



Capacity Building Module: Solar Energy Basics & Solar Photovoltaic Systems

CHAPTER 7:

Risk Management for Rooftop Solar PV Projects

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PART 1

ROOFTOP SOLAR PV PROJECT PHASES

KEY CHARACTERISTICS & FEATURES OF A PROJECT

Key Characteristics of a Project:

- Activities are complex, unique, and non-routine.
- It has clear objectives, scope of activities, and target outputs.
- It operates within specific time, budget, and resource constraints.
- It involves experts, specialists, and professionals.

Features of a Project:

- Follows a single cycle system.
- It is dynamic in nature.
- Consists of one-time activities without repetition for similar tasks.
- It is constrained by specific time, cost, and quality parameters.
- Involves many interrelated activities.
- Requires a diverse range of resources, expertise, skills, and technologies.
- It is influenced by environmental factors.

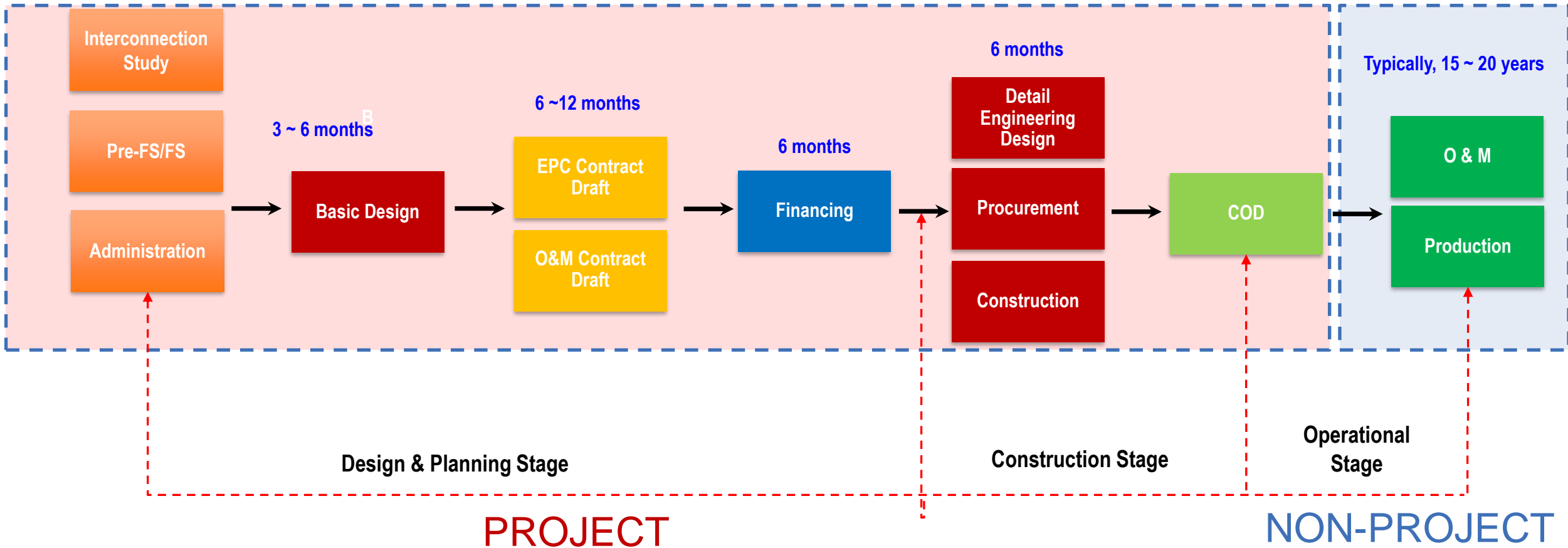
Examples of Projects:

Rooftop Solar PV Power Plant Development Project; Toll Road Infrastructure Project

Examples of Non-Projects:

Operational and Maintenance Activities

ROOFTOP SOLAR PV PROJECT DEVELOPMENT PHASE



Quality of Design & Planning determines the financial, economic, and environmental feasibility of a project.

Quality of Project Management and Contractors determine the success of the construction phase.

A background image showing construction workers in safety gear, including white and yellow hard hats and high-visibility vests. The image is dimmed and serves as a backdrop for the text.

PART 2

DEFINITION OF RISK MANAGEMENT

Risk management involves handling risks through identification and evaluation, mitigation, and allocation. Risks in the development of Rooftop Solar PV can be viewed from various perspectives. Risks can differ depending on the viewpoint of each stakeholder.

Example: Intermittency of Solar Radiation Energy

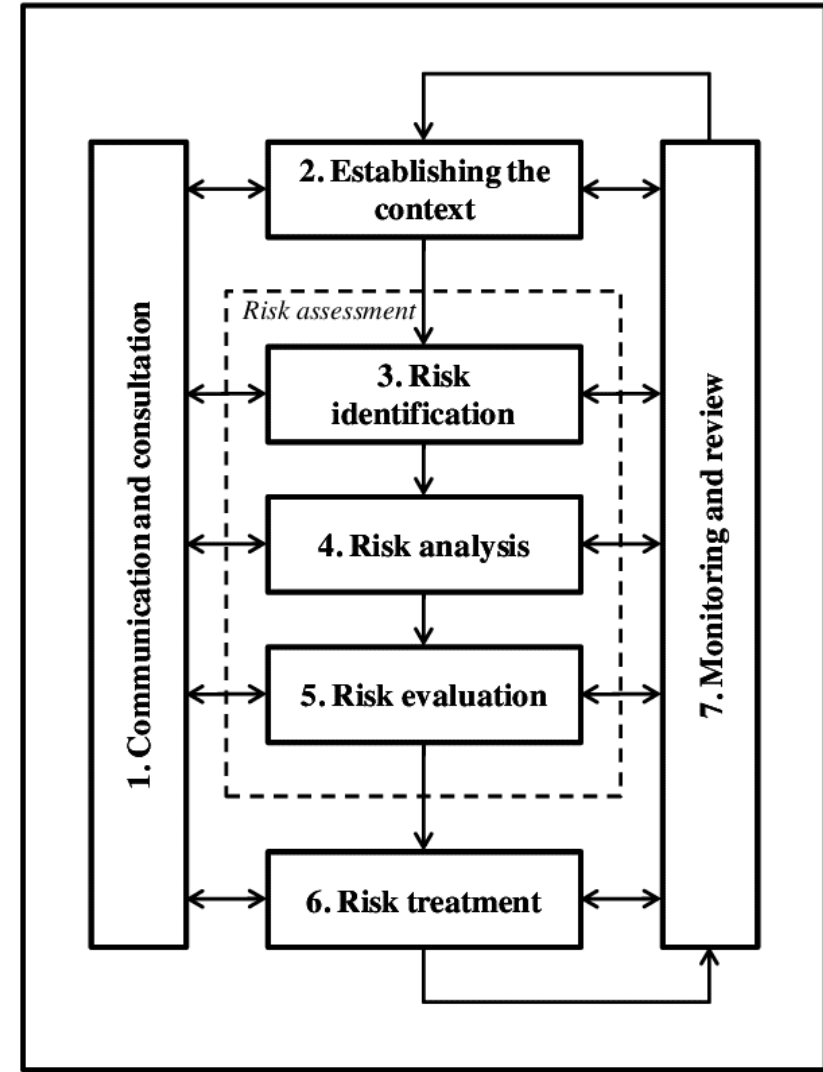
- For Developers/Project Owners: Risks affecting energy output → Risk of Reduced Electricity Production from the Rooftop Solar PV System
- For Lenders/Banks/Financing Institution: Risks affecting revenue/savings reduction from electricity
- For PLN: Risks affecting the capacity and stability of the grid in delivering electricity to customers

RISK MANAGEMENT

For Developers/Project Owners: Risk management is conducted from the planning stage through to the construction, operation, and maintenance stages of the Rooftop Solar PV System.

Risk is an uncertain event that can impact project targets positively or negatively.

Lenders/Banks/Investors specifically focus on all risks that might affect the borrower's ability to repay the loan. Before making any investment decisions, Lenders/Banks/Investors typically develop a **Risk Allocation Matrix** during each project's due diligence to ensure that all stakeholders: **Identify all risk elements and Discuss how all risk elements can be managed during project implementation.**



Project Risks can be categorized into two types:

1. Internal Risks:

1. **Definition:** Risks specific to the project that can be managed by the project developer.
2. **Example:** Risk of project delays due to equipment installation errors, which can be avoided through quality control measures during the installation process.

2. External Risks:

1. **Definition:** General project risks that cannot be controlled by the project developer.
2. **Example:** Risk of project delays due to external events such as natural disasters, civil disturbances, or changes in government policies and regulations. For instance, a rooftop solar PV system may be damaged due to civil unrest around the building's location.

RISK CONTROL STRATEGIES

Risk Control Strategies include various approaches to manage and mitigate risks throughout a project's lifecycle. Here are some common strategies:

1. Risk Avoidance

- Altering project plans or procedures to avoid potential risks.
- Example: Choosing a different location for construction to avoid environmental hazards.

2. Risk Mitigation

- Implementing measures to reduce the likelihood or impact of a risk.
- Example: Installing additional safety equipment to minimize the impact of potential accidents.

3. Risk Transfer

- Shifting the risk to another party, such as through insurance, contracts, or outsourcing.
- Example: Purchasing insurance to cover potential damage or loss.

4. Risk Acceptance:

- Acknowledging the risk and preparing to manage its consequences if it occurs.
- Example: Setting aside contingency funds to cover unexpected costs.



PART 3

RISK MANAGEMENT FOR ROOFTOP SOLAR PV PROJECTS

RISK ASSESSMENT MATRIX

Creating a risk assessment matrix for financing rooftop solar PV in Indonesia involves a thorough evaluation of various potential risks. The matrix is developed to help stakeholders identify, assess, and prioritize risks to ensure informed decision-making and effective risk management strategies.



RISK ASSESSMENT MATRIX

No	Type of Risk	Description	Probability	Impact	Strategy	Mitigation Actions
1	Political risks	Changes in government leadership or political instability that may affect policy continuity and commitment to solar PV projects development.	Medium	High	Mitigate	Implement a PPP scheme that does not follow multi-year requirements, allowing project payments to extend beyond the incumbent leadership period (i.e., five years). This ensures that the projects are not affected by changes in local government leadership.

RISK ASSESSMENT MATRIX

No	Type of Risk	Description	Probability	Impact	Strategy	Mitigation Actions
2	Regulatory risks	<p>Changes in regulations affecting solar PV installation and operation.</p> <p>For example: MEMR Regulation No. 2/2024 removes net metering scheme and limits application submissions for rooftop solar PV installation only to January and July.</p>	Medium	High	Accept	<p>It is important to stay updated with regulatory changes.</p> <p>Engaging with government and regulatory bodies to advocate for more supportive regulations for the development of rooftop solar PV is crucial.</p> <p>By maintaining an ongoing dialogue with these entities, it can help shape policies that encourage the growth and adoption of rooftop solar PV systems, ensuring a more favorable environment for financing solar PV projects.</p>

RISK ASSESSMENT MATRIX

No	Type of Risk	Description	Probability	Impact	Strategy	Mitigation Actions
3	Economic risks	<ol style="list-style-type: none">1. Underestimating the CAPEX can lead to a lack of funds to complete the project.2. Currency fluctuations in exchange rates can affect project costs and returns.	High	High	Mitigate	<ol style="list-style-type: none">1. Cost estimates should be based on reliable sources, such as the LKPP website (https://e-katalog.lkpp.go.id/) or recent quotes from vendors.2. Implement Market Flex. If there are changes in currency value between the term sheet and the agreement, the terms can be adjusted accordingly.

RISK ASSESSMENT MATRIX

No	Type of Risk	Description	Probability	Impact	Strategy	Mitigation Actions
4	Continuity of energy subsidies	Continuity of energy subsidies that maintain low electricity tariffs, particularly for the social tariff, extending the payback period for solar PV installations and making rooftop solar PV less attractive.	High	High	Accept	<p>For buildings that use the social tariff, such as hospitals and public health centers, solarizing these facilities demonstrates a strong commitment to community health and safety. Reducing reliance on grid electricity generated from fossil fuels helps mitigate air pollution and combat climate change, ultimately benefiting public health and well-being.</p> <p>It is also important to prioritize buildings with regular tariffs (non-subsidy) that have high electricity consumption as selected locations for implementing rooftop solar PV systems.</p>

RISK ASSESSMENT MATRIX

No	Type of Risk	Description	Probability	Impact	Strategy	Mitigation Actions
5	Financing risks	Lack of financing for the project due to the small scale of a single project.	High	High	Mitigate	<p>Bundling the project to reach a certain level of capacity would improve financial feasibility by reducing the cost per unit of energy produced.</p> <p>Bundling several projects into a larger portfolio achieves economies of scale. This can reduce overall costs and increase attractiveness to investors who prefer larger investments.</p>

RISK ASSESSMENT MATRIX

No	Type of Risk	Description	Probability	Impact	Strategy	Mitigation Actions
6	Access to capital	Limited availability of capital from state budget (APBN/APBD) for financing solar PV projects.	Medium	High	Mitigate	<p>Collaborate with the private sector through Public-Private Partnership (PPP) scheme, where private entities invest in solar PV projects in exchange for a share of the benefits or returns.</p> <p>Apply for grants and financial support from donor organizations that support sustainable development and renewable energy projects.</p>

RISK ASSESSMENT MATRIX

No	Type of Risk	Description	Probability	Impact	Strategy	Mitigation Actions
7	Equipment failure	Performance and reliability issues with solar PV systems can arise from equipment failures, such as malfunctioning inverters, degraded solar panels, or faulty wiring.	Low	High	Transfer	Use proven technology and select manufacturers that provide high-quality products, comprehensive warranties, and performance guarantees. This ensures reliability and longevity in solar project implementations.

RISK ASSESSMENT MATRIX

No	Type of Risk	Description	Probability	Impact	Strategy	Mitigation Actions
8	Skilled labor availability	Availability of skilled labor for installation and maintenance.	Medium	High	Transfer	<p>Include requirements for the PV EPC to engage and develop local human resources throughout the project's implementation, during installation and also for after-sales service.</p> <p>The selected PV EPC should conduct training programs and establish partnerships with local educational institutions.</p>

RISK ASSESSMENT MATRIX

No	Type of Risk	Description	Probability	Impact	Strategy	Mitigation Actions
9	Environmental risks	Risks from natural disasters, such as earthquakes	Low	Medium	Mitigate	Designing for resilience, ensuring adequate insurance coverage, and developing comprehensive emergency response plans are critical aspects of mitigating risks associated with natural disasters.

RISK ASSESSMENT MATRIX

No	Type of Risk	Description	Probability	Impact	Strategy	Mitigation Actions
10	Social risks	Community acceptance. Resistance from local communities due to unfamiliarity with solar PV systems.	Low	Low	Mitigate	<p>Engaging with the community to increase their understanding and awareness of adopting solar PV systems can lead to their support for sustainable energy.</p> <p>Local governments can play a pivotal role in promoting rooftop solar PV systems by demonstrating leadership through the implementation of solar PV systems on their public buildings, such as government offices, schools, hospitals, and public health centers.</p>

CONCLUSION

There are various funding options for rooftop solar PV systems, including public funding, private/business funding, or public-private partnerships (PPP). Each funding choice will influence the risk characteristics and the risk management approach for the rooftop solar PV project.

Sustainable development of rooftop solar PV systems involves effectively managing all potential risks associated with the project.

Local governments play a key role in promoting sustainable development of rooftop solar PV systems.

Risk management is a crucial aspect of sustainable rooftop solar PV development.

By understanding and proactively managing risks in rooftop solar PV development, local governments can maximize the benefits of solar energy in their regions.

END OF CHAPTER 7 OF 7

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