

# Public Participation and Legal Research in Solar PV Power Plant Site Selection

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**Abstract.** Public Participation has been introduced to the decision-making process of environmental actions and has drawn attention in the environmental field. This approach can affect certain environmental issues or policy directions that the public is concerned about by means of public opinions and public participation in decision-making. This paper takes the Taiwan region as the research object to illustrate the new Solar Fishery and Electricity Symbiosis Auditing- Environmental and Social Inspection (SFES-ESI) process for the solar PV site selection in this region, the opportunities for public participation during the process, and legal recommendations.

## 1. Introduction

The theory of “Public Participation” has been introduced to the decision-making process of environmental actions and has drawn attention in the environmental field. This approach can affect certain environmental issues or policy directions that the public is concerned about by means of public opinions and public participation in decision-making.

Taiwan region implemented the “Solar Fishery and Electricity Symbiosis Auditing- Environmental and Social Inspection (SFES-ESI) ” for the site selection of SFES development projects since 2020. The introduction of “Public Participation” to the assessment of ESI of the photovoltaic (PV) development can not only generate feedback and recognition among local opinions on photovoltaic development but also eliminate concerns in a timely manner. In addition, it can establish a model for coexistence and common prosperity in the future.

This paper takes the Taiwan region as the research object to illustrate the SFES-ESI process for SFES of solar photovoltaic stations in this region, the opportunities for public participation during the process, and legal recommendations.

## 2 Connotation of public participation

### 2.1 Meaning of Public Participation

Public participation can be understood as an act of participation by the people or the masses, a process in which people actively participate in a project and discuss it together. It allows the masses to express their opinions, participate in decision-making, and influence the direction of some topics or policies.

The “A Ladder of Citizen Participation” theory proposed by Sherry R. Arnstein based on citizens’ control and power in their participation is one of the most widely referenced connotations in the discussion on public participation and one of the important models in this field. According to the theory of “A Ladder of Citizen Participation”, citizens’ control and power gradually increase from rung 1 to rung 8, from accepting being manipulated by the government, to accepting informing and placation, and to forming a partnership with the government and having the right and opportunity to control. [1]

The role of public participation is more pivotal because of the overall public nature of the effects of environmental resources and ecosystems. A development project is more likely to proceed smoothly if it can gain the support of the majority through public participation and reach a consensus on how the environment will be changed and sustained in the future.

### 2.2 Legal Protection of Public Participation

As environmental rights stress the public nature of the environment and the protection of the right to public participation, formal legal protections for public participation can be found in both international and Chinese laws and regulations. Key points are summarized below.

#### 2.2.1 Rio declaration

Principle 10 of the Rio Declaration released at the Earth Summit in 1992. The document mentions the importance of public participation. [2] Such as “the participation of all concerned citizens”, “facilitate and encourage public awareness and participation”. Although it is only a declaration, it promoted the subsequent formulation of

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regulations related to “Public Participation” in international documents.

### 2.2.2 Aarhus Convention

The Convention, which came into force in 2001, was the first major international document that explicitly protects public participation in environmental issues. In addition, it specifies the meaning and practice of the “public participation theory”, and its content has been introduced to laws and regulations in various countries to guide practice. Key points of the Convention can be summarized in the following table. [3]

**Table 1.** Key points of the Aarhus Convention

Article	Content	Meaning
1	Require “...each Party shall guarantee the rights of access to information, public participation in decision-making, and access to justice in environmental matters in accordance with the provisions of this Convention.”	Guarantee the three important rights of the public in environmental issues, namely access to information, public participation in decision-making, and access to justice.
2-5	“The public concerned” means the public affected or likely to be affected by, or having an interest in, the environmental decision-making; for the purposes of this definition. “...non-governmental organizations promoting environmental protection and meeting any requirements under national law shall be deemed to have an interest.”	1. Clarify the scope of “public participation”. 2. NGOs that meet certain requirements can be counted as part of public participation.
6-1	Require that the cases listed in Annex I of the Convention be included in public participation. (including actions that have a significant impact on the environment such as natural gas refining, nuclear power stations, and mining.) May decide on a case-by-case basis not to apply these provisions to such activities that might have adverse effects on national defense purposes.	Specify the scope and exceptions of public participation
6-2	The public concerned shall be informed, either by public notice or individually as appropriate, in an adequate, timely, and effective manner.	Specify timely participation, information provision and access, etc.
6-5	Each Party should, where appropriate, encourage prospective applicants to identify the public concerned, to enter into discussions, and to provide information regarding the objectives of their application before applying for a permit.	Encourage direct communication between project applicants and the public
9	Require legislation to guarantee the public’s right to make judicial request, and such procedures should be free of charge or inexpensive.	Specify the legal remedies for public participation

### 2.2.3 Decrees in China

China implemented the “Measures for Public Participation in Environmental Protection” and the “Measures for Public Participation in Environmental Impact Assessment” in 2015 and 2019 respectively, and the public can participate in environmental affairs in accordance with regulations. The Measures specified how to collect public opinions (through consultation, questionnaires, symposiums, expert discussions, hearings, etc.) and how to disclose information. In terms of the scope of the “public”, construction units are required to listen to the views of citizens, legal persons, and other organizations within the scope of environmental impact assessment and encouraged to listen to the views of citizens, legal persons, and other organizations outside the scope.

## 3. Causes of Public Participation in the PV power site selection

This paper discusses the site selection procedure for PV development in Taiwan region implemented in 2020.

### 3.1 PV power plan installation don't need to review the environmental impact assessment procedure.

Taiwan’s decree considers that the PV is a kind of renewable energy and burden on the environment is relatively small, except that the installation is conducted in "Important Wetlands" and the installed capacity is more than 2MW. In principle, PV power plan installation don't need to review the environmental impact assessment procedure [4]. Therefore, the public lacks opportunities to participate and learn.

### 3.2 The PV installation target

Taiwan region has a target to reach the cumulative installed capacity of PV in 2025 should reach 20GW. Not only to actively installing PV systems in buildings, but also promotes the diversified use of land to achieve a green energy utilization method combining multiple functions in one place.

Taiwan area has an area of 36,000 km<sup>2</sup>. Due to the high cost of urban land acquisition, PV developers will be more want to choose the land in coastal, estuarine, agricultural, fishery and forestry. However, these areas usually have rich ecosystems or culture, large scale of PV power plan in the areas maybe change the local landscape, ecosystems or original aquaculture methods. It will easily lead to resistance from the residents in case of lacking good communication.

The following are some important cases.

#### 3.2.1 The “Zhiben” case in Taitung County

The area is an autonomous region for indige-nous peoples. Although it is not yet listed as an important wetland, it has a rich eco-logical environment. The

residents protested the county government's approval of the PV project because it did not comply with the decree of the autonomous region and the overall area is too large, which endangers the original ecology. A lawsuit was filed against the development, and in September 2022, the court ruled that the autonomous region's decree used by the county government was not valid and re-voked the permit for the PV power station. [5]

### 3.2.2 The "Luzhugou" case in Tainan City

PV installer turned fishing ponds into solar PV stations. However, the stations were too close to houses and other oyster farming sites, and oyster farmers were worried that the water was polluted and the stations would endanger the original ecology of the area, which was an important winter place for migratory birds. [6]

### 3.2.3 The "Qigu" case in Tainan City

In Taiwan region, land is privately owned, and in Qigu, most farmers rented fish ponds from the owners. However, as the PV installer paid higher rent, some fish pond owners canceled their contracts with the farmers. As a result, the land price rose, and few fish ponds were left for the farmers. At the same time, it is planned that 20% of local land may be used for PV installation, and residents argue that the density is so high that it affects the local industry and living environment. [7]

## 4. Solar fishery and electricity symbiosis system

Solar Fishery and Electricity Symbiosis system (SFES) (or Fishery-Solar Hybrid System, FSHS), is a dual utilization method that photovoltaic (PV) devices are installed on the fishing pond, so that the part above the fishing pond can generate electricity, while the pond can still fishery.

Taiwan aims to achieve 4GW of installed capacity with SFES. Up to 40% of the area of each fish pond can be used for PV installation., which requires 10,000 hectares of fishing ponds, accounting for about 23% of the area of Taiwan's fishing ponds [8].

The three recommended models according to the announcement are illustrated in the following figure.

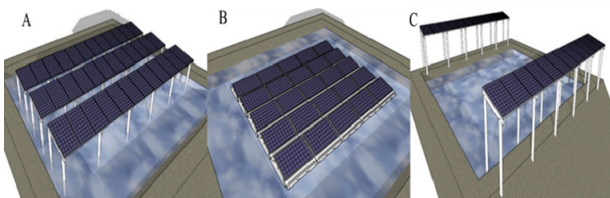


Fig 1. Three models of SFES application [9]

Type B (the floating platform type) focuses on the material of the float, and both Type A (the column type) and Type C (the bank type) have requirements for the height, design, and installation, which are briefly described as follows:

As the above cases, the solar PV power plant sometimes may occupy the water space and install

columns in the middle of the fish pond. In such a context, early participation of farmers in the discussion on the details of the installation helps reduce the trouble of adjustment and modification later on.

## 5. Environmental and social inspection for SFES site selection

To address the difficulties in PV development, avoid disputes arising from the site selection, and increase the opportunities for communication with local residents and public participation, Taiwan region implemented the "Solar Fishery and Electricity Symbiosis Auditing-Environmental and Social Inspection (SFES-ESI) " for the site selection of SFES development projects. The key points of ESI are as follows.

At present, only SFES development projects, not other PV projects, are required to carry out ESI.

### 5.1 The implementation of ESI

ESI can be implemented in the following two ways.

#### 5.1.1 By government departments

The main teams organized by the government. department, including the Ministry of Economic Affairs (MOEA) in charge of energy, the Council of Agriculture (COA) in charge of agriculture, and the Ministry of Interior (MOI) in charge of land.

The COA analysis the number of fish ponds and ecological information; The MOEA convenes experts to check scope screening and public communication; The MOI provides land information if need in ESI process.

After the implementation of ESI, the government departments will announce the areas suitable for development and the issues that are considered important by local residents. At present, the main areas for ESI are six cities in the southern part of Taiwan island.

#### 5.1.2 By Solar PV installers

If solar PV installers want to install SFES in an area beyond the scope of ESI approved by government departments, they need to implement the ESI procedure by themselves and submit the results to the MOEA for review.

### 5.2 Differences between ESI and Environmental Impact Assessment

ESI and environmental impact assessment are not the same. PV installation does not need to go through the environmental impact assessment procedure in Taiwan region, and ESI makes up for the gap. In addition, environmental impact assessment is carried out after the installer has selected the site, while ESI is implemented before the site selection, which helps the installer choose a suitable area.

### 5.3 The process of the implementation of ESI

The process is shown in the following figure (see the Fig.2.) The process consists of the following steps.

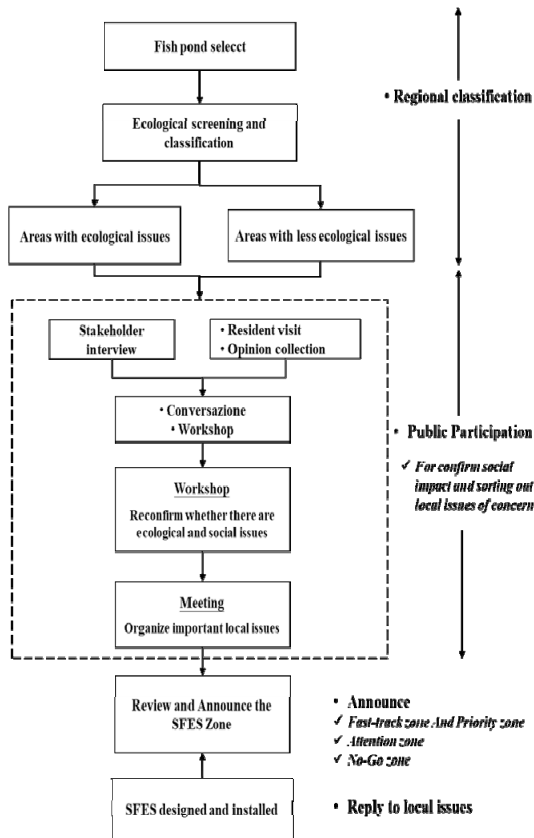


Fig. 2. The process of Using ESI to select the SFES Zone

#### 5.3.1 Fish pond select

First to remove the areas known to be richer in ecology, and fish ponds with more suitable locations were selected.

#### 5.3.2 Ecological screening and classification

Fish ponds will be screened in combination with various ecological and local data maps, and then the ecologically fragile areas will be removed and landscapes which valued by locals. Fish ponds will be screened in combination with various ecological and local data maps, and then the ecologically fragile areas will be removed and landscapes which valued by locals, and then to classification regional. The ponds be divided to “Areas with ecological issues” or “Areas with less ecological issues”.

#### 5.3.3 Public Participation

Public participation is an important part of the whole process of ESI, and details can be seen in Title 6.

#### 5.3.4 Review and Announce the SFES Zone

After the government has implemented SEI, the zone is classified according to the local ecological and social

issues and then announced. Zones that meet the requirements of the “Fast-track zone And Priority zone” have fewer ecological and social problems. In other words, these areas are better choices for those who want to build PV stations. In terms of those “Attention zones”, PV installers need to address some ecological or social issues and respond to the concerns of the local people. “No-Go zones” are not suitable for PV power stations.

#### 5.3.5 Reply to local issues

After the announcement of the zone, PV installers, before in-installing SFES in an area, need to reply to the local issues collected by ESI, including ecological, social, and industrial issues and what local residents focus on.

### 5.4 The significance of ESI

The documents of the official ESI process and the local issues collected are made public. In the future, if PV installers want to install SFES in areas where government departments have implemented ESI, they need to respond to the issues and promise to take environment-friendly measures, and the corresponding documents are necessary for the application for the review of a PV power station. If PV installers implement ESI by themselves, they need to submit documents regarding the ESI process and the promise together when applying for the review of a PV power station.

## 6. Public participation in the ESI process

Steps related to public participation in the ESI process are described as follows [10].

### 6.1 Building a work team.

Relevant government departments, experts, and NGOs are invited by the ESI team and the local governments to form a work team. The team members have discussions throughout the ESI process to ensure the correctness of the implementation and results and help the ESI team improve efficiency. In this work team, NGOs participate in the discussions on environmental issues.

### 6.2 Identifying stakeholders

The ESI team first identifies the stakeholders of SFES as the basis for future public participation.

The most direct stakeholders are residents, farmers, fishermen’s organizations, fish pond owners, and local ecological conservation groups. In addition, local history researchers, members of the National People’s Congress (NPC), tourism practitioners, and PV practitioners are also considered stakeholders. The range of stakeholders identified by SEI is wide enough to help collect opinions from various parties.



### 6.3 Stakeholder interviews

Interviews are conducted with a wide range of stakeholders to understand their attitudes toward the local ecology, industrial features, special culture, the economy, etc., and understand their views and doubts about the future of PV installations.

### 6.4 Meetings or interviews

Meetings and interviews of 10 to 15 people are conducted. The participants include local farming organizations, NPC members, village leaders, relevant NGOs, experts, and scholars. These meetings and interviews allow the public with in-depth knowledge of specific areas to express opinions.

### 6.5 Meetings to gather opinions

These public events invite stakeholders, local residents, and the public and collect opinions from a wide range of participants. The meetings are open to all sectors of society, so the public concerned about PV development can have the opportunity to participate.

### 6.6 Site survey

The ESI team visits the potential sites for PV installations, together with experts and people familiar with the sites who can help identify the locations. After the survey, the information previously collected will be reconfirmed and included in the subsequent report. In such a context, people familiar with the sites get the opportunity to participate in the discussion again.

### 6.7 Meeting to discuss and sort through important local issues

After completing the entire process, the ESI team will hold meetings to discuss and sort through important local issues, including ecological, social, and industrial issues, as well as important projects of importance to local residents. During the process, experts, local opinion leaders, and NGOs are invited to discuss and confirm as many issues as possible that are important to the local community. Therefore, local residents' opinions can play a part in the discussion again. The opportunities for public participation in the ESI process are shown in the following table. (see the Table 2)

**Table 2.** Opportunities for public participation in the ESI process

Stage	Participants	Public members participating
<b>Building a work team</b>	the ESI team, local governments, relevant government departments, experts, and NGOs concerned about the topics	NGOs
<b>Identifying stakeholders</b>	the ESI team	A wide range: Local stakeholders who are directly

Stage	Participants	Public members participating
		affected, and those who are concerned about the areas and the future
<b>Stakeholder interview</b>	the ESI team	A wide range: Local stakeholders who are directly affected, and those who are concerned about the areas and the future
<b>Meetings or interviews</b>	the ESI team, local farming organizations, NPC members, village leaders, relevant NGOs, experts, and scholars	organizations with in-depth knowledge of the areas, members of the public, NGOs
<b>Meetings to gather opinions</b>	the ESI team, open meetings	open to the public
<b>Site survey</b>	the ESI team, people familiar with the sites	residents familiar with the sites
<b>Meeting to discuss and sort through important local issues.</b>	the ESI team, experts, local opinion leaders, and NGOs	local opinion leaders and NGOs

## 7. Conclusions

### 7.1 ESI has effectively expanded public participation

To effectively promote PV development, Taiwan region implemented the ESI process in 2020, which has expanded public participation and provided the public with more opportunities to participate in discussions on environmental issues and decision-making.

After the ESI process was implemented by government departments in June 2022, 4,702 hectares of Fast-track zones [11] and 7,933.4 hectares of Priority zones and Attention zones have been selected respectively [12].

### 7.2 It is recommended to incorporate the implementation of ESI into law

Documents regarding the ESI process and the promise are necessary for the application for the approval of a PV power station. However, there is no specific legal provision on how ESI should be implemented.

The current instruction on how to implement the ESI process is an official "reference manual" that can be downloaded from the Internet. However, it is only for reference, not legally binding.

The ESI process implemented by government departments gains the trust of the public in most PV projects. However, the ESI process implemented by the PV industry is different, which might have different results due to different numbers of meetings to collect opinions, the scope of stakeholders, and the questions asked.

The reports and results of the ESI process that are not specified by law are necessary documents for solar PV station approval, which may cause the risk of inconsistent review standards. It is recommended that the necessary legal provisions be established after a consensus on the ESI process has been reached.

### 7.3 Public remedy procedure should be incorporated in ESI

In public participation, public requests for “information disclosure” and “right relief” should be guaranteed in addition to the opportunities provided to participate in discussions on the sites for PV installations. However, there is no such guarantee in the relevant ESI documents.

The main reason is that, as stated in 4.2, there are no legal provisions for ESI, so the public cannot defend their rights when they request “information disclosure”, find their request for “information disclosure” is rejected, or find themselves excluded.

Taiwan does not have a public participation law like the one in mainland China, and the “Freedom of Government Information Law” and the “Administrative Procedure Act” currently used are unable to regulate the behavior of private PV installers and lack special protection for environmental rights. Therefore, it is recommended that provisions for public requests for “information disclosure” and “right relief” be incorporated into laws and regulations on ESI.

### 7.4 Overall land-space planning should be used to determine the allocation of renewable energy sites

Both the harmony between society, the environment, and the economy advocated in the sustainable development theory and Distributive Justice required in the Environmental Justice theory emphasize the coordination between the overall resource allocation, humans, and the natural environment.

The ESI process for PV site selection is the choice before PV development, but from the perspective of the environment as a whole, it is recommended that the overall spatial planning of the country or a large area be the top-level guidance.

The overall consideration is how to make the top-level regional spatial planning and use plans from spatial, cultural, and economic perspectives, taking into account the carrying capacity of the local environment.

This approach prevents obvious mistakes in the site selection stage of renewable energy development, guides more accurate assessments in suitable areas, reduces the waste of time and money, and helps renewable energy projects to be installed in suitable locations for the purpose of environmental sustainability.

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