

Article

Challenges for Integrating Strategic Environmental Assessment to Enhance Environmental Thinking: A Case Study of Taiwan Energy Policy

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Abstract: There is an increasing need to evaluate environmental impacts at higher policy planning levels, especially after the European Union (EU) strategic environmental assessment (SEA) directive proposed in 2001. However, integrating SEA and policy planning processes is challenging owing to institutional challenges and/or political problems. We aimed to explore the challenges of this integration process through in-depth interviews with core stakeholders in Taiwan energy policy making. Our results reveal three main types of challenge related to policy planning, SEA implementation, and difficulties in dealing with environmental issues. The first includes the policy planning model, transparency in the policy planning process, and controversial issues clarification; the second includes the different types of SEA purposes, unclear feedback on policy planning, and public participation limitation; the third includes a lack of knowledge of brokerage processes, scientific uncertainty, the role of the Taiwan EPA (TEPA) for environmental thinking, and the influence of local information in policy planning. The results of this study can be applied to countries that use impact-oriented SEA (currently the most common type of SEA) and consider environmental issues during the energy policy planning process.

Keywords: strategic environmental assessment; energy policy; environmental thinking

1. Introduction

1.1. Strategic Environmental Assessment in Energy Policy

Traditionally, the core objective of energy policy is to provide sufficient electricity, resulting in a focus on economic and energy issues. With the rise of environmental awareness, there is increasing consideration of clean energy technologies, energy saving, and pollution mitigation measures during policy planning. Energy transition with the 3E objective (economy, energy, and environment) has become a major goal of energy policy making in many countries [1,2]. Hence, the integration of environmental thinking into the policy planning process and making energy policy more sustainable are key challenges for decision makers [3]. Therefore, the assessment of impacts on the environment, economy, and society is required to facilitate the planning process. Many countries have set up environmental impact assessments (EIA) and strategic environmental assessment (SEA) as regulatory tools for considering environmental issues and evaluating environmental impacts. EIA is particularly useful for evaluating the construction of facilities involved in energy supply because it is designed for evaluating potential impacts at a project level. However, EIA cannot solve the cumulative effect problem [4]; furthermore, at higher or national levels of planning, it is difficult to integrate EIA into the decision-making framework [2]. Therefore, the application of impact assessment methods should be considered at higher levels of policy, plans, and programs.

SEA is used to enhance environmental thinking at plan and program levels [5], or during the policy planning process [6,7]; it can help decision makers integrate environmental and other policy issues. At the end of the 1980s, the term, SEA, appeared formally [8]. Later, during the 1990s, SEA entered an expansion stage [8,9]. Since 2010, because the United Nations Economic Commission for Europe Protocol on SEA (UNECE) has been entered into force, SEA may be more popular in Europe [10,11]. At the same time, some research has started to explore the limitations and challenges when applying SEA into policy planning [6,12–14], with an aim to better understand whether SEA can bring environmental benefits to current decision making or not.

Presently, SEA has significant potential to enhance environmental thinking in policy planning, but this potential has not yet been fully achieved [11]. The challenges can be categorized according to the following aspects: Policy planning, complexities in environmental issues, and the SEA operation process. Regarding the complexities in environmental issues, as described by Kuldna et al. [15] and Sheate and Partidário [16], the knowledge exchange function in the SEA process is important. The impact assessment function should integrate not only the information provision, but also the substantial influence of knowledge on the policy planning. Besides, the definition and the operation of sustainability in the SEA process is still in the vague stage [14]. Regarding the policy planning limitations, Kørnøv and Thissen [17] pointed out that the current rational policy planning process is very limited in its capacity to solve complex policy problems, and suggested collaborative planning or deliberative democracy in the planning process. Dalkmann et al. [18] proposed the analytical strategic environmental assessment (ANSEA) framework and developed process criteria to integrate the concept of decision windows. Slunge et al. [19] also emphasized the importance of a decision window, and attempted to achieve this concept by understanding the policy planning process, determining environmental priorities, and strengthening public participation and their representatives. Bonifazi et al. [20] stated that democracy, exemplified by aspects, like public participation, public empowerment, SEA purpose, intra-generation or inter-generation fairness, and inter-departmental or intra-departmental cooperation, is important in the policy planning process. About SEA operation, there are some key limitations. The integration of SEA and policy planning has been studied by [21–23]. Lobos and Partidário [24] explained that different stakeholders have different views on the aspects of SEA, such as SEA purpose, SEA effect on policy planning, and the focus of impact assessment. These differences arise mainly from the traditional rational planning approach [24]. Polido and Ramos [25] emphasized that the scoping step is the most important step in the SEA process. However, the scoping step is not currently very effective, especially for the communication and public participation in this step. After the SEA application, the SEA effectiveness should be explored. Therefore, through understanding the challenges of current applications, the SEA can indeed help the policy planner to integrate environmental thinking in the future.

1.2. Research Goals

Our main aim was to assess whether the present SEA practice can enhance environmental thinking in energy policy, within current Taiwan political and decision-making contexts. Different nations may face unique challenges, and the empirical experience may be helpful to future SEA application.

The aim of this study will be achieved by the evaluation of the SEA applied to energy policy in Taiwan through the in-depth interview method. Compared with questionnaires, in-depth interviews can obtain responses with individual differences. Moreover, this method is suitable for exploring the attitudes, values, and motivations of respondents [26] as well as questions related to “why”, but not “how many” [27]. In Section 2, the energy policy is briefly described, including policy goals and different alternatives, and the conceptual framework for environmental thinking. In Section 3, we present the methodology, including the interview selection process. In Section 4, we describe the results; finally, the discussion and conclusions are described in Sections 5 and 6.

2. Background

2.1. Taiwan Energy Policy Planning

The Taiwan Environmental Protection Agency (TEPA) has formulated SEA regulations, and lists the types of policies to which SEA should be applied to assess environmental impacts. Energy policy is one such policy. SEA gives the government the opportunity of focusing on environmental issues, which was not an aspect previously focused on by the policy planning unit. This was the first time that SEA was applied to the national energy policy; the starting year was 2007. However, the Fukushima nuclear disaster in 2011 altered the public view on nuclear energy, and on energy planning as a whole. Hence, the Energy SEA was withdrawn and returned to the Energy Bureau in 2011. Although the old Energy SEA case in 2007 was withdrawn [28], the Energy Bureau prepared a new energy policy during the tenure of the Kuomintang (KMT) government (2012–2016) [29]. In this study, we explore the energy policy in this later period.

The policy planning experts of the Energy SEA case include the Energy Bureau, Industrial Technology Research Institute (ITRI), and Taiwan Research Institute (TRI) groups. The design of alternatives, including the decisions related to the application of economic development, energy security, and environmental protection principles (3E principles) to the alternative goals, is led by the Energy Bureau and TRI groups. This principle is regulated in the Guideline on Energy Development. ITRI experts were responsible for the prediction of future GDP and the installed capacity of power using the energy model. The information provided by ITRI experts would be checked and discussed by the Energy Bureau and TRI. The preliminary Energy SEA report was completed in 2015. After that, a public communication meeting took place in December 2015. The meeting was open to the public, who were allowed to state their opinions or ask questions.

Taiwan's energy policy goals are based on the 3E principles [30]. The objective of Alternatives 1 and 2 relate to a nuclear 4 crisis; the design of Alternatives 3 and 4 is based on economic considerations; and Alternatives 5 and 6 consider the greenhouse effect.

Alternatives 1 and 2 were designed to solve the nuclear crisis, with a plan to decrease dependency on nuclear power in the coming year. Under this plan, nuclear 1, 2, and 3 will not have their life spans extended; the difference between the two alternatives is whether or not nuclear 4 will operate. Nuclear 4 has almost been completed, but its safety is doubted by some ENGOs and by the general public. The planning considerations in Alternatives 3 and 4 are rooted in the economic aspects, and aim to decrease power generation costs. Therefore, installed capacity will be mainly composed of traditional energy (e.g., coal-fired power) to meet the electricity gap. Finally, environmental goals are also considered; the goal of Alternatives 5 and 6 is to achieve the lowest possible carbon emissions; hence, the addition of a renewable energy supply, increases in natural gas power installed capacity, and no new building of coal-fired power plants. Reducing carbon emissions is relevant to the trans-boundary issues of climate change and global warming. The relationship between global warming and energy is very close; in particular, coal-fired power has the highest carbon dioxide emissions among energy technologies [31]. The descriptions of the six alternatives are explained in Tables A1–A3.

The following lists four policy goals and six alternatives. Alternatives 1 and 2 belong to policy goals 1 and 2, respectively. Given its controversial nature, nuclear power development will be decided via a referendum, and Alternatives 3 and 4 have the same goal: “Minimize the cost”. The goal of Alternatives 5 and 6 is to “achieve the lowest possible carbon emissions”.

Alternative 1: *Steadily reduce the role of nuclear power: Reduce dependence on nuclear energy and gradually build a nuclear-free homeland.*

Alternative 2: *Become a nuclear-free nation: Build a nuclear-free homeland by 2025 (discontinue building of the fourth nuclear power plant, and decommission the first, second, and third nuclear power plants).*

Alternative 3: *Minimize the cost of electricity generation: Decrease the cost of electricity generation, and include four nuclear power plants.*

Alternative 4: *Minimize the cost of electricity generation: Decrease the cost of electricity generation, and have no nuclear power plants.*

Alternative 5: *Achieve the lowest possible carbon emissions: Decrease carbon emissions and include four nuclear power plants.*

Alternative 6: *Achieve the lowest possible carbon emissions: Decrease carbon emissions and have no nuclear power plants.*

2.2. Impact-Oriented SEA

In most SEA cases, impact-oriented SEA is very common [32]. This kind of SEA process starts with screening, which refers to the determination of the need for SEA. The next step is scoping, where the main purpose is to create a discussion arena at the beginning of the formal impact assessment to discuss evaluation methods, categories, and indicators. This is the key step and represents the core evaluation basis [25]. After that, a preliminary impact assessment is completed by environmental experts, socioeconomic experts, and energy experts (in this case) on the scoping basis. Finally, in Taiwan, public communication meetings are held to announce the SEA report, including the alternatives, and the evaluation results. Different public participation methods are implemented, depending on the regulations prevailing in the nations concerned.

The above SEA process is based on the rational logic design [33], which is currently applied in most SEA cases. The key purpose of impact-oriented SEA is to provide the impact assessment results so that the policy planner can select the most environmentally friendly alternative. The core consideration for rational logic is that policy planners believe that they have enough scientific information [34] to make good decisions. The key problems are thought to be clear, and decision-making or objectives planning depend on the few experts and objective information. In other words, the rational planning process is simple, linear, and usually does not involve people and experts from a wide variety of fields. The policy planning process suffers from low transparency, so that information input cannot be provided by the public. Kørnøv and Thissen [17] also argued that a rational policy planning model is not applicable when dealing with multiple values or diverse opinions.

The above impact-oriented SEA process is more suitable for SEA cases that have clear and simple policy goals [33,34]. Policies that have high social consensus, similar values, and low risk of conflict can be developed by these rational or expert methods [33,34]. Therefore, the policy goal does not need to be further clarified. The preliminary decision of environmental evaluation categories, and methods can be decided in the scoping step. However, if the policy goal is uncertain, and cannot achieve consensus or encompasses different values, the effectiveness of impact-oriented SEA may be limited.

Besides, this kind of impact-oriented SEA process design cannot be easily integrated into the policy planning process [25]; it can only improve the provision of scientific information for decision makers, allowing them to evaluate the results for different alternatives. However, it cannot further influence or strengthen the policy planner's environmental thinking on the policy planning process. Environmental thinking is not one of the important elements of the entire policy planning process, and the policy planner does not regard the environmental issues or problems as being necessary to the goal forming process.

Therefore, to proactively strengthen the environmental thinking in policy planning, some literature suggests that the SEA process should be integrated into the policy planning process in the beginning, and should focus not only on the impact assessment step, but also the policy planning step. The integration of the two process is the key factor influencing SEA effectiveness [10–12,14,22,23].

2.3. Strategic-Oriented SEA

Therefore, the concept of strategic-oriented SEA has been proposed, with the suggestion to integrate more environmental thinking into policy planning, and strengthen both direct and indirect SEA effectiveness [20,22]. This kind of SEA focuses more on the policy planning process [19,21]

and the integration process [23], and aims to make policy planning more strategic [24]. The main transformation compared with impact-oriented SEA is that the environmental effects should be part of the policy planning composition; furthermore, some studies have concluded social and economic issues are also considerations that should be covered [35,36]. This strategic feature leads to a more flexible and integrated SEA process, and attempts to achieve environmental goals and strategies by various strategic methods. Hence, such a form of the SEA process may not necessarily have a fixed process [7]. Different types of policies, and different policy planners, may need to apply different method types to complete the purpose according to the context. The SEA process should be designed to accurately reflect the SEA purpose, so communication is important [11]. For this, more integrated, institutional, and strategic-oriented methods are needed [7].

Noble and Nwanekezie [32] further believed that strategic-oriented SEA can be divided into two types: Strategic-futures and strategic-transitions. The application of the second may influence the present political context, or governance institution, which is beyond the scope of a single government department. These challenges are interconnected with the strategic features of SEA, which may be huge and hard to overcome; nonetheless, SEA operators must clarify them.

Although the strategic feature means that SEA places a greater emphasis on policy planning, there are currently few applications of strategic-oriented SEA. One reason is that a more strategic-oriented SEA process is more flexible and open [37], and this may lead to unclear operation for policy planners and SEA operators. Currently, most SEA regulations belong to the impact-oriented type, which is more convenient for policy planners to follow. Although Noble and Nwanekezie [32] and Partidário [38] stated that this operation may result in SEA only ensuring compliance with current legislation or providing information about the potential impacts, most SEA applications are indeed of the impact-oriented type. However, for most policy planners, who need to know how to apply SEA in a short timeframe, the actual SEA guidebook and regulations are important.

Another reason may be that strategic-oriented SEA represents a transition, as compared to impact-oriented SEA, which is multi-level and complex. This transition concerns not only the impact assessment methods, but also the institutional environments [37,39], governance [40], decision systems, and communication ways [41]. This change may not be achievable in a short time. In Partidário's [42] opinion, this gap may need more empirical cases to facilitate strategic thinking in SEA. However, a more practical approach could involve by starting to provide SEA practitioners with the various methods and tools necessary for guidance regarding different SEA purposes [32]. For different policy and SEA purposes, SEA practitioners need to understand the advantages and limitations of various types of SEA, and apply them suitably.

Two types of SEA will make an extremely significant difference in the SEA process design and the importance of policy planning in the whole SEA process. The differences in the nature of the two types of SEA will strongly influence environmental thinking in policy planning. The more strategic type of SEA may bring a different direction for the impact-oriented nature to find a current limitation. However, the strategic-oriented type of SEA is still evolving, and needs to be discussed further through case study analysis.

2.4. SEA Operation

In the SEA operation process, in addition to the limitations of policy planning, public participation is another challenge in current SEA operation.

In impact-oriented SEA operation, the scoping step is very important [25]. Scoping is the beginning of the connection between the SEA process and policy planning. Also, the scope of the impact assessment, categories, and indicators are developed in this step [34]. Finally, public participation begins to enter the SEA process in this step, including stakeholders and experts [34]. In other words, scoping is the basis of the impact assessment in SEA, and it is a good time point to provide the environmentally relevant feedback from the public. Communication and public participation are essential to increase the effectiveness of scoping [25].

However, according to the survey of 20 SEA cases from Polido [25], the current scoping effectiveness is limited. Especially for the communication and public participation function, the application of consultation tools, stakeholder engagement, and contributions from participants are not present in reports. This is also supported by [43], who found that current public participation in scoping, especially that of the lay public, is very limited. Overall, the current SEA process includes the public participation process; however, the current public participation effectiveness is not obvious [44]. The influence of public participation on the plan or program is limited.

The relationship between environmental problems and public participation was highlighted by [45]. According to Bond et al. [46], greater public participation is needed for pluralism, and to integrate different framings of problems. For environmental assessment purposes, O’Faircheallaigh [47] and Rega and Baldizzone [44] both explain the benefits of information collection via public participation. This benefit is important in the SEA scoping step. For the substantive effectiveness of public participation [48], information and knowledge is the main contributor to better decisions [47,48]. Local environmental information could be provided by local public to fill information gaps. Experimental and value-based knowledge is also needed to complement the limitations of expert knowledge [49,50]. To increase environmental thinking in policy planning, the current SEA process should incorporate public participation and improve the efficacy of public participation.

2.5. Environmental Issues

2.5.1. Complexity in Environmental Issues

The current meaning of sustainability is not clear, and stakeholders have different views on this subject. There are two trends of explaining sustainability, which are the three pillar approach and the integrated concept of sustainability [51,52]. The former is the common understanding of sustainability [52], which considers the environmental, social, and economic aspects separately in the impact assessment process. However, some advocates reject any trade-off between natural resources and other socioeconomic objectives [26,53], and believe that sustainability should involve integrated and system-based thinking [35]. Gibson [36] also proposed the integrated principles of sustainability for sustainability assessment.

In addition to the fact that its definition is broad, the actual operation of sustainability in SEA is ambiguous [14]. Policy planners and SEA practitioners seem to not know how to operate sustainability in SEA [14]. Some studies have designed sustainability evaluation frameworks to assess the sustainability of current SEA applications. Lamorgese and Geneletti [54] applied seven evaluation principles for analyzing the sustainability of 15 SEA cases in Italy. These sustainability principles were modified based on Morrison-Saunders and Hodgson [55] and Gibson [36] to include a very broad definition of sustainability. However, some studies suggest that the inclusion of too many sustainability aspects in the SEA process may influence or decrease the proportion of environmental thinking in the policy planning process [35,56].

Should sustainability be integrated into the economic, social, and environmental aspects? Or is it essential to emphasize the environmental aspect first? This kind of challenge may have different answers depending on different policy purposes and the discussion of the stakeholders. We agree with [14], and Wu and Ma [30] also suggested that the integration of policy planning and SEA is essential, and the purposes of SEA and policy need to achieve a consensus in the beginning of the SEA process. For the impact-oriented SEA, because this SEA process is isolated from policy planning processes, environmental or sustainable thinking may not have a chance to be discussed and agreed upon by SEA and policy planning units. Strategic-oriented SEA has potential to gather environmental or sustainable views and reach a consensus, because this type of SEA emphasizes the integration of the policy planning process into SEA.

2.5.2. Institutional Challenge

The relationship between the institutional constraints and environmental thinking has been proposed [57]. For example, the government lacks a willingness to integrate environmental thinking into the policy planning process. In addition, in many SEA cases, policy planners only regarded SEA as the regulation needed for operation. Hence, they do not make good use of the environmental integration effectiveness of SEA. Li et al. [58] also emphasize that the environmental protection agency in China faces challenges because its voice and power are smaller than those of the economic development units. These institutional challenges do not occur in short time-frames, and are closely linked to the specific context of each nation. They are difficult to transform in the current political context.

Fischer [59] states that the established routine be changed and the attitudes or perceptions may change through interactive public participation. Jha-Thakur et al. [57] also stated that interactive learning is the basis to facilitate the above opinions. Also, Jha-Thakur [57] and Stinchcombe and Gibson [60] suggested that the continuous improvement of decision-making and the enhancement of learning at the individual and organizational levels are the two important elements to integrate environmental thinking into policy planning. Double loop learning is a concept of organizational learning. It refers to the fact that adjustments to governance factors behind the action will be made after mistakes have happened. For example, the culture or the strategy will be drastically changed. Therefore, the learning process in the SEA process is key to radical change of institutional constraints.

The connection between substantive change and public participation has also been discussed in terms of the knowledge brokerage concept [15,16], which emphasizes the importance of the transformation of information to knowledge. The core function of knowledge brokerage is to facilitate the knowledge transfer and exchange among stakeholders. Hence, SEA has potential to be a platform for this function [15,16]. Pure environmental information collection is meaningless to the policy planner, because information should be further transformed to environmental knowledge. Additionally, knowledge is key to influencing the policy planner to integrate environmental thinking into the policy goal. The transformation process of information to knowledge is important to cause a change of attitude of the policy planner. The methods for this knowledge brokerage process proposed by [16] need extensive public participation. For example, regional workshops, strategic options discussion, and trust development need to be conducted. Two-way communication is important in the public participation process [6,30]. Through a good learning process, public participation will lead to a substantive quality change of policy and social choice [61,62].

Previously, the evaluation of good public participation in the policy planning process is of the democracy and empowerment [63], but Fiorino and Laird [64] thought the “group learning” should be considered. Furthermore, Webler et al. [63] defined learning to be social learning and emphasized the importance of communication and interaction in the social learning process. From the above point of view, the effectiveness of public participation in policy planning is influenced more by the “people”, especially communication and social learning effects.

3. Methods

The purpose of this study was to analyze the main challenges of environmental thinking in policy planning. Following the conceptual framework, the environmental thinking challenges in the energy policy case can be explored from the view of the policy planning process, SEA operation process, and environmental issues. We wish to investigate what happened in the policy planning process and SEA process, which cannot be explained easily in the formal SEA report. In a semi-structured interview, the questions can be changed according to the individual experience of each participant. Thus, semi-structured interviews can involve more complicated research questions [65].

According to the description from Kuzel [66], we decided to use purposive sampling and the snowball method to select case studies and identify suitable interviewers. Usually, qualitative research

is focused on information richness, but not on representativeness. Hence, while only one case study can be used, the emphasis is placed on in depth purposive sampling [67].

Through an in-depth interview, the policy planners and SEA operators, including the Energy Bureau, ITRI, and TRI units, were asked questions around policy planning, environmental thinking, and SEA operation. Further, semi-structured interview questions were applied, which is more open compared to questionnaire surveys. Hence, the interview question outline was sent to the interviewees before the formal interview.

After the preliminary interview with the core policy planners, we focused on the “energy issue”, which is the most controversial issue in this SEA case. Therefore, we interviewed the three ENGOs, including “The Society of Wilderness”, “Green citizens’ Action Alliance”, and “Nuclear Myth Busters”. The reason we interviewed these three groups is that they all had attended the SEA scoping or public consultation meeting. Besides, these organizations have been concerned about energy issues for a long time in Taiwan, and they own different advocates for different energy path directions. The Green citizens’ Action Alliance tends to oppose nuclear energy, the Nuclear Myth Busters embrace nuclear power, and The Society of Wilderness is neutral to nuclear power. Hence, it is suitable to question them regarding the energy controversy in policy planning based on different views. At the same time, because this case is in an integrated area, including energy, law, SEA, social science, and the environment, experts from these areas were also interviewed for the three parts of the conceptual framework. The environmental expert is a member of both EIA and SEA committees; hence, this expert was familiar with the SEA process. The SEA expert was a scholar, who had operated in a Taiwan SEA case before. The other two were law experts, who have focused on the SEA field.

Finally, because the environmental thinking improvement also involves institutional challenges, we focused on the different governmental departments’ opinions of SEA, environmental thinking, and policy planning. These departments include “Industrial Development Bureau”, “Institute of transportation, Ministry of Transportation and Communications (MOTC)”, and Taiwan Environmental Protection Agency (TEPA). The interview outline also followed the conceptual framework, and was adjusted for the interviewees’ experience. We interviewed the consultation company, Unitech Engineering Corporation, which helps the government to operate SEA processes in many cases. Hence, this company has a complete and clear view of cooperation experience with the government.

We operated the second round of interviews with the interviewee of the Energy Bureau, and TRI experts. We wanted to explore whether the learning effects are achieved from the main SEA operator and policy planner, because they have implemented this case for many years.

Core stakeholders in the energy policy SEA were interviewed (Table 1), including participants in the policy planning and scoping steps. The interview time was 30 min to 2 h, according to the situation. Semi-structured interview questions focused on the planning process of energy policy, the purpose and understanding of SEA, environmental thinking in the policy planning process, the challenges of considering environmental issues, communication and cooperation between government officials, public participation in SEA, and major challenges of current SEA regulation.

Table 1. Stakeholders interviewed in this research.

Government (n = 5)	ENGOs (n = 4)	Consultation organization (n = 6)	Experts (n = 6)
1. Energy Bureau	1. The Society of Wilderness	1. Industrial Technology Research Institute (ITRI)	1. Energy
2. Industrial Development Bureau	2. Green citizens’ Action Alliance	2. Taiwan Research Institute (TRI)	2. Law (2)
3. Institute of transportation, Ministry of Transportation and Communications (MOTC)	3. Nuclear Myth Busters	3. Unitech Engineering Corporation	3. Environmental
4. Taiwan Environmental Protection Agency (TEPA)			4. SEA
			5. Social science

In the interview data analysis stage, we first made verbatim drafts from interview audio files; second, we then used verbatim coding to analyze the interview data. This coding step is important in qualitative analysis [68]. The analysis required the review of each set of notes, and the extraction of meaningful data. Meanwhile, the relationship between the cutting parts was kept. In other words, the analyst distinguished and linked the information in the coding step. We used template analysis in

the coding step, which is more open-ended compared with a quasi-statistical analysis style and can be modified after reviewing the text [69]. The template in this research was derived from participation observation experience, SEA literature, and the preliminary interview content.

4. Results

By following the conceptual framework in Section 2 and template analysis with the interview data, the interview results of challenges for integrating environmental thinking into energy policy can be classified into three aspects. The first deals with challenges in policy planning, which is addressed in Section 4.1; the second involves SEA operation, addressed in Section 4.2; and the third deals with difficulties in dealing with environmental issues, addressed in Section 4.3.

4.1. Policy Planning

4.1.1. Rational Policy Planning: Narrow Environmental Goals and Consideration of Alternatives

Through experts' discussions at the beginning of the policy planning stage, including TRI, Energy Bureau and ITRI, alternatives 1–6 were designed to meet three kinds of policy goal needs.

In the current 3E goal design, environmental considerations in the alternatives have been given the same weight as other aspects. The main policy goal planners, TRI and the Energy Bureau, do not emphasize the importance of environmental issues, nor design goals with more environmental thinking. Interestingly, after the policy objectives were planned, we interviewed experts in TRI, who thought that policy objectives could be integrated into environmental design in the future, including human health and ecosystem considerations. TRI experts thought that it is too narrow for current environmental thinking to cover only the carbon emission issue; however, in Taiwan, many people are concerned about PM 2.5 particulates and fear that they will contract respiratory diseases. The human health goals can be improved through policy design in future SEA. TRI interviewees also believe that other environmental expertise units (e.g., the TEPA) can aid in the policy planning process. Our interview results reveal that the TRI believe that the present expertise in the policy planning process is insufficient; however, they did not try to find a way to persuade the Energy Bureau to make improvements in the policy planning process.

Based on the interview data, the TRI, ITRI, and Energy Bureau are not aware of the importance of cooperation with other experts during the policy planning process. However, they believe that the policy goal could be integrated more with environmental thinking. Currently, there is no discussion of environmental goals in the energy policy, and the decision of policy goals is not open to the public or even other environmental experts. One TRI interviewee noted that, if the Energy Bureau could cooperate with the TEPA, there would be numerous environmental goals in the energy policy goals. The other ITRI interviewee thought some environmental issues belong to cross-generational issues, and this kind of issue should be open and decided by more lay public.

4.1.2. Transparency in the Policy Planning Process: Uncertainty of Maximum Renewable Energy Production

Presently, to encourage maximum renewable energy development, the upper limits of renewable energy production are addressed in each alternative. However, numbers relating to capacity are doubted by ENGOs. An ENGO said that:

"This number is hard to predict, and different methods may have different answers I think the strange is that the foreign report is written in a range, but our report lists a fixed number. This is that I don't understand and is very funny. Because my expertise is mechanical engineering, I know that this thing in nature is not a fixed value Instead of telling a fixed value, it's better to tell the range. This way makes everyone accept it."

Although the numbers are assured by government officials, how they were obtained is not described clearly in the Energy SEA report [29]. In the report, the installed capacity description of renewable energy is a fixed number for future years. One TRI interviewee said that “more resources invested can drive the growth of renewable energy; therefore, the fixed amount of renewable energy production is somewhat strange”. Because renewable energy involves local land resources, and a natural system, one NGO interviewee suggested it is necessary to cooperate with NGOs in the policy planning process.

4.1.3. No Suitable Approaches to Address Controversial Issues

Nuclear energy is a highly controversial issue in Taiwan, and one that is difficult to discuss using the rational evaluation or negotiating method employed in the current impact-oriented SEA process. In addition to public pressure, the influence of other parties and Executive Yuan is substantial. The Executive Yuan is the highest administrative organ of Taiwan, so it has a leading role in national policy. If the political authority of the Energy Bureau is low compared with other departments, then political decisions may be made prior to expertise-based decisions during the SEA process.

The six current alternatives include four policy goals: “Steadily reduce the role of nuclear power”, “Become a nuclear-free nation”, “Minimize the cost of electricity generation”, and “Achieve the lowest possible carbon emissions”. The first two came about by the political will of two different parties in Taiwan: KuoMinTang (KMT) and the Democratic Progressive Party (DPP). The most significant difference between them is the understanding of the future role of nuclear energy in Taiwan. The DPP believes that nuclear power plant 4 should not be operated and that nuclear plants 1–3 should be phased out entirely by 2025 because of the possible nuclear disaster risk. According to DPP policy planning logic, natural gas power plants can provide more electricity, replacing nuclear power in Alternative 2. KMT agrees with DPP that nuclear plants 1–3 should be phased out, but nuclear plant 4 can be operated when safety is ensured. Policy goals 1 and 2 are based on planning carried out by KMT and DPP separately. The other two goals stem from the Energy Bureau and from experts and were designed for the purpose of solving the nuclear energy dispute.

Currently, the environmental impact can only be evaluated after the policy objective is decided on by the government’s direction (e.g., the nuclear power direction) through scoping. This leads to a limited range of environmental impacts, and cannot influence policy objectives. Feedback of environmental information and impacts to the decision maker is weak, because the government deems some energy issues too controversial to be discussed in detail during the SEA process. These issues are not purely energy or environmental issues, but also political issues. In the absence of consensus, the alternatives have been decided on by just a few experts. Presently, the future of nuclear power cannot be decided based on electricity provision, the nuclear waste problem, or cross generational justice in the policy planning process, because of the political context influencing energy policy planning and the SEA process. Some interviewees believe that environmental thinking cannot be thoroughly evaluated because it depends on the influence of the political context on policy.

4.2. Strategic Environmental Assessment Operation

4.2.1. Different Types and Purposes of SEA

We found that different stakeholders with different SEA purposes pose another challenge. For energy government officials, the SEA is an impact-oriented SEA that focuses on the impact assessment results of each alternative. Listing many alternatives in the SEA report is unnecessary, because it is believed that it will confuse the lay public, who do not know which policy goal is better or which is the main policy direction of the government. In their opinion, decreasing the environmental impacts of the alternatives after the policy is completed is the purpose of the SEA. However, for NGOs, the purpose of the SEA is to become a platform on which to discuss energy policy, propose opinions, and determine the most sustainable solution.

One SEA expert stated that the current SEA process in Taiwan focuses more on the “policy impact” definition, and less on the strategic role of SEA. This interviewee emphasized the nature of “integrated assessment” and the “strategic role” of SEA. SEA should be proactive in the policy direction of Executive Yuan. In other words, SEA should be integrated into the higher level of governance, and provide an important strategic direction. Therefore, SEA could provide more opportunities to break through the political context, and influence policy planning from the beginning.

In his opinion, SEA should be more connected with the other government departments, and concern the governance institution. This idea is also supported by Monteiro and Partidário [40], because the policy formation and the integration process are embedded in the governance system.

4.2.2. Unclear Public Participation Feedback to Alternative Planning in Current SEA Implementation

Public participation in SEA mainly occurs during two stages: SEA scoping and public communication meetings. IAIA [70] suggest that feedback is one of the key elements to increase SEA effectiveness. In our case study, we found that public participation in SEA encourages greater stakeholder engagement and verification of the energy policy and related environmental impacts. However, the institution is not complete enough to prompt feedback to the policy design.

According to some NGO interviewees, they are often not satisfied with government feedback, especially in the policy planning design; furthermore, they do not believe the government to be sincere. ENGO said:

“What I care most about last year’s scoping, many of the advice I suggested are technically perfunctory. I said that although this policy is for energy development, I regard energy conservation and energy management as one kind of the alternative in energy development planning. Energy development is not only considering the power generation, but also considering energy conservation and management. Obviously, the last scoping meeting was welcoming, but this suggestion is not considered to put it in. I think this is actually finding the answer in the small pool, rather than finding answers in the vast ocean.”

Another interviewee thought that landscape is a key issue in Taiwan, and national land planning should be integrated into policy planning. Land resources should be verified to decrease the risk during energy transition. In particular, renewable energy sources (e.g., geothermal energy, solar energy, and wind energy) require large amounts of land resources. Overall, many scoping participants proposed opinions about the policy, but not the evaluation categories or indicators. Clearly, the time and agenda-setting of scoping cannot fulfill most participants’ demands, and the government is not aware of the different purposes of public participation among the participants.

Another interviewee also raised the problem of the government’s response in public consultation meetings: “Usually the rank of government officials sent to respond is not sufficient, and then the feedback is poor. The government should let officials with real decision-making power respond to people during the public hearing or consultation meeting”. He thinks government attendants who have substantive rights to respond to the opinions are essential. This would ensure that the government official can actually react to the decision immediately, so that the suggestions from the participants may have positive impact.

4.2.3. Public Participation Limitations: Dealing with Diverse Opinions

When referring to the restrictions in SEA public participation, the interviewee from the consultation company noted that they may have to visit participants separately to collect their real opinions because it can be difficult for participants to discuss, interact, or even enter the deliberative process in a normal public consultation meeting or scoping. Sometimes, ENGOs use high-decibel scenes to reach political demands (such as asking the government to return policies), but those scenes may not reflect the real opinions that they want to express. If the host is unable to maintain control, conflicts can arise. The consultation company stated:

“It should be noted that different NGO groups have different considerations and goals when they attend the meeting. What they can accept for the discussion results are different. Then we can only visit them in private. The advantage of communicating with them is that they really care about this topic. However, the real ideas sometimes don’t be explained in public.”

When we asked a consultation company why the government does not want to apply different public participation methods in SEA, the answer was that the government official was not familiar with various public participation methods and their purposes. They may also apply to other methods; for example, the world café, for which many do not understand the logical and methodological basis.

In the MOTC interviewee statement, there was controversy related to public participation during the public consultation meeting. MOTC asked the participants with opposing opinions to propose suitable solutions as well. In other words, participants cannot just only find mistakes or doubts statements from the opposition, as this can easily disrupt the consultation meeting.

4.3. Difficulties in Dealing with Environmental Issues

4.3.1. Lack of a Knowledge Brokerage Process

The present policy planning only lists one environmental goal of the alternative, which is to “Achieve the lowest possible carbon emissions” in alternative five and six. In addition to the problems pointed in the policy planning section, one interviewee interviewed stated that carbon emissions are well known internationally, yet other environmental issues are not familiar to policy planners. Moreover, environmental goals in higher policy and program levels, as opposed to the project level, are hard to envisage for the policy planner (in our case, the Energy Bureau). For example, the environmental impact of a wind energy plan is easy to imagine and is reflected in the EIA process because it has actual location allocation. However, for electricity ratio planning in a higher-level SEA, the policy planner does not know how to determine the essential environmental issues and how to integrate them into environmental objectives in alternative planning.

An Energy Bureau interviewee said: “I think the SEA is more like energy technology composition, it is not practical like wind energy plan to talk about the block configuration. It is more difficult to reflect the environmental aspects. CO₂ emission is easy to understand and imagine, and can be calculated”

Another environmental expert also stated that environmental issues must be internalized into government’s values; therefore, the environmental planning cannot be altered owing to party rotation. This expert emphasized the importance of internalization of environmental value.

4.3.2. Scientific Uncertainty: Accuracy of Scientific Information is Doubtful

In the second interview with the Energy Bureau, a decision maker noted that the accuracy of scientific information is another problem when making decision. The problem is that “it is hard to evaluate the environmental database information”. For example, the results of air pollution diffusion models differ among scientists. Another department, the Industrial Development Bureau, also had the same opinion when discussing petrochemical policy. Therefore, a meeting between experts would enable discussion of simulation model results to ensure their credibility. Differences between model results may lead to participants in the meeting discussing the topic according to their values instead of the scientific facts.

One ENGO member also highlighted the uncertainty problem when discussing the nuclear disaster deaths from the Fukushima and Chernobyl disasters. The key is that the reported number of deaths varies greatly between scientific research and the news. This ENGO believed that the number of deaths can be subjectively operated; for example, some NGO organizations count the deaths from the nuclear accident and the tsunami together, but some results are only based on the deaths from the nuclear accident. In short, the death rate can be subjective; however, once the results are made public, the public will not know where the real difference lies, and non-professional decision makers

are equally unclear about the different statistical models. This uncertainty may influence energy policy decision-making; for example, whether nuclear energy is one of the future energy options, or how to balance the value of the low carbon benefits against the risk of nuclear disaster.

4.3.3. Overlooked TEPA Role in Environmental Issues and Environmental Thinking

At the beginning of policy planning, the Energy Bureau did not consult on environmental issues with the TEPA. One interviewee suggested that it is not difficult to invite the TEPA to discuss environmental issues, but a key issue is the lack of a coordinator to deal with opinions from different government departments. Hence, the conclusions from a meeting do not typically influence the policy planning process substantially. Moreover, the interviewee stated that the Energy Bureau adopts a more passive and one-way attitude to other opinions. Thus, communication is not effective. Another interviewee from TEPA suggested that some government officials do seek professional environmental advice from the TEPA (in another golf course SEA case), but most SEA policy planners adopt a sloppy and passive attitude for TEPA suggestions. In another SEA case-sightseeing policy, although the leader invited TEPA to an expert meeting to seek environmental advice, the policy objectives proposed by the government official were not very clear. This TEPA expert could not give substantive environmental opinion on policy integration. Another extreme example from the Industrial Development Bureau found that the EPA takes a hostile standpoint, and does not realize the petrochemical industry status. Simultaneously, the Industrial Development Bureau believes that SEA cannot bring large benefits to petrochemical policy.

4.3.4. Local Information Relationships' Lack of Environmental Consideration Between Different Planning Levels

When implementing SEA, the environmental impact at the project level may influence higher tiers of policy planning. For example, to provide sufficient electricity during the energy transition stage, and to make up for the temporary unstable supply of electricity from renewable energy, natural gas plays an important role in energy policy planning. However, natural gas power generation requires sufficient receiving stations to achieve this goal. In Taiwan, Taoyuan County is an optimal location for developing natural gas receiving stations; however, algal reefs form a special landscape along the coastline of Taoyuan County. Algal reefs provide certain ecosystem services, one of which is absorbing carbon emissions and reducing the greenhouse effect.

In summary, two challenges exist in this case study. The first relates to the balance between local landscape preservation and national energy policy, and whether national energy policy should be modified or whether local natural resources should be sacrificed. This dilemma happened after the alternatives had been decided, but unexpected issues can influence policy implementation.

The second issue relates to SEA function improvement: How to consider and integrate local environmental thinking at the national policy level.

One environmental expert stated that:

“In this policy, the policy planner did not consider this problem. The Ministry of “Economics and Energy Bureau did not consider that the local gas receiving station has the problem. It means that environmental impact was ignored by them. They only want to increase the proportion of gas power generation. The policy planning departments universally arguing that SEA is an obstacle to the administration, but they do not think environmental protection is their responsibility.”

In this example, the local environmental issue is clearly influenced not only by the natural gas receiving stations, but also by the energy transition direction. In the interview process, some experts agree that SEA should play a lead role in facilitating the EIA process. However, this case reflects how the local environmental impact crisis cannot be simply solved. One of the main reasons is that the policy planner did not carefully consider relevant natural resources, and local information was

completely overlooked by experts in the beginning. If the Energy Bureau started had considered this issue during the policy planning process, the installed capacity of natural gas could have been altered, and other alternatives could have been discussed.

5. Discussion

5.1. Policy Planning

5.1.1. More Collective Policy Planning:

The shortcoming of being impact-oriented is that the policy-planning process cannot be open enough to inspire creativity and integrate different environmental considerations and value. Therefore, in this case, when new values conflict with the original values and responsibilities of the government, it is very difficult to make the government accept this new opinion. For instance, zero-electricity growth might be a sustainable energy option in the policy planning process, because lower electricity demand would decrease the electricity supply and thereby diminish associated environmental impacts. However, this option could only be suggested from the NGO arena, and would not be used as an SEA alternative. This is significant because, if this option became an SEA alternative, it could be verified via the formal SEA examination process through the TEPA and Executive Yuan, resulting in more stakeholders who could verify its feasibility.

One member of an NGO stated that government officials should allow the zero-electricity growth option to be discussed in meetings to accumulate practical experience and data. By evaluating the feasibility of this alternative step-by-step, it would become more meaningful and useful when finally implemented as an alternative in Energy SEA. In other words, the energy policy alternatives that government officials input into Energy SEA are the most conservative alternatives. This conservative view may not have a chance to be modified in the rational planning process in SEA.

Stoeglehner et al. [22] proposed that environmental objectives can play a role in different stages of the planning process: Preparation, investigation, drafting, decision-making, and implementation. Ownership of environmental values is key for integrating SEA into policy planning [22]. A standalone SEA cannot easily achieve double loop learning, which decreases the ownership of environmental values or objectives by planners. Collective learning and planning allows more opportunities for planners to increase ownership of environmental values by double loop learning [12]. Double loop learning means that the policy planner has more chances to check the environmental belief and make choices to alter perspectives on policy planning [44], compared to single loop learning, which can only change the results or decrease the environmental impacts by an adaptation measure, such as adjustment of the development site. Double loop learning may further question the necessities of this development plan, and have opportunities of redefining the values or meanings behind the plan [12,22].

5.1.2. Increase Transparency in Policy Planning

In fact, the development of renewable energy is harder to predict than that of traditional energy. The amounts of electricity production from fossil fuels, such as coal, natural gas, and oil, are fixed at the beginning of development projects. Renewable energy development falls under the concept of decentralized power, but not centralized power. Uncertainty in the upper limits is influenced by technological progress, natural resource allocation (such as land resources and ocean resources), economic costs, the environmental carrying capacity, and the energy transition direction. Decentralized power means that surveys of environmental information baselines are important; for example, identification of land resources required to install solar panels, or suitable ocean areas for wind turbine assembly installation. Besides, the development of off-shore wind energy involves energy, fishing, tourism, and natural conservation issues, and this information is needed to ensure that

consensus is obtained with transparency. Given that all this information is highly flexible, the Energy Bureau should make information more transparent to increase public acceptance.

One NGO stated:

“I think it is very important that the investigation process requires a lot of NGOs to participate. In the process of doing surveys and inventory, it is necessary to involve citizens. NGOs usually concern the environmental issues a lot, like protecting environment and doing resource survey in a wetland. If they are not allowed to participate in the investigation, they will question the SEA report. However, when the government was doing surveys and integration, NGOs were invited to come together. If their opinions were involved, the information they made would at least be acceptable because they were involved. If NGOs don't accept it, they slap their own face.”

5.1.3. Controversial Issues need Achieve Consensus in the Beginning of the SEA Stage

From the MOTC interviewee description of another Taiwan SEA case study, we observed how the discussion of controversial issues in the early stages of decision-making is very helpful for reducing subsequent disputes and for increasing policy acceptance. At the same time, it does not let a closed decision-making process affect the discussion possibilities of various issues, including environmental issues. This case in Taiwan related to transportation in the east of the country, where “the leader of the government department is a key role”. One interviewee told us that the leader of the SEA implementation group clearly expressed their position when Executive Yuan wanted to solve the transportation problem in eastern Taiwan through political decisions. The opinion of Executive Yuan was that building a new highway was necessary, but this decision differed from that of the SEA implementation group. Therefore, the SEA group invited different NGOs (not only ENGOs), local aborigines, and other experts to discuss differences in opinion at the beginning of the policy planning process to more fully understand stakeholder demands. At that time, the policy objective had not yet been formed, but stakeholder opinions were deemed valuable. After negotiations during several meetings, key issues began to arise, which provided motivation for the policy. The key issue in the eastern Taiwan transportation SEA was “how to build safe roads to people's homes”. Building safe roads is a consensus issue with an acceptable policy basis. This basis is important because it lowers the difficulties in designing the alternatives. Therefore, the design of all alternatives was based on this premise, but not with the objective of building highways or with rational thinking about transportation demand. Transportation demand is important when designing a new road, but if there is no consensus among the parties, this reason may not be sufficient to convince people.

Through the different experiences of these two cases studies, we know that clarifying key issues is important in SEA. It can increase policy acceptance and ensure smooth SEA operation. In the second case study, we believe that SEA has potential effectiveness to open the discussion space, and successfully reframe the policy objective. Furthermore, SEA can become a platform for collecting stakeholder opinions to negotiate and achieve consensus when controversial issues arise.

5.2. SEA Operation

5.2.1. Feedback in SEA Operation

The main barrier to feedback is the limited scoping time and the agenda-setting; government officials did not plan to discuss the issue completely, because the alternatives were already essentially fixed prior to scoping. The Energy Bureau knows that if the agenda is open to discussion of controversies about energy policy (such as the future of nuclear power, the timing of energy transition, and environmental goals or environmental thinking in policy objectives), the outcome is uncertain. Therefore, in scoping, participants can only discuss system boundaries, evaluation categories, and indicators, which will influence the impact assessment part of the SEA report. However, there is no feedback between scoping and the policy planning process. Thus, participants can propose

a suggestion for alternative planning, but there is no institution to respond. However, in the future, it is important that feedback is achieved, so the connection between scoping and the policy planning is developed. The environmental thinking proposed by scoping participants can have a positive impact on the policy goals.

5.2.2. Adopt Appropriate Public Participation

Richardson [71] pointed out that SEA is inherently valuable, and the SEA community needs to address the question of how to deal with multiple conflicting values. O'Faircheallaigh [47] mentions that the purpose of public participation in EIA is to provide a field for different interest groups to pursue desired outcomes and resolve conflicts, not just cost-effective information for decision making.

This reflects two current limitations of the SEA process. The first is that the public participation methods are not suitable for allowing stakeholders to state their opinions or for deeper interaction. Public participation in the SEA process is needed; however, most experience is limited in public participation effectiveness [45]. The second is that the government (SEA practitioner) limits the purpose of public participation to simply collecting information from participants, which is the most common purpose in most SEA cases. These two limitations are linked; in other words, future SEA processes should include different and diverse public participation institutions based on different purposes. However, currently, government officials are not familiar with different public participation skills because they are used to conducting expert meetings and one-way communication meetings to the lay public.

For example, to involve environmental or sustainable thinking in the policy planning process, large amounts of time are required to define the scope of the key sustainability issues as well as to invite experts and NGOs from different fields. For other issues, the lay public should also be invited. Currently, we are lacking an effective platform for the collection and analysis of opinions and information.

5.3. Environmental Issues

5.3.1. Learning Effect

It is not clear whether the current SEA process includes the time or the institution to promote this process of internalizing information to knowledge. Knowledge transfer or knowledge brokerage of different issues, such as sustainability issues, to traditional government officials could be strengthened in the policy planning steps to enhance learning [15]. Sheate and Partidario [16] also suggested that it is difficult for only information to influence policy planning. The learning process from information to knowledge is essential, playing a key role in changing decision-makers' opinions of a policy. Moreover, sustainable issues or the scope of sustainability is sometimes vague in the literature [14,72,73]; thus, a consensus should be achieved in the policy planning process.

The good news is that policy planners may change their attitude through the learning process in this case. This point is not only suggested by Glucker et al. [48], but is demonstrated by our case studies. During the second visit to the Energy Bureau, the interviewee stated that the role of government should change in the future to become a platform for providing common resources to the industry, and to make the policy planning process more flexible. As new energy technology speeds significantly influence the energy transition process, policy planning must be adjusted to respond to future energy transition. The government must take the initiative to propose a new idea relevant to the policy planning in the interview. The interviewee believed that when they participated in a deliberative democratic conference, the performance of the facilitator changed her views on public participation. Of course, this change of attitude does not mean that public participation should play a deliberative role in all SEA cases, nor that large amounts of time should be spent in discussion or obtaining a suitable conclusion. It simply means that the government can be open to implementing suitable public participation methods according to their purpose.

This opinion indeed is not the Taiwan government's consensus, but it is Energy Bureau official's opinion and a suggestion for the energy transition. This suggestion also stands for the strategic-oriented SEA and changes of governance views have emerged. The Energy Bureau may tend to apply a more strategic SEA process when facing policy, which is complex and involves difficult policy goals, like energy transition.

Another ITRI interviewee also explained the issue of government attitudes to unfamiliar issues (public participation methods, environmental issues, etc.). The government does not necessarily completely exclude open public participation, but it does have an opportunity to gradually become familiar with it. The government should take time to constantly accumulate experience from small public participation opportunities.

5.3.2. The Institutional Problem needs to Be Improved

The institutional situation may occur when the government regards SEA only as a process or institution used to fulfill legislative demands. West et al. [74] and Tetlow and Hanusch [11] have also pointed out that policy planners sometimes regard SEA as a regulatory obligation, not as a tool for integrating environmental thinking. As a result, the government does not spend time on the agenda-setting and communication required to obtain valid advice.

In TEPA's opinion, the scoping step is a suitable platform for discussing sustainable alternatives. It is obvious that the Energy Bureau currently have no plans to focus on alternative planning, or to design more sustainable options with other departments and stakeholders. As a challenge involving institutions and political culture, this is hard to change [57].

6. Conclusions

The purpose of the transition from impact-oriented SEA to strategic-oriented SEA is to improve environmental thinking in public policy. Through in-depth interviews and data analyses, the main contributions of this research are the generalization and discussion of the challenges related to environmental thinking in the SEA process in three main areas: Policy planning, SEA operation, and difficulties in dealing with environmental issues.

Firstly, policy planning is difficult to integrate with SEA in the beginning in the current impact-oriented SEA process. Hence, the traditional policy planning process is a type of rational model planning, which is not necessarily suitable for the main purposes of SEA and realizing environmental benefits. Meanwhile, SEA and environmental experts are absent from the early stage and thus cannot influence the policy planning process. In addition, low transparency causes policy goals that cannot be accepted by the public and ENGOs. Also, the avoidance of discussing controversial issues decreases the possibility of broadening environmental thinking. In the interviews, the core policy planning experts stated that policy goals may include more environmental goals, such as human health, if the policy planner can cooperate with other experts. We suggest that more collective planning is needed for SEA application, if the policy goals are very complex and difficult to clarify by a few experts. It is also necessary to achieve a consensus regarding controversial issues at the beginning of the SEA process, before the policy goals have been determined.

For the SEA operation, we found that public participation and its effectiveness in the SEA process are limited. The solution of this problem may depend on the willingness of government officials and the gaining of familiarity with public participation. We suggest that scoping operation improvement could be the first issue for SEA practitioners, because it is key for impact assessment and bridging between public opinions and policy planning. In other words, scoping includes two interconnected elements: Impact assessment and public participation. Increasing the effectiveness of scoping can have positive benefits for the effectiveness of SEA.

In terms of difficulties dealing with environmental issues, environmental thinking or sustainability thinking is sometimes ambiguous, and the meaning is different for each stakeholder. The learning effects seem very important for enhancing environmental thinking, including policy planners'

learning of unfamiliar environmental information and local environmental information. In addition, the institutional challenge should be modified stepwise based on SEA experience by considering specific contexts. This modification process is a learning process, which is important for policy planners and SEA operation. In our case, a change in the attitude of the policy planner in this regard was evident when we interviewed the Energy Bureau for the second time. The most important criteria here are not only what the Energy Bureau proposes regarding the future role of the government or public participation, but also what the policy planner has thought about the practice before and whether possibilities suggested by other experts or NGOs are embraced. Such changes do not occur by persuasion by SEA experts. On the contrary, these changes are voluntary, as explained in Section 5.3.1. It is difficult to assess whether this reflection will make the energy policy more environmentally oriented, but this learning process is absolutely essential for policy planners in SEA operation and improvement.

Strategic-oriented SEA provides some insight into the current SEA process; however, it is an ideal and still evolving model, which is difficult for policy planners to implement in all SEA cases. Based on the in-depth interview in this case study, we believe that the findings can provide some empirical results and suggestions for enhancing environmental thinking in SEA operation. This study was limited in that we focused on only one SEA case, because it would be difficult to choose a suitable case for comparison among the current instances of SEA application in Taiwan. For comparison on the same basis, we believe that it is more appropriate to choose an SEA type that is also at the national level and with complex policy goals. Future studies can further focus on examining multiple SEA cases and comparing the challenges of environmental thinking in the different SEA application contexts. These kinds of studies may provide more abundant results, which can be applied to improve different SEA processes or institutions.

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Appendix A. Summary of energy policy alternatives

Table A1. Summary of energy policy alternatives 1 and 2.

Rank	Electricity Classification	Policy Goal 1	Policy Goal 2
		Alternative 1	Alternative 2
1	Renewable energy	Expand electricity generation capacity to 18734 MW in 2035	Expand electricity generation capacity to 18734 MW in 2035
2	Nuclear	Nuclear power plant 1,2,3	No extension to the life span
		Nuclear power plant 4	Nuclear 4 did not pass the referendum
3	Natural gas	Natural gas goal in 2030 and 2035: achieve 20 and 26 million tons, respectively	Natural gas goal in 2030 and 2035: achieve 20 and 26 million tons, respectively
4	Coal-fired	New coal-fired power plant may be built flexibly based on demand for electricity	New coal-fired power plant may be built flexibly based on demand for electricity

Table A2. Summary of energy policy alternatives 3 and 4.

Rank	Electricity Classification	Policy Goal 3	Policy Goal 4
		Alternative 1	Alternative 2
1	Renewable energy	Expand electricity generation capacity to 18,734 MW in 2035	Expand electricity generation capacity to 18,734 MW in 2035
2	Nuclear	Nuclear power plant 1,2,3	Extend the life span of three nuclear plants 1,2,3 in service
		Nuclear power plant 4	Nuclear 4 begins operating when safety is ensured and the referendum is passed
3	Natural gas	No increase of present natural gas supply	No increase of present natural gas supply
4	Coal-fired	New coal-fired power plant may be built flexibly based on demand for electricity	New coal-fired power plant may be built flexibly based on demand for electricity

Table A3. Summary of energy policy alternatives 5 and 6.

Rank	Electricity Classification	Policy Goal 5	Policy Goal 6
		Alternative 1	Alternative 2
1	Renewable energy	Expand electricity generation capacity to 18734 MW in 2035	Expand electricity generation capacity to 18734 MW in 2035
2	Nuclear	Nuclear power plant 1,2,3	Extend the life span of three nuclear plants 1,2,3 in service
		Nuclear power plant 4	Nuclear 4 begins operating when safety is ensured and the referendum is passed
3	Natural gas	Natural gas goal in 2030: achieve 20 million tons	Natural gas goal in 2030: achieve 20 million tons
4	Coal-fired	No new electricity generation capacity	No new electricity generation capacity

Table A4. Conceptual framework and interview questions.

Conceptual Framework	Interview Questions
Policy planning	What are the challenges of SEA application in energy policy?
	How does the government plan the policy?
	For solving the energy transition and energy crisis, is current policy planning suitable?
	Do you think the controversy of energy transition should be solved in current SEA?
	Do we need more meetings to achieve the consensus before the alternatives planning?
	Does TEPA play a role in the policy planning? Does TEPA bring the benefits for environmental thinking?
SEA operation	What is your opinion of integrating environmental thinking into SEA
	What's your opinion of current scoping operation?
	What's your opinion of current public participation methods in SEA?
	Can you provide suggestions for the future scoping?
	Do you think current scoping has positive effect on the policy planning?
	What kind of public participation mechanism is required for SEA? Information provided? Or exchange of opinions? Or the argument of values? debate?
Environmental issues	What do you think the SEA role in the future?
	With the accumulation of experience in SEA, does the government unit change environmental awareness? Attitude? Policy planning method? Or cooperative communication
	Do you think the public sector is familiar with the significance of SEA? If the answer is not, does the government ask the TEPA or environmental experts?
	Why do current policy goals have limited environmental goals?
	Do you think there are other important environmental goals can be integrated into policy?
	Do you think the cooperation is needed between the policy planner and ENGOS? How do they communicate effectively?
	Do you think the cooperation is needed between the policy planner and TEPA? How do they communicate effectively?

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