

Chapter 3

Impact and severity of the solar farm operation on the Local environment

The purpose of the analysis is to anticipate any impact if any of the project on the environment. The study included past and present data on the status and quality of the environment and the value of resources in the area. Taken into consideration as well was the consequence of the operational impact of the photovoltaic power plant project by Solar Power (Korat 2) Co., Ltd. The impact assessment was divided into two phases, the construction phase and the operation phase.

3.1 Impacts on physical resources

3.1.1 Topography

Construction phase

The original topography of the project area was mainly rice fields. However most of the surrounding area was abandoned and empty and covered with short shrubs and grasses. In the early stage of land preparation prior to the construction of photovoltaic power plant, Solar Power (Korat 2) Co., Ltd. was required to grade the site for the construction component, but this had minimal impact and the topography remained the same. Therefore, the operation of project during the construction phase had very low impact on the original topography.

Operation phase

During this phase, no activity will impact or change the topography.

3.1.2 Climate and meteorology

Construction phase

During this phase, no activity will impact or effect change on the climate or metrology both at module local and regional levels.

Operational phase

During the project operational phase, the maximum module cell temperature will be 75°C, but as the project is located in an open plain area there will not be any impact or change of climate or meteorology at local level.

3.1.3 Air quality

Construction phase

During this phase, we use normal earth moving and piling equipment, the equipment is only on site for several weeks it is considered temporary and produces no severe impact due to following reasons;

1) Air pollution the only source is machine exhaust gasses and as the prevailing wind is across the site these will disperse in the most remote areas where there are no human or animal inhabitants .

2) Fugitive dust this is derived from the construction activities, it is mainly soil particles and it is not difficult to control. The most common control method is to spray water on the construction area. U.S.EPA 1977 data indicated that the area if sprayed with water twice a day will reduce any floating dust by up to 50%.

3) Pollution from the machinery and equipment used in the construction is considered low quantity as the project area is very large and most of the construction activities are far away from the project boundary. Any Air quality change and its impact on the people in adjacent areas will be less.

4) Dust originating during this period will mainly come from the transportation of construction material and equipments. Therefore, the project will require that all trucks to be covered with canvas or plastic sheeting during transportation to the project area in order to reduce the amount of dust generated. All transport and construction vehicles will be required to clean their wheels using a wooden stick to hammer out all mud, in addition water will be sprayed to clean the wheels, etc. in order to prevent dirt falling outside of the project area. The project will require all contractors to strictly comply with the said measures to minimize and eliminate any pollution. From the reason above, it can be concluded that all activities during the construction phase will not significantly impact on the air quality in adjacent areas.

Operation phase

As solar farms use photovoltaic modules to produce power which requires no fossil fuels to be burnt there is no air or water pollution.

The project operation may have a small impact on the local ambient air temperature by increasing it a little bit due to the heat diffusion and light reflected from the solar modules. However, there is a strip of trees along the canal levee next to the adjacent paddy field which will block the impact. Moreover, the project will plant more trees in the surrounding areas in order to increase air and soil moisture and reduce ambient temperatures. Therefore, there will be no impact on the surrounding area.

3.1.4 Sound volume

Construction phase

In this period, there will be many construction activities in the project area such as area grading and filling, construction of buildings, road and infrastructure. The construction activity that may create the most significant annoyance is pile driving with a sound level of 92 decibels (A) within a distance of 150 meters, thus, the company will require contractors to avoid pile driving during people's resting time. Pile driving must only be conducted during daytime.

Pile driving with a sound level of 92 decibels (A) may impact workers. According to the requirements of Interior Ministry (the Revolutionary Council Promulgation No.103), workers will not work longer than 7 hours at the sound volume higher than 91 decibel (A), but as sound from pile driving is louder than 91 decibel (A), thus, worker should not work longer than 6 hours. The Contracting Company shall strictly comply with this rule, by taking breaks or working shifts. All workers shall wear personal safety equipment such as ear plugs or ear muffs which reduce the sound volume by at least 15 and 25 decibel (A), respectively in order to minimize the impact. However, as the pile driving will be only done in short periods. If the Contracting Company follows the regulations strictly, the expected impact will be in an acceptable volume range.

Sound volume from tools, equipment and machines used in general construction are as follows:

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Tool	Sound volume (decibel A)	Tool	Sound volume (decibel A)
Pneumatic chip hammer	103-113	Earth Tamper	90-96
Jackhammer	102-111	Crane	90-96
Concrete	99-102	Hammer	87-95
Skilsaw	88-102	Grade all	87-94
Stud welder	101	Front-end loader	86-94
Bulldozer	93-96	Backhoe	84-93

The assessment of the sound impact during the construction phase will use the maximum sound possible from power plant construction equipment which is 113 decibel (A) at a distance of 150 meters from the construction site. This approach is considered as an assessment of severity since in practice, there is no continuous sound for a period of 8 working hours.

The prediction of any sound impact will consider the distance of adjacent impacted places where at different distances from the sound source how much impact they receive. The prediction will use the Decay Formula which is a sound volume prediction equation varied by distance or sound volume reduced by increased distance.

$$Lp2 = Lp1 - 20 \log (r2/r1)$$

When $Lp1$ = Sound volume at $r1$ distance from sound source (113 decibel A)

$Lp2$ = Sound volume at $r2$ distance from sound source

$r1$ = Reference distance of sound source (1.5 m.)

$r2$ = Distance from sound source to sound receiving place

Sound volume at different distances is as follows;

Distance from sound source (m.)	Sound volume from construction (decibel A)
1.5	113
15	93
30	87
50	82.5
100	76.5
200	70.5
300	67
400	64.5
500	62.5
1000	56.5
1500	53
2000	50.5
2500	49

Sound receiving places surrounding the project construction site in different directions are as follows;

Direction	Community	Distance (m.)	Sound volume from construction (decibel A)
North	Wat Pathumporn	1,000	56.5
South	Ban Thungplakudnoi	500	62.5
East	Ban Hnongsang	500	62.5
West	Residences	500	62.5

According to the promulgation of the Natural Environment Board, edition No.15 (1997), 24-hour average sound volume was defined at 70 decibel A. However the sound level received by the villages nearest to the project construction site without any sound absorbed on

the way, will be 63 decibel A. The most severe volume figure is still not over the specified standard. Therefore, the sound impact from the project construction on adjacent communities was expected to be low.

To minimize the sound impact, the project has measures for impact prevention, and relief during the construction period as follows:

Impact prevention, solution, and relief during the construction phase

- Construction only in daytime.
- Reduce sound volume by minimizing the use of heavy machines which is the main source of sound.
- Regularly inspect the efficiency and performance of any machines used.
- Inspect engine exhaust pipes to be in line with the requirements of Industrial Product Standard Office.
- Contractors to strictly comply with all measures.

Operation phase

The project is close to a main road. There will be an increase in vehicle sound during construction. When the construction is completed, there will be no additional impact on the community who live approximately 5-10 m. away from the road.

The project when completed produces no sound or movement during operation. Therefore, there will be no sound pollution. The Equipment is fixed and there are no moving parts. Therefore, there will be no wear and tear.

3.1.5 Geology and earthquake

Construction phase

There will be no activity of the construction impacting on geology and earthquake.

Operation phase

The project area is located on zone 0 of the earthquake risk area which is classified as low risk area. Therefore, there is no risk for construction and it is not necessary to design for earthquake prevention.

3.1.6 Soil resource and pedology

Construction phase

The project will require earth filling and soil grading in order to make the land suitable for building. Earth filling and compressing will make the soil denser, but it will be limited to the project area. It may result in some soil erosion outside of the construction area, especially in the rainy season. However a levee encompassing the entire project boundary from the beginning of project will reduce any soil erosion to the adjacent water source or low land.

Thus, the project it is expected to have a low impact on the soil resources in the construction period.

Operation phase

After construction is completed, most of the project area will be covered by photovoltaic modules, asphalt road, and grass fields which will reduce the soil erosion to be less than present or even prior to the project construction. Therefore, there will be low impact from the project operation during the operation phase.

3.1.7 Hydrology and soil surface water quality

Construction phase

During the construction phase, there may be impact that erodes soil out of the construction area due to earth filling and grading. The levee building encompassing the entire project boundary will help to reduce soil erosion to water source. Waste water generated by workers, which was expected to be about 2 cubic meters/day, will be collected in stained well within the project area without discharging to outside area or water sources. Thus, it was expected to have low impact on soil surface water quality. However, there may be soil surface erosion in rainy season but there will be no impact due to having only small soil surface disturbance in short time.

Operation phase

Since there is no pollution, thus, there will be no impact on soil condition.

3.2 Impact on biological resources

3.2.1 Terrestrial ecology

Construction phase

The project construction activities will not impact forest and wildlife ecological system, since the project area is rice field and its surrounding area is abandoned. Therefore, land uses will have no impact on the diversity of ecology system. Construction activities will not impact on any plants, birds and wild animals.

Operation phase

During the operation period, there will be no activity impact on plants, forests, birds or wildlife as there are no original forests or wildlife. Thus there will be no impact on plant biodiversity. There will be no utilization/import of GMO plant and/or alien species into the project area. The operation then will no impact on project area.

3.2.2 Aquatic ecology

Construction phase

During the construction period, there will be material transportation and earth digging/filling, which are not closed to water source. Thus, there will be no impact on soil surface water quality.

Operation phase

Operations in this period will have no significant impact.

3.3 Impact on utilization value of human

3.3.1 Land uses

Construction phase

As the project utilizes abandoned rice paddy which is now covered with short shrubs and grasses during the construction period there will be no impact on any land use.

Operation phase

Any impact on land use is low, as the project operation will not release any pollution that will have any impact from any environmental aspect.

3.3.2 Transportation

Construction phase

Impact assessment on traffic quantity during the project construction period and consists of material transportation by trucks through highway No. 22 (Nitayo road) to Sawang Daen Din District, turning left into highway No. 2091 and turn right into highway No. 2280 for another 6 km. These are the 3 main transportation routes.

- This period, earthmoving equipment transportation, as this is an internal project no impact on outside roads or traffic.
- This period, 10 wheels trucks used to transport in materials needed for construction, traffic will be increased to 2 trucks /hour.
- This period, 6 wheels trucks will be used for transporting construction workers this will increase traffic by 2 trucks/hour. Also this will only increase traffic numbers in the morning and evening peak periods.

Operation phase

Impact assessment on traffic quantity during the operation period found that the project operation will have low impact, since there will be no transporting of fuel. There will only be the daily transportation of 16 staff.

3.3.3 Water utilization

Construction phase

During this period, water used for both construction activities and worker consumption will come from a water tank located on the grounds of the construction area. There will be no impact on the community water utilization in areas surrounding the project.

Operation phase

Water required by the project during normal operation is approx 40 cubic meters per day. This will come from an artesian well within the project, this can supply water to the project without any local impact.

There is no community water treatment system. Any waste water from the project will be collected treated and stored in a well before discharging to waste water drainage.

3.3.4 Water draining and flood control

Construction phase

Water management in the project area, an irrigation and drainage system has been installed to collect and store as much rainwater as possible. There will be no water draining to adjacent agricultural areas. Therefore, there will be no impact on adjacent farmers. In a case of local flooding, the project area was raised with earth fill without blocking the natural water flow in anyway. Therefore, there will be no impact on water draining or flood prevention.

Operation phase

The project has already designed water draining and flood prevention system covering the project area. Therefore, the occurred impact will be low.

3.3.5 Electricity utilization

Construction phase

During this period, the project will use a small amount of electricity supplied from the PEA grid. This will be used for night work and for use by construction equipment. Thus, it is expected not to have any impact on the electricity utilization of the adjacent community during this period.

Operation phase

The project operation will have positive impact on electricity utilization by making it more stable and improving the quality of life. The project will add about 6 megawatts of electricity capacity to the area. In addition it also supports the government policy on power production from renewable energy.

3.3.6 Disposing of garbage and waste residue

Construction phase

Garbage derived from construction and employee activities will be collected and disposed of at a suitable sanitary garbage facility.

Operation phase

Ban Thon Sub-District has no official place of garbage disposal. All garbage will be eliminated by piling up and burning. Furthermore, it also lacks of material, equipment and vehicles to collect and transport garbage due to there was no holistic management plan in the past. Thus, the project has to develop a garbage disposing plan in line with sanitary principles.

Electricity generated by the project operation will not be kept in batteries but will be all sold to the PEA. The efficiency of photovoltaic module deteriorate and lose power by 1% per year. The project has a 25 year design life any solar modules that do reach the end of their useful life will recycled and the silicon will be remelted and reused.

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3.3.7 Waste water disposing

Construction phase

In this period, all waste water derived from worker consumption will be drained to stained well.

Operation phase

During this period, any waste water produced, which will consist of waste water from staff and employee consumption which is estimated at about 1 cubic meter/day, will be treated and stored in a well before discharging to outside.

3.3.8 Agriculture

Construction phase

During this period a levee will be built surrounding the construction site. Therefore, there will be no impact on agriculture of the surrounding area.

Operation phase

There will be no releasing waste water from the project. Therefore, there will be no impact on the adjacent agricultural area.

3.3.9 Fire prevention

Construction phase

During this period, there will be fire preventive measures put in place,

- Contractors have to provide 24 hour security guards..

- Outsider shall not be allowed to enter the construction site without getting consent.
- Provide construction workers with training on fire prevention.
- Provide fire extinguishers in fixed locations around the construction site.
- Provide specific areas for separately storing inflammable materials that may cause fires. Separate area of steel welding and clearly post no smoking signs in fire risk areas.

Moreover, in case of a fire, the project management will ask for help from adjacent public authorities such as Sawang Daen Din Multiplicity and Ban Thon Sub-District Administration Organization, etc. By strictly complying with these measures, the chance of a fire occurrence will be minimized and the expected impact on adjacent communities will be low.

Operation phase

During this period, the project will have no flammable materials on site. Important equipment is located in an approved equipment room which has fire prevention, fire alarm systems as well as basic fire extinguishers. Therefore, it is expected that any fire impact from the project operation will be low.

3.4 Impact on value to life quality

3.4.1 Social-economic condition

Construction phase

During this period, there will be employment of local and outsider workers which could impact adjacent community economic conditions. Although, it will have some effect in the short-term, it will create jobs by increasing local incomes and result in more commodity sales to the workers. For the social aspect, there will only be temporary migration of labor during this period. Therefore, there will be no impact on living condition and social behavior.

Operation phase

When the project is launched, a direct positive effect is the established power plant will have a fund and there will be money allocation from the fund to improve local community and its people. Besides, in case of the future problem, the project operator will be glad to receive any comments and will take consideration for further future improvement in order to sustain the project.

The project will have positive impact to tourism. That is the project will be a learning source where many students, citizens and tourist can visit and learn about renewable energy from electricity generating by photovoltaic cell. This will be another tourism site of the sub-district.

3.4.2 Public health

Construction phase

Due to the project controls and preventive measures taken on all important issues including the incidental impact from dust or noise during construction there will be no impact on people's health in the project or adjacent areas.

Operation phase

During this period, there will be very little human activity, no noise, no pollution and there will only be few operational staff so there will be no impact either.