

# CRITERIA FOR ASSESSMENT OF DIFFERENT DESIGNS OF SMALL-SCALE BIOGAS PLANTS

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## Introduction

Use of small-scale biogas plants (BGPs) has been widely extended in Southeast Asia, where biogas energy is used mainly for cooking and lighting. Biogas plants are used to transform organic waste into combustible fuel, bringing the benefits of improvement of the living standards of rural households and reduction of their environmental impact. Despite many benefits of biogas utilization, there are different technical and non-technical constraints, which may result in compromising of the potential benefits. Advantages and disadvantages of different designs of biogas plants used in developing countries (fixed dome, floating drum, inflatable tubular) need to be sufficiently explored in a holistic way. Therefore, a technical, environmental, economic and social analysis needs to be performed to assess the potential of biogas plants. Furthermore, this study intends to develop a multi decision-making tool for further use in practice.

## Aim of the study

The purpose of this study is to develop holistic assessment technique, which will be used for assessment of different BGP designs. For this purpose, a technical, economic, social and environmental analysis, based on chosen impact criteria needs to be performed to assess the potential of biogas plants.

Figure 1: Fixed-dome biogas plant in Vietnam



Table 1: Criteria for the assessment

| Dimension     | Assessment criteria   |
|---------------|---|
| Technical     | Process efficiency<br>Energy payback<br>Operational reliability   |
| Social        | Health and sanitation<br>Gender equality<br>Perception of BGP use |
| Economic      | Total investment cost<br>Payback period                           |
| Environmental | Life-cycle analysis<br>Global Warming Potential                   |

Figure 2: Use of biogas for cooking



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## Methodology

The methodology involves a deep review of current literature, followed by primary data collection by interviews, focus discussions and measurements performed in the target area of Southeast Asia. The sustainability assessment framework (SAF) was developed, to be effectively used for multi criteria decision tool development, regarding different types of BGPs based on case-specific contexts. The framework integrates multi criteria analysis principles of four dimensions of sustainability: Social, Economic, Technical and Environmental.

## Criteria for the assessment

The impact criteria for each dimension (Table 1) were chosen to capture the fundamental aspects of the sustainability dimensions, based on reliability, measurability and relevance to the situation in the target areas.

## Further steps and expected outputs

After data collection, the obtained data will be analysed in evaluation matrix, using weights to indicate relative significance of each criterion. Multiple-criteria decision analysis will be performed to assess different criteria in favour of developing a decision-making tool, to be used by implementers and researchers.



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