials.
- Current tunnel kilns must improve production to reduce consumption of materials, fuels, saving natural resources.
- Encouraging investment Southern provinces in tunnel kiln using rice husk and wood saw dust.
- Provinces and cities at national level must develop a pathway to stop production of traditional kilns, improving traditional kiln by 2016, of continuous vertical shaft brick kilns, brick dome with fossil fuels by 2018 and depending on the local situation, it is encouraged with production of non-fossil fired brick domes (deadlines of 2017 and 2020 are applied for mountainous provinces).

1.3. Research Questions

The implementation of NFB production in Vietnam progressed behind the planned schedule (UNDP, 2013). According to a UN report, the targets were not achieved mainly due to under-budget issues and low demand for new brick-making technologies over the traditional ones. This paper focuses on the analysis of customer-related issues in accepting the green product by illustrating the application of the model of Problem-Driven Iterative Action (PDIA) for change space analysis. This paper aims to answer the following questions: Where do we have large change space for green brick production? How do we build change space? What is the strategy for institutional collaboration to integrate best practices with local knowledge and initiatives in the brick sector?

2. Literature Review

2.1. Planetary Boundaries, Consumerism and Sustainable De-Growth

The current concepts of planetary boundaries of the Earth System set a limit on human activities as “safe operating space” of the Earth, which should not be surpassed to ensure sustainable development (Stockholmresilience.org (Producer), 2017). The concept of planetary boundaries is the foundation for explaining the emergency of constraining environmental-unfriendly industrial production. The planetary boundaries set a "safe" distance from a dangerous level, which means that if human production operations within these limits, the Earth is safe. Otherwise, if human-made activities are beyond those boundaries, our planet will suffer deleterious change (Rockstrom *et al.*, 2009). Researcher proposed seven planetary boundaries including climate change, ocean acidification, stratospheric ozone, biochemical nitrogen cycle and phosphorus cycle, global freshwater use and land system change. For example, in terms of climate change, the boundary is that carbon dioxide concentration in the atmosphere should be less than 350 ppm (Rockstrom *et al.*, 2009). The UN Global Compact Ten Principles called stakeholders including businesses to be responsible to environment and actively participate in achieving the UN Sustainable Development Goals in both developed and developing nations (Rockstrom *et al.*, 2009) (UNDP, 2013). Researchers at Yale University waved a red flag or high alert on the current issues that will hamper global efforts to achieve the Sustainable Development Goals (EPI, 2016). These threats directly endanger our planet's ability to develop within planetary boundaries. Specifically, among nine planetary boundaries, three in danger are intensified greenhouse gas emission, converted to carbon dioxide, loss of biodiversity (loss to ecosystems, including loss of species, and their habitats), and nitrogen overload (due to overuse of nitrites and nitrates from agricultural activities which negatively impact the water quality) (Theis and Tomkin, 2015). (Rockstrom *et al.*, 2009) argues that intensified production reflects the requirement of supplies to meet the growing demand due to increasing population and the intensification accounts for environmental problems and without being controlled, it will infringe “safe operating space”.

Increasing population generates larger demand for consumables and under the economic perspective more supplies should create to meet the demand. The dominant neoliberalism advocates the economic paradigm which favors more, not better, consumption (Martínez-alier *et al.*, 2010). Uncontrolled consumerism entails the overuse of fossil fuel and excessive input materials for production for consumers. These activities are fair for economic growth but not sustainable in terms of environmental and social dimensions. Incessant supplies for economic and production activities to meet consumerism are in need of numerous volumes of inputs such as energy. Recent studies have showed that growth-related factors have impact on energy shortage crisis (Qureshi *et al.*, 2016). However, if too much electric energy from non-renewable sources is used for economic growth, it will surpass the “safe operating space” of the Earth system and our planet will be in danger. A proposed solution to the growing threat to planetary boundaries due to increasing consumerism is to scale down global economic growth or de-growth for sustainability (Martínez-alier *et al.*, 2010). A new idea is proposed to shift growth towards sustainable de-growth which refers to "smaller economy with less production and consumption"(Martínez-alier *et al.*, 2010). This new movement not only looks at a problem in the perspective of ecological economics but also in the lens of human and social ecology. A society of de-growth could be construed as that "built on quality rather on quantity" (Martínez-alier *et al.*, 2010). For example, selective green brick production will be a better practice for users and makers.

Nevertheless, the solution of economic de-growth faces the debates. The cons hold that de-growth implies GDP reduction, which is not prioritized by growth-thirsty nations to create income and employment for their citizens. In

the case of brick production, traditional brick industry creates income for many unskilled local workers in rural areas. Removal of polluting brick kilns means zero income-generating activities in those production facilities. Consequently, to some extent brick industry contribution to national income decreases. As workers at rural traditional brick kilns are normally unskilled, it would be hard for them to seek another job.

2.2. Concept of Change Space

The foundation to analyze change space was laid by the contingency thinking approach. A contingency thinker believes that no practice is best in all contexts because local environmental factors affect the effectiveness of adopting a best practice or technique. In the field of management, an effective decision made by a leader should be subject to the capability of his subordinates, their willingness and situational urgency. A contingency or situational leader should allow for a participative consultation process if his staffs are capable and willing to get involved in the decision-making process, of course if the decision time is not urgent and space change is big enough. This approach is different from the classical top-down approach whereby strategic objectives are hard to be changed and all operational decisions should be strictly aligned with previously-designed objective. An example of top-down approach is that if a strategic objective is to promote green production through reduction of carbon dioxide in traditional brick production, a best practice of green brick production will be introduced and a number of policies and projects to adopt this good practice will be planned. Differently, adaptive leadership will not regard a single practice as a solution. Rather they just put it as one of many feasible candidates of local interventions, so that they will test them in many iterations in the real environment until it has proven valid for practice. This process is called Problem-Driven Iterative Action (PDIA) (Andrews *et al.*, 2016).

2.3. Framework for Adapting a Best Practice

Figure 1 describes a framework for a development practitioner to position a practice and take appropriate steps as change space analysis.

Figure-1. Framework for adapting a practice

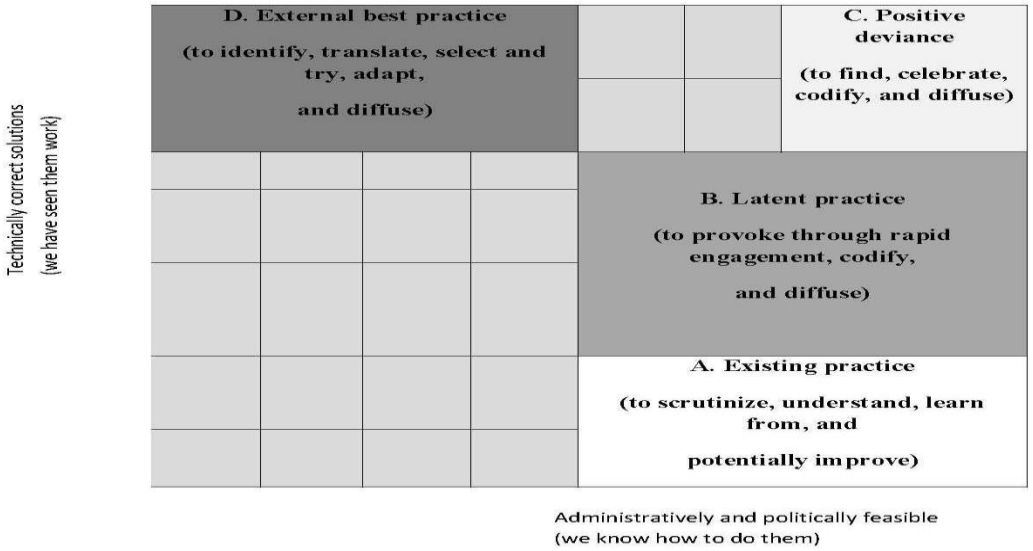


Figure 1 shows "design space" based on the two dimensions: technical and administrative/political feasibility. It also sequences the process for the design space, where "existing practice" knowledge, denoted as "A", for an intervention is high but technically it has not yet been proven feasible elsewhere, therefore reliance on local experience is a "find-and-fit" strategy for change agents through "empowering" local people.

Area "B" of the Figure 1 is for the situation where state institutions have capacity to solve the problems and there are some potential solution alternatives. The fit strategy is to engage stakeholders to have more "focused attention" (Andrews *et al.*, 2016). Change agents do not need to solve broad problems widely. Rather, they can pay a focal attention to an area of the problem where some initial steps of problem have been done so that results can be quickly achieved. The tools of "Rapid Result" interventions can be applied in this category of contexts.

For Area "C" of the Figure 1, a development idea has been locally practiced, which means that change agents have known how to do it, and its implementation results have proven positive, which means that the idea is technically correct. In a development context which is dominated by a majority of defective or negative cases, a few good cases are positive "deviant" cases. Andrews *et al.* (2016) illustrated the concept of "positive deviant" with an example of a family with no infant dying young in a community where all other households suffered infant mortality. This positive case needs to be investigated for good practice in nourishing and looking after the infants so that success factors can be celebrated, codified and diffused to other community or broader areas.

Area D of the Figure 1 is about the possibility for an external best practice to be selected, experimented, adapted and used in a locality. It is based on the idea that no single best practice from different contexts is correct in local context. Therefore, external best practices can be listed, evaluated according to local criteria, tested in the field before a decision is made to use it.

3. Methodology

3.1. Problem-Driven Iterative Adaption Approach

The qualitative analysis approach for this study employs Problem-Driven Iterative Adaption Approach to analyze change space and stakeholders. Table 1 compares and contrasts the traditional mainstream top-down and the PDIA processes.

Table-1. Comparison between classical and emerging leadership frameworks for development projects

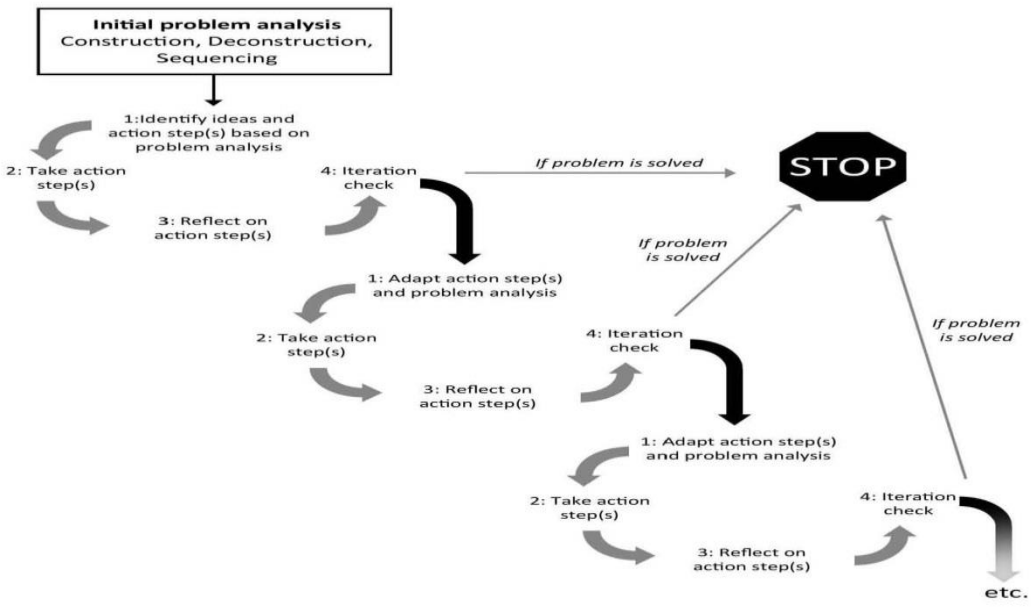
Mainstream Development Process (Projects/Programs/Policies)	Problem-Driven Iterative Adaptation (PDIA)
Top down	Bottom up
Lower-level operation plans in alignment with organizational strategies	Lower-level operations plan adapted to local contexts
Best practices are normally used to solve problems	Best practices should be used in combination with local complex dimensions.
Specialists from institutions study and decide on a solution for the problem before any intervention	Experiment iterations to search for "technically viable solutions to locally perceived problems"
Normally a well-defined problem	Numerous problem ideas identified
Steps are well designed before implementation	Iterative steps progressively to the "real solutions" to emerge
Slow for any adaption	Flexibility in design for easy adaption to the design of any intervention

The mainstream process has been followed by institutions to develop state capability through development programs and projects. Essentially, under this approach development institutions such as the World Bank (WB), the International Monetary Fund (IMF), the World Trade Organization (WTO) are inclined to promoting priori arrangements they regard as "inherently desirable" for emulation (Rodrik, 2008). In alignment with the mainstream process, specialists in development formulation and design are responsible for defining problems, designing interventions and constructing monitoring and evaluation systems. For example, in the designing phase of a development project they set up logic framework, a.k.a. Log frame, for very well-defined objectives, outcomes and outputs, together with means of verification and assumptions. This mainstream design is based on the result or objective-based management perspective and robust for subsequent monitoring and evaluation purposes. Differently, the PDIA approach does not require a project designer to define a solution for a problem right at the initiation phase of the project. Rather, multiple solution options need to be presented in the early stage and through an experimental process of "find-and-fit", a best solution for the local condition is proposed. This iterative experimental process is illustrated as a diagram in Figure 2.

3.2. PDIA Steps

Figure 2 shows the PDIA process beginning from "initial problem analysis" until final "problem is solved".

Figure-2. The process map for PDIA



One of the advantages of the emerging PDIA is that it allows for design flexibility in that a problem must be eventually solved. It means that multiple solutions can be used in a context until that problem is solved. In addition,

the PDIA highlights the importance of "problem analysis" by constructing, deconstructing and sequencing techniques. This paper is following the following sequence for problem analysis: 1) Construct the problem out of a condition; 2) Deconstruct the problem using the fish-bone tool; 3) Change Space Analysis; 4) Stakeholder Analysis and 5) Stakeholder Strategy

3.3. Data Collection

Evidence used to illustrate the steps of the PDIA process is extracted from official reports by donors such as UNDP, bilateral donors.

For the stakeholder analysis, the author mainly used the sources from official and well-known news media, most of which was translated into English from Vietnamese.

4. Application of PDIA Model: a Case of Brick Production

4.1. Constructing a Problem

Considering environmental threats, statistics show that poor air quality caused 5 times more global deaths than unsafe water. Specifically, in 2013 poor air quality accounts for 10% of all global deaths (i.e. 5.52 million) while unsafe water for only 2% of global deaths (1.24 million) (EPI, 2016). According to Andrews *et al.* (2016), issued by Yale University, Vietnam ranks 131 out of 180 participating countries, which is worse than other countries in Southeast Asia. Specifically, its Biodiversity and Habitat scored 40 out of 100; Air Quality 40 out of 100; Forests 20 out of 100 (Andrews *et al.*, 2016). The Goal No. 3 on Good Health and Wellbeing of the Sustainable Development Goals (SDGs) set targets to reduce death and illness from poor air quality, e.g. respiratory diseases. The Goal No. 11 of the SDGs on cities and the Goal No. 12 on responsible consumption and production also mention air quality (UNDP, 2013); (YCELP, 2016) . To resolve the air quality problem, it requires the engagement of the State, bilateral and multilateral donors, private donors, companies, communities, consumers. Specifically, companies need to adopt environment-friendly production practices. Emissions from traditional polluting factors are worsening the problem. Consumers need to have awareness to use green products. Donors provide funds for advocacy activities. Among these stakeholders, poor people are most vulnerable to poor quality air as the diseases will burden financial hardship of treatments. If products are cleaner from all processes of production to consumption, air pollution will be reduced, contributing to human health improvement.

4.2. Fishbone Diagram

Based on secondary data from media in Vietnam, the author was able to identify key causes to the problem of slow adoption of green product. Some excerpts are as follows:

"*To transition production model is easy but it is very difficult to change the consumption behavior. Ordinary-class non-firing bricks usually do not meet the requirements of consumers. High-class non-firing bricks have high price." Mr. Hoang Van Long, the Director of Cau Ho Brick and Tile Company in Ha Tinh Province*"[1].

"*In recent six years there have been many policies promulgated but their implementation in practice has not been as expected, not yet "reached" enterprises. In some provinces managers and professionals still do not understand all advantages of non-fired materials and documents from the Central agencies, so it is difficult to use non-fired materials in real life", Mr. Kieu Van Mat, Board Director of Song Da Cao Cuong JS Co., a flagship in producing non-fired bricks from waste*.[2]

[1] http://baohatinh.vn/cong-nghiep/xoa-lo-gach-tuynel-can-lo-trinh-ben-vung-bai-cuoi-n
[2] https:// w ww.tienphong.vn/kinh-te/gach-khong-nung-chinh-sach-nhieu-nhung-khong-thuc-hien-duoc-1163141.tpo

Figure-3. Fishbone Diagram for Slow Adoption of Green Products

4.3. Change Space Analysis

Table-2- Change Space Analysis

Cause 1	**Slow adoption of green brick production practices**	**Level**	**Reasons/Assumptions**
How much authority do you have to address this cause?		Medium	We as end consumers of products and services may decide to buy environment-friendly products or green services or not. However management of the firms have stronger power to select green practices or not. New green practices require high investment capital, and imply technological risks, therefore top managers may not follow them if they prioritize cost reduction.
How much acceptance do you have to address this cause?		Medium	Pro-environment consumers accept green ideas applied in production and services. Top companies are flagships of this movement. But limited knowledge, awareness of green concepts, together with individual consumption attitude (e.g. price sensitivity, perceived suspicion of utility of green products) may lead to slow acceptance of this initiative.
How much ability do you have to address this cause?		Low	Even though we know the necessity to follow best green practices, it depends on other stakeholders, e.g. institutional capacity
Describe your overall change space		We know best practices in green production. Research and development of this practice is being implemented and put into operation by top firms. Select a typical industry (e.g. brick production) because it generates carbon dioxide harming human health.	

5. Conclusion

As the main purpose of this work is to illustrate the application of Problem-Driven Iterative Action Approach to improve change space for development projects, the results identified are only related to customer perspective. Donors' development reports indicated other barriers to green brick production adoption which include implied social costs in case of eliminating traditional brick kilns, lack of detailed legal frame for the use of non-fired brick practices, lack of the quality of non-fired bricks, limited institutional capacity to implement relevant development programme, lack of finance for this practice investment, especially for small-and-medium sized enterprises.

5.1. Recommended Strategy for Growing Change Space

In the short term, we can increase our space of change by providing awareness enhancement campaigns for consumers with hope that they accept more green products. We will provide evidence from previous studies on how more profit comes together with more green practices. Business will then accept these new practices if they know

they can generate financial returns. We will also look for green and cheap techniques and have experts introduce them to firms. We can ask our university rector to prioritize research projects on green production and introduce experimental outputs to local firms. In the long term, we will establish a green production consultancy center. We will ask for some seed fund from supporting financial institutes and green venture capitalists. Local firms that come to us for green adaptation will receive technical assistance and some initial starting fund. A network with big corporation with best practices will be established for knowledge sharing purpose.

5.2. Recommended Strategy for Stakeholder Collaboration

The following table shows a possible strategy for stakeholder management.

Table-3. Stakeholder Management

Stakeholder	Importance (from power/matrix)	Current attitude	Desired attitude	Type of participation
Brick production kilns	Close engagement/manage closely	Neutral	Very positive	Interactive participation
Provincial Department of Science and Technology	Keep informed	Neutral	Positive	Passive participation (they have too many other concerns, so they have limited interest in the project)
Provincial Department of Industry	Empowerment/keep informed	Neutral	Positive	Passive participation (it has to report to provincial authority on industry advances so it needs to be informed on the project)
Donors	Close engagement/manage closely	Positive	Very positive	Participation through materials, cash or labour
Research institutes/universities	Empowerment/keep informed	Neutral	Positive	Participation through consultation The innovation research institutes do not have power on the project but they have interest in green initiative projects. Therefore it is necessary to have them informed. Also, the project needs to consult them for insight in the field.
Local sustainable business coalition	Empowerment/keep informed	Neutral	Positive	Participation through consultation. This coalition advocates green initiatives but it does not have any power on the project. The project may consult it for some technical reports. They may have high interest in project accomplishments

5.2. Recommended Strategy for Institutional Collaboration

Based on the stakeholder analysis, the green production project must be planned to collaborate with Department of Industry. The reasons include that they have a high level of interest in the project initiative accomplishments even though they do not provide resources for the project. However, we want to work with them to introduce contextualized best practices of greener brick production so they can replicate success models for brick production industry in the province and hopefully share them with other provinces. With this collaboration, the impact of the project would be of more spillover effect.

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