

Towards Sustainable Development Evaluation: Sustainability Impact Assessment in Development Programmes

SAKSHI*¹, VANDANA VERMA² AND SUMAN SODHI³

¹Ph.D. Scholar and ^{2&3}Associate Professor

¹Department of Apparel and Textile Science, I.C. College of Community Science, Chaudhary Charan Singh Haryana Agricultural University, Hisar (Haryana) India

^{2&3}Department of Extension Education and Communication Management, I.C. College of Community Science, Chaudhary Charan Singh Haryana Agricultural University, Hisar (Haryana) India

***Corresponding Author**

ABSTRACT

In the present era of rapid industrialization, urban expansion, welfare planning and infrastructure growth, the evaluation of development programmes has moved far beyond traditional output measurement. Modern development is no longer judged only by short-term economic gains, but also by its long-term environmental safety, social inclusiveness, governance accountability and future adaptability. This shift has increased the importance of Sustainability Impact Assessment (SIA) as a comprehensive approach for examining whether development interventions create balanced and durable benefits. The present review paper critically analyses the conceptual foundation, major frameworks, key dimensions, indicators, practical importance, measurement challenges and emerging approaches related to sustainability impact assessment in development programmes. The review reveals that sustainability impact is multidimensional in nature and requires the integration of environmental, economic, social, governance and technological perspectives. Recent literature further indicates that modern sustainability frameworks are increasingly moving from simple descriptive models toward data-driven systems such as ESG reporting, Life Cycle Sustainability Assessment, AI dashboards and digital predictive analytics. However, issues such as indicator standardization, long-term data gaps, weak social quantification and governance inconsistency continue to limit accurate sustainability measurement. Recent scholarly studies also emphasize that the future of sustainability assessment lies in intelligent monitoring, integrated scorecards and adaptive evidence-based planning. The paper concludes that Sustainability Impact Assessment has become an essential component of responsible development evaluation because it helps ensure that present growth does not create future environmental, social, or institutional burdens.

Keywords: Sustainability Impact Assessment, ESG, Life Cycle Sustainability, Indicators, AI-based Monitoring

INTRODUCTION

Traditionally, the success of such programmes was measured mainly through visible achievements such as the number of roads constructed, income generated, production increased, or funds utilized. However, in the present century, this narrow way of judging development is no longer considered sufficient. A programme may provide quick economic growth, but at the same time it can also create environmental pollution, social inequality, excessive resource consumption, or weak long-term

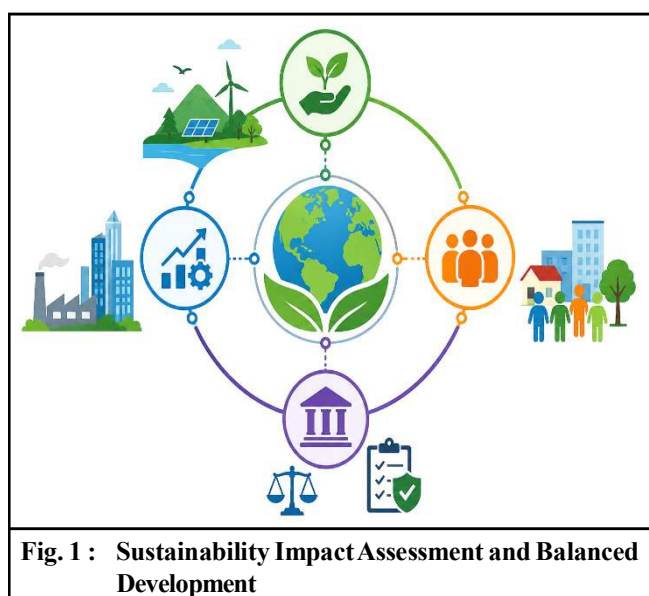
community benefits. Because of this changing reality, the understanding of development evaluation has gradually shifted from short-term output measurement to long-term sustainability measurement. Recent global reviews confirm that development planning is now increasingly judged by its future resilience and balanced public benefit rather than only by immediate financial gain (Ozili, 2022).

The concept that has strongly influenced this shift is sustainability. Sustainability simply means meeting present developmental needs without harming the ability of future generations to meet their own needs. In

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academic and policy discussions, sustainability is now seen as a balance among economic growth, environmental protection and social welfare. This broader understanding has made researchers and policy makers realize that development programmes cannot be called truly successful if they provide only temporary benefits while producing future ecological or social burdens. Bond *et al.* (2025) explain in their updated state-of-the-art review that sustainability assessment has now become one of the most critical decision-support tools because modern societies are facing increasing climate pressure, institutional instability and resource limitations.

As a result of this changing developmental thinking, the idea of Sustainability Impact Assessment (SIA) has gained strong importance under the broader field of impact assessment of development programmes. Sustainability Impact Assessment refers to a systematic process of examining whether a programme is generating economically useful, socially inclusive and environmentally responsible outcomes over a long period. Unlike traditional evaluations that usually focus only on cost, time, or target achievement, sustainability impact assessment studies the deeper and long-term consequences of development interventions. It attempts to answer an important question—whether present development is creating meaningful progress or only temporary visible success. Scholars have increasingly emphasized that assessment tools must now move beyond ordinary output reporting and should evaluate sustainability as an integrated developmental objective (Farahdel *et al.*, 2024) (Fig. 1).



The importance of Sustainability Impact Assessment has become even greater after the worldwide acceptance of the United Nations Sustainable Development Goals (SDGs). These goals clearly demand that development should not only raise income levels but should also reduce poverty, improve equality, ensure responsible consumption, protect climate, conserve resources and strengthen institutions. Therefore, projects related to irrigation, transport, urban housing, industry, education, public health and rural development are now expected to demonstrate sustainable outcomes rather than only expenditure completion (Minutiello *et al.*, 2024). Recent studies on environmental governance also indicate that impact assessment practices are rapidly evolving to include social justice, institutional transparency and long-term environmental accountability as central parts of programme evaluation (Glasson and Therivel, 2019).

Another reason for the growing importance of this topic is the rapid expansion of sustainability research across academic disciplines. Current review studies reveal that sustainability is no longer limited to environmental studies alone; it has now become deeply connected with economics, public policy, governance, social development and technological systems. Gupta and Ferrarez (2024), in their comprehensive review on sustainability in project management, reported that modern development evaluation is shifting away from the old cost–time–scope model toward a multidimensional sustainability model where social responsibility, ecological safety and economic continuity are judged together. In the same way, Bebbington *et al.* (2014) found that social participation, accountability and trust indicators now play a significant role in measuring whether development programmes remain sustainable after implementation.

Recent literature also highlights that sustainability impact assessment is becoming more scientific and technology-driven than before. Artificial Intelligence, GIS mapping, digital dashboards, satellite monitoring, sustainability scorecards and real-time data analytics are increasingly being used to measure environmental performance, resource efficiency, governance transparency and community inclusion. Such advanced tools allow researchers to track not only present achievements but also future sustainability risks. This indicates that sustainability assessment is no longer a simple descriptive review process; rather, it is developing into a dynamic and evidence-based decision-making mechanism for development planning (Vinuesa *et al.*,

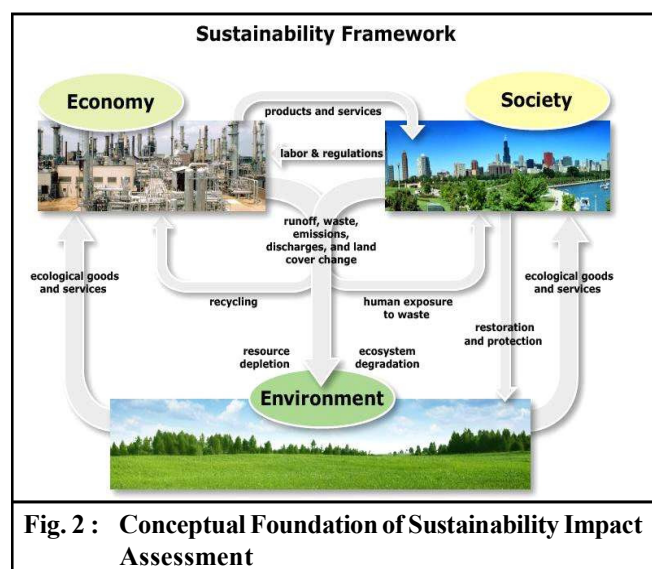
2020).

Despite this progress, several practical challenges still remain. Different countries use different sustainability indicators, long-term field monitoring is often weak and many development programmes continue to focus more on immediate completion than on future sustainability outcomes. Because of these limitations, Sustainability Impact Assessment is still an expanding and evolving field that requires critical academic understanding.

Keeping this background in view, the present review paper aims to examine the meaning, conceptual basis, major frameworks, dimensions, indicators, significance, challenges and emerging trends related to sustainability impact assessment under development programmes. The paper attempts to provide a broad understanding of how recent scholarly studies are redefining the way development success should be measured in the long run.

Conceptual Background of Sustainability Impact Assessment

Sustainability Impact Assessment is a systematic process used to study whether a development programme is producing balanced benefits for the economy, society and environment not only in the present but also in the future. It is based on the idea that development should not create one-sided progress. If a programme increases production but damages natural resources, or if it builds infrastructure but fails to improve community welfare, then such development cannot be called sustainable. Therefore, Sustainability Impact Assessment focuses on long-term continuity, balanced resource use and socially meaningful outcomes (Fig. 2).



The conceptual understanding of this assessment is linked with integrated development thinking. Earlier impact assessments mainly focused on financial completion, target achievement, or physical outputs, but modern sustainability studies argue that development must be evaluated in terms of long-term resilience and public benefit. Pope *et al.* (2017) explains that sustainability impact is not a single measurable result; rather, it is a combination of environmental responsibility, economic stability and social continuity working together.

A major conceptual base of Sustainability Impact Assessment is the idea of interconnected sustainability dimensions. Fatima *et al.* (2025) explain that sustainability should be measured through interdependent impact scores because change in one dimension directly affects the others. For example, technological growth can improve productivity but may also increase energy demand; similarly, industrial expansion can improve employment but may create pollution. Thus, the concept of sustainability impact is dynamic rather than isolated.

Another important conceptual shift is that present sustainability assessment does not stop at checking whether a programme was completed successfully. It also asks whether the programme can continue delivering benefits without causing future burden. Because of this, Sustainability Impact Assessment is now viewed as a broader developmental quality check that combines performance, responsibility and future adaptability (Table 1).

Table 1 : Core Conceptual Elements of Sustainability Impact Assessment

Conceptual Element	Meaning in Sustainability Assessment
Long-term Continuity	Programme should remain beneficial in future
Balanced Development	Equal focus on economy, society and environment
Resource Responsibility	Controlled use of natural and financial resources
Social Inclusiveness	Benefits should reach wider community
Adaptive Capacity	Programme should survive future changes

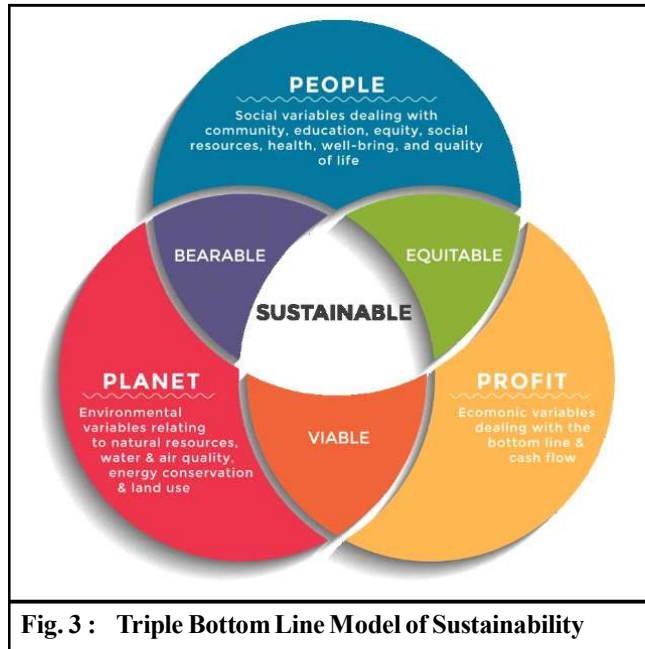
Major Frameworks of Sustainability Impact Assessment

To understand sustainability impact in a measurable form, researchers have developed different frameworks. These frameworks convert the broad idea of sustainability into organized models of assessment. Recent literature

states that sustainability frameworks have gradually moved from basic descriptive models to integrated data-driven systems (Mulligan, 2026).

Triple Bottom Line Framework

This framework is based on three pillars—People, Planet and Profit. It explains that no development programme is sustainable unless it creates social welfare, protects the environment and remains economically useful (Fig. 3).



Sustainable Development Goal Based Framework

This framework checks whether development programmes contribute toward global SDG targets like poverty reduction, climate action, clean water and sustainable cities.

ESG Framework

Environmental, Social and Governance framework uses measurable sustainability scores and is increasingly used for transparent reporting and policy accountability (Chopra *et al.*, 2024).

Life Cycle Sustainability Assessment

This framework studies sustainability from programme planning to post-completion impact and helps identify delayed social or ecological burdens.

Digital and AI-Based Framework

Modern sustainability studies now use Artificial Intelligence, dashboards, GIS mapping and predictive analytics for continuous monitoring of sustainability risks and performance. Recent AI sustainability models show that technology can improve real-time sustainability judgement and future planning (Table 2).

Key Dimensions and Indicators of Sustainability Impact

Sustainability impact is measured through several dimensions because one single indicator cannot explain the full developmental effect. Recent reviews emphasize that multidimensional indicator systems are essential for correct sustainability judgement (Farahdel *et al.*, 2024; Braun *et al.*, 2024).

Environmental Indicators

Carbon emission, waste generation, water use, biodiversity safety, renewable energy use

Economic Indicators

Cost-effectiveness, productivity, income growth, employment continuity, maintenance cost

Social Indicators

Public participation, health access, education, gender equality, beneficiary satisfaction

Governance Indicators

Transparency, accountability, monitoring, grievance handling, institutional continuity

Technological Indicators

Digital efficiency, smart monitoring, innovation use, data management

Table 2 : Comparative Analysis of Sustainability Assessment Frameworks

Framework	Main Focus	Major Benefit	Suitable Use
Triple Bottom Line	Social-Environmental-Economic balance	Simple understanding	Basic programmes
SDG Based	Global development targets	International relevance	Government schemes
ESG	Measurable sustainability scores	Transparency	Institutions
LCSA	Full life cycle impact	Long-term view	Infrastructure
Digital/AI	Real-time monitoring	Predictive analysis	Smart governance

Sala *et al.* (2015) notes that modern sustainability indicators must cover all three traditional dimensions with measurable supporting variables to provide useful decision making.

Importance of Sustainability Impact Assessment in Development Programmes

Sustainability Impact Assessment has become highly important because development programmes today involve huge public investment, natural resource use and long-term social consequences. If sustainability is not measured properly, a programme may appear successful in reports but may fail in practical long-term benefit.

First, it helps in identifying hidden environmental damage that is often ignored during normal output evaluation. Second, it improves policy accountability by checking whether public funds are creating durable results. Third, it supports social justice by examining whether development benefits are reaching the wider population or only selected groups. Fourth, it improves future planning because sustainability data helps in correcting weak programme areas.

Recent state-of-the-art sustainability reviews explain that governments are now increasingly using sustainability assessment as a policy quality filter before approving major development investments (Bond *et al.*, 2025) (Fig. 4).

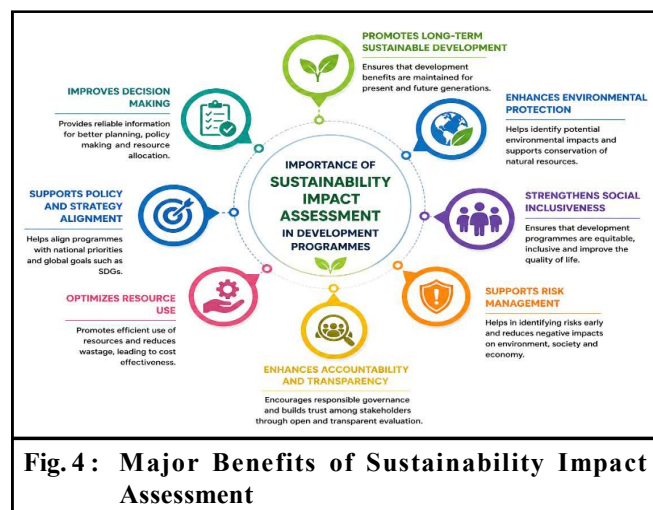


Fig.4: Major Benefits of Sustainability Impact Assessment

Challenges in Measuring Sustainability Impact

Even though sustainability assessment is highly useful, its practical measurement is still difficult (Fig. 5).

- Lack of standardized indicators
- Insufficient long-term field data
- Weak community participation

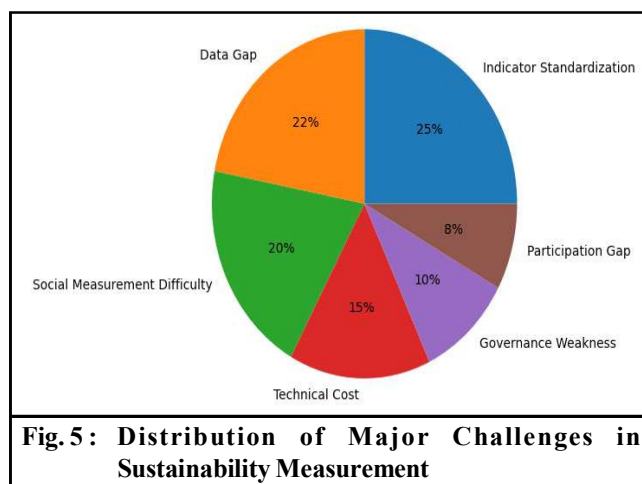


Fig. 5: Distribution of Major Challenges in Sustainability Measurement

- Difficulty in quantifying social outcomes
- High technical and financial cost
- Governance inconsistency

ISO (2006) clearly reports that environmental and economic indicators are relatively developed, but social sustainability remains difficult to quantify in many sectors.

Guinée *et al.* (2025) further note that many sustainability systems still struggle with integration of cost data, life-cycle data and process-level sustainability evidence.

Recent Trends and Emerging Approaches

Recent sustainability research shows a clear shift from manual descriptive assessment to intelligent evidence-based monitoring. The latest trends include:

- AI-assisted sustainability prediction
- GIS and satellite-based monitoring
- Digital KPI dashboards
- Life-cycle integrated scorecards
- ESG linked public accountability systems
- Adaptive sustainability rating models

Recent studies on smart sustainability rating systems and AI analytical frameworks confirm that sustainability assessment is becoming more predictive, transparent and data-intensive than before.

Conclusion

Sustainability Impact Assessment has emerged as an essential part of modern development evaluation because it provides a broader understanding of whether a programme is creating meaningful and lasting public benefit. Unlike traditional assessments that focus mainly on short-term targets, sustainability assessment studies long-term environmental safety, economic continuity,

social inclusiveness, governance strength and technological adaptability. The review clearly shows that sustainability impact is multidimensional and requires the use of structured frameworks, measurable indicators and updated monitoring tools. Although several challenges such as indicator inconsistency, data limitations and social measurement complexity still remain, recent digital and AI-supported approaches are making sustainability assessment more scientific and reliable. Therefore, in the present age of responsible development planning, Sustainability Impact Assessment is not only a review tool but also a necessary guide for ensuring that development remains beneficial for both present and future generations.

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