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# Optimizing Waste-to-Energy Ventures in India: Best Value Procurement as a Strategic Imperative

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**ABSTRACT**:
As India grapples with the mounting challenges of urbanization and escalating municipal solid waste, the imperative for effective waste-to-energy (WTE) solutions has never been more pressing. This paper delves into the transformative potential of Best Value Procurement (BVP) as a strategic approach in the procurement process for waste-to-energy projects in the Indian context. Moving beyond the traditional emphasis on cost-centric models, BVP prioritizes quality, innovation, and long-term value, aligning with the multifaceted goals of sustainable waste management and renewable energy production.

The paper explores the dynamic and complex landscape of waste-to-energy initiatives in India, acknowledging the unique socio-economic and environmental considerations that shape this domain. By analyzing the principles of Best Value Procurement, this paper underscores its potential to navigate the intricacies of waste-to-energy projects, fostering collaboration, risk management, and stakeholder engagement.

Case studies and analyses are employed to illustrate the iterative and adaptable nature of BVP, highlighting its capacity to drive continuous improvement throughout the lifecycle of waste-to-energy projects. The discussion emphasizes the need for a procurement framework that not only identifies cost-efficient solutions but also maximizes long-term value and contributes to environmental sustainability.

As India endeavors to position itself at the forefront of sustainable waste management practices, understanding Best Value Procurement as a strategic imperative becomes paramount. By encouraging flexibility, innovation, and a commitment to excellence, BVP emerges as a catalyst for aligning waste-to-energy project objectives with the broader goals of environmental stewardship, social cost, economic efficiency, and community development.

This paper serves as an entry point for a comprehensive exploration of how Best Value Procurement can revolutionize the procurement landscape for waste-to-energy projects in India, contributing to the nation's aspirations for cleaner, more resilient, and energy-efficient urban landscapes.
Key words: Best Value procurement, Waste to Energy, life cycle approach, procurement framework, environmental sustainability, social cost

## Introduction

Public procurement is a crucial element for good governance of a country as it plays a vital role in the public financial management system. It is estimated that public procurement accounts for around 15 to 20% of the gross domestic product across the world(Manta et al., 2022) . In India, it accounts for approximately 20 to 22% of the country's GDP. Out of USD 2.7 trillion of Indian economy, public procurement amounts to the tune of USD 500 billion annually(GFR,2017). Deriving the best value out of public expenditure is the sole objective of any government spending.

However, governments across the world are continuously facing challenges in setting up a well-functioning and efficient public procurement system that is corruption free and well managed. Addressing the fiscal deficit problems in any government system requires strategic and efficient allocation of its resources in terms of government expenditures. Considering large-scale public expenditure on procurement, it is imperative that India follows a public procurement system that emphasizes value maximisation rather than the least cost of the procurement(WTO, n.d.).

Waste-to-energy (WTE) projects stand at the forefront of India's pursuit of sustainable and efficient waste management solutions, addressing the dual challenge of environmental stewardship and energy demand. As the nation strives to enhance its waste-to-energy infrastructure, the methodology by which these projects are procured plays a pivotal role in determining their success and impact. Best Value Procurement (BVP) emerges as a strategic approach, transcending conventional cost-centric models to prioritize holistic value, innovation, and long-term sustainability for major infrastructure projects including WTE(Narmo et al., 2018).

India, with its burgeoning population and rapid urbanization, faces a formidable challenge in managing the escalating volumes of municipal solid waste. Waste-to-energy projects have emerged as a promising avenue, not only for waste reduction but also as a source of renewable energy. However, the effectiveness of these projects is inherently tied to the procurement strategies employed. The adoption of Best Value Procurement in the context of waste-to-energy projects becomes particularly pertinent, given its ability to navigate the intricacies of project complexities and enhance overall project outcomes.

This introduction sets the stage for exploring how Best Value Procurement principles can revolutionize the procurement landscape for waste-to-energy projects in India. Beyond the traditional focus on cost considerations, BVP introduces a paradigm shift that places emphasis on quality, innovation, and collaboration. The dynamic nature of waste-to-energy initiatives necessitates a procurement framework that not only selects the most cost-efficient solutions but also maximizes long-term value and environmental benefits.

As we delve into the intricacies of Best Value Procurement in the subsequent discourse, the aim is to unravel the transformative potential of this approach in the Indian waste-to-energy context. By promoting adaptability, stakeholder engagement, and a commitment to excellence, BVP offers a promising avenue for aligning project objectives with broader environmental, economic, and social imperatives. In doing so, it contributes to the realization of India's ambitions for sustainable waste management practices and the development of a cleaner, greener, and more energy-resilient future.

The literature surrounding Best Value Procurement (BVP) in the context of waste-to-energy (WTE) projects in India reflects a growing recognition of the need for strategic approaches to address the challenges of urbanization and escalating municipal solid waste. The following literature review provides an overview of key themes, methodologies, and findings from existing studies in this field. Various Studies emphasize the strategic imperatives of waste-to-energy projects, acknowledging the pressing need for sustainable solutions. BVP emerges as a strategic framework that goes beyond conventional cost-centric models, aligning with the broader goals of sustainable waste management and renewable energy production. Scholars delve into the unique socio-economic and environmental considerations that shape waste-to-energy initiatives in India. This literature study emphasizes the importance of a procurement approach that is sensitive to these contextual factors and this is being demonstrated by various researchers in their works(Lines et al., 2022). is identified as a methodology capable of navigating this dynamic landscape.

Existing literature extensively explores the principles and frameworks of Best Value Procurement. This includes a focus on quality, innovation, and long-term value as key criteria for project evaluation(Devika, 2012). BVP is seen as a method that can enhance collaboration, manage risks effectively, and engage stakeholders throughout the procurement process. Case studies and analyses are employed to illustrate the iterative and adaptable nature of BVP. Real-world examples demonstrate how BVP can be effectively applied, underscoring its potential for success and scalability. The literature consistently underscores the need for a procurement framework that contributes not only to cost efficiency but also to long-term value and environmental sustainability. BVP is positioned as a strategic imperative in achieving these goals, aligning with India's aspirations for cleaner and more energy-efficient urban landscapes.

The literature advocates for procurement approaches that encourage flexibility, innovation, and a commitment to excellence. BVP is portrayed as a catalyst for aligning waste-to-energy project objectives with broader goals of environmental stewardship, economic efficiency, and community development.

Though there is limited literature on Best Value Procurement in waste-to-energy projects in India, procurement for long term infrastructure projects through BVP process can be drawn as parallel to WTE projects(Dimitri, 2013). This reflects a growing understanding of the strategic significance of this approach. BVP is seen as a

transformative methodology that not only addresses the challenges posed by urbanization and municipal waste but also contributes to India's broader goals of sustainability and energy efficiency.

The inadequate comprehension of responsibility and accountability frequently contributes to project failures in the Indian context. Unlike conventional methods that rely on stringent rules and regulations, Best Value Procurement (BVP) values expertise, accountability, and transparency. This approach fosters higher creativity and quality, leading to an improved marketplace without the added burden of frequent inspections and regulations. BVP, by leveraging the vendor's expertise, simplifies projects, reduces complexity, duration, and costs, while enhancing overall quality. However, its simplicity requires effective leadership and worker involvement, relying on common sense and logic instead of established frameworks.

To understand "What is Best Value Procurement?" in the Indian setting, one must delve into the Information Measurement Theory (IMT)(Kashiwagi, 2002), the foundation of the BVP philosophy. IMT revolves around the predictability of events using available information to transition from a low-bid environment to an information environment based on performance characteristics. BVP aligns with this theory by investing time upfront in the Execution Phase for vendors to identify performance measurements, predict outcomes, and merge their expertise with the given problem.

BVP's theoretical framework encompasses four phases: Pre-qualification, Selection, Clarification, and Execution. Decision making and bias are minimized in the vendor selection process through automated processes, resulting in more effective and efficient client decision-making. Filters applied in the Selection Phase, such as Project capability, Interview of key personnel, Prioritization, and Dominance check, facilitate the selection of the best-value vendor based on performance information. This approach ensures transparency and values all types of expertise, especially in markets with numerous qualified participants(Preda, 2020).

Risk assessment and value-added documents in the capability documents distinguish high-performing vendors from the low-performing ones. Emphasis on risk identification during the Clarification Phase, where the selected vendor elaborates on plans, ensures mitigation of risks before the contract (Bansal and Kar, 2021). Tender criteria beyond price have gained prominence in India, and BVP has been adopted successfully in infrastructure projects, similar to the experience of such projects in the Netherlands(Storteboom et al., 2017). The interest in BVP is growing in India, with the potential to differentiate projects, increase value for money, and uphold transparency and objectivity. The success of BVP is demonstrated by its ability to deliver higher value, reduce costs, and streamline project completion times in various global contexts, including the United States.

**Methodology:**
This research focuses on exploring Best Value Procurement (BVP) within the Indian context, employing a multi-faceted approach that combines a scoping literature study and case study methodology.

***Scoping Literature Study:***

- The research commenced with a scoping literature study that involved a comprehensive review of existing literature on Best Value Procurement to establish a foundational understanding of the core principles and operational steps.
- Search strategies were employed using various platforms such as Oria, Scopus, TU Delft Library, Google, and Google Scholar. Specific keywords, including "Best Value Procurement in India" and "waste to energy project through competitive bidding," were used to curate relevant literature.
- The literature study focused on identifying key insights, principles, and challenges associated with BVP in the Indian context.
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***Case Study:***
Some selected case studies pertaining procurement for Indian Governments implementing innovative schemes were selected for in-depth examination through a case study approach that somehow put value for money through a life cycle cost approach under BVP criteria. Case selection was based on relevance and availability, with an initial examination of a list of Indian cases practicing Best Value Procurement. Contacts were made with representatives to confirm the willingness to share experiences. Document studies were conducted prior to interviews to gather background information about the projects.

***Interviews:***

- Semi-structured focused interviews were conducted with responsible individuals from the project side for all selected WTE projects to get their perspectives on sustainable procurement, mostly on the competitive bid. The questionnaire focused on whether they have incorporated social and environmental cost while bidding for the project. The interviewees held roles such as project manager, and procurement coordinator from the project developer side or from the local bodies.
- Interviews were conducted through telephonic conversations, over google meet. The interviews primarily focused on understanding the client's perspective on procurement of projects in India and the nature of imbibing the best value concept in project procurement from both the sides.
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***Limitations:***

- The explorative nature of this research inherently limits its scope. As such there is no nomenclature of BVP projects that were registered in India .Generally , it was recognised that the projects procured under competitive bidding guidelines would be covered under BVP projects in India due to its relative transparency and better value optimisation.
- Also, as the term is relatively new and not so prevalent in government procurement, getting value out of any procurement of the project , most specifically in government projects is conceptually as well as practically difficult. As they are focussing mostly on traditional procurement going by the books under strict norms and regulations, least cost project is the norm. More ever, waste to energy project procurements under the BVP mode conceptually is a difficult subject to them. However, they procure all projects taking both the vital parameters time and cost that would qualify under the best value procurement. However, for the sake of this study, other infrastructure large scale projects are considered as BVP project procurements for study purpose. That may be one of the limitations of the study.
- Interviews were not conducted face-to-face, which may have implications for the depth of information shared. Efforts were made to mitigate this limitation through robust communication channels.

This methodology aims to provide a comprehensive understanding of Best Value Procurement in the Indian context, combining theoretical insights from literature with practical perspectives gained through case studies and interviews.

**Finding and Discussion:**

*General procurement practices in India*

Central Public Sector Enterprises (CPSEs) contributes a major portion of the public procurement of works, goods and services. Government of India has established Government e-Marketplace (GEM) and central public procurement portal for streamlining the procurement process. However, it faces major challenges in driving transformation in the procurement system in the absence of any comprehensive procurement legislation. In absence of any law, public procurement matters are governed by GFR (General Financial Rules) 2017, promulgated by Ministry of Finance, Government of India. The GFR majorly emphasizes on L1 (Least Cost) method of procurement. (GFR 2017)

While the developing and emerging markets put major thrust on increasing competitiveness, enhancing transparency and reducing corruption at all levels of procurement processes by following value procurement practices, India still follows the traditional way of least cost procurement. India has been resistant to open up its government procurement market to the world. It is not a signatory to the World Trade Organisation (WTO)'s Agreement on Government Procurement (GPA) that has stressed accessing foreign markets for public procurement since 2010(WTO, n.d.). While it is important to support domestic suppliers for government procurements, at the same time, there is a need to increase global competitiveness of domestic suppliers to compete in the international market by focusing on quality and service delivery.

Public procurement in India is a complex process, especially when it comes to public service delivery. It is entangled with complex bureaucratic provisions, constitutional arrangements between state and the centre, different regulatory compliances and absence of functional institutional arrangements. The procurement process India faces several hurdles like inefficient monitoring processes, limited accountability and governance, limited awareness.

**Major challenges faced by the procurement process in India can be categorised as:**

*The absence of a comprehensive procurement act*

In India, the absence of a comprehensive procurement act remains a notable gap in the regulatory framework governing public procurement. Unlike some developed nations that have established detailed procurement legislation, India relies on the General Financial Rules (GFR) 2017, promulgated by the Ministry of Finance, to guide procurement processes. The GFR emphasizes the Least Cost (L1) method, focusing predominantly on financial considerations. The absence of a dedicated procurement act poses challenges as it leaves the procurement landscape without a unified legal framework to address evolving complexities and specificities associated with modern procurement practices. This gap not only hampers the establishment of standardized procedures but also contributes to a lack of clarity in addressing issues such as anti-competitive practices, corruption, and the promotion of best value procurement practices in the Indian context. The need for a comprehensive procurement act is crucial to provide a legal foundation for transparent, accountable, and efficient procurement processes aligned with international best practices

**Lack of standard bid documents**

The deficiency of standard bid documents in India poses a significant challenge in the realm of public procurement. Unlike systems in some developed countries that benefit from standardized and universally accepted bid documents, India grapples with a lack of such a normative framework(Patil & Laishram, 2016). This absence hampers the procurement process as it leads to inconsistencies, variations, and potential ambiguities in bid submissions. Standard bid documents are essential for ensuring a level playing field, fostering competition, and enhancing transparency in the procurement process. Without standardized bid documents, there is an increased risk of inefficiency, misinterpretation, and delays in procurement cycles(Ashok & Birajdar, 2015). Addressing this gap becomes crucial for streamlining procurement practices, enhancing the credibility of the bidding process, and promoting fair competition among potential suppliers and contractors in the Indian context.

**Delays in activities in the procurement cycle**

Delays in activities within the procurement cycle present a formidable challenge in the Indian context. The intricate bureaucratic processes, coupled with a multitude of regulatory compliances, contribute to significant time lags at various stages of procurement. From the initial identification of needs to the finalization of contracts, the procurement cycle in India often encounters prolonged timelines, impeding the swift execution of projects. These delays can be attributed to factors such as complex approval procedures, extended evaluation periods, and bureaucratic intricacies. The consequence is a slower pace of public service delivery and a hampered ability to respond promptly to emerging needs. Addressing and mitigating these delays is essential for optimizing efficiency, ensuring timely project implementations, and aligning public procurement with the fast-paced demands of a dynamic and growing nation like India(Ashok & Birajdar, 2015).

**Unfair practices and corruption**

Unfair practices and corruption pose significant challenges within the procurement landscape in India. Despite efforts to establish transparent and accountable processes, instances of unethical conduct persist, undermining the integrity of procurement activities. Practices such as bribery, favoritism, and nepotism can influence decision-making, leading to distorted outcomes in vendor selection and contract awards(Panda & Sahu, 2011). Corruption not only erodes the principles of fairness and equity but also hampers healthy competition among potential suppliers. Tackling these issues requires comprehensive measures, including robust anti-corruption policies, effective monitoring mechanisms, and stringent legal frameworks.

***Anti-competitive practices***

Anti-competitive practices in procurement present a formidable challenge to India's procurement landscape, impeding fair competition and distorting market dynamics. Such practices can manifest in various forms, including bid rigging, collusive behavior among suppliers, and the creation of cartels to manipulate prices or exclude potential competitors(Khan, 2017). These activities undermine the principles of transparency, equality, and efficiency that should characterize a healthy procurement ecosystem. Anti-competitive behavior not only compromises the integrity of the procurement process but also leads to suboptimal outcomes, often resulting in inflated costs and diminished value for public resources(Kakati & Dean, 2016).

***Low participation due to biasedness in qualification criteria's***

Low participation due to bias in qualification criteria poses a significant challenge to India's procurement landscape, hindering the goal of fostering robust competition. When qualification criteria are perceived as

biased or unduly favoring certain suppliers, potential bidders may be discouraged from participating in the procurement process. This issue can result in a limited pool of qualified suppliers, reducing the competitiveness of bids and potentially leading to suboptimal outcomes for the procuring entity(Hazarika & Ranjan Jena, 2017). Establishing clear guidelines and eliminating any undue favoritism in the qualification process is crucial for promoting a competitive and diverse procurement environment in India.

***Absence of independent grievance redressal mechanisms***

The absence of independent grievance redressal mechanisms in India's procurement framework represents a notable deficiency in the dispute resolution process. A robust and impartial system for addressing grievances is crucial to ensuring fairness, transparency, and accountability in public procurement. In the absence of dedicated mechanisms, concerns and disputes arising from the procurement process may lack an effective avenue for resolution (Verma and Bansal, 2021). The establishment of independent grievance redressal mechanisms would provide aggrieved parties with a formal channel to voice their concerns, seek remedies, and contribute to the overall integrity of the procurement system(Sen, 2019). Such mechanisms can play a pivotal role in instilling confidence among stakeholders, fostering a sense of procedural justice, and ultimately enhancing the efficiency and reliability of public procurement practices in India(Kakati & Dean, 2016).

***Competency and skills issues of procurement professionals***

Competency and skills issues among procurement professionals in India pose significant challenges to the effectiveness of the procurement process. The complex nature of public procurement, coupled with evolving market dynamics, demands a high level of expertise and proficiency from those involved in procurement activities. However, there exists a gap in terms of skill development, awareness of best practices, and staying abreast of the latest trends within the procurement landscape(McKevitt et al., 2012). Addressing competency and skills issues is crucial for improving the decision-making capacity of procurement professionals, fostering innovation, and ensuring that procurement practices align with the evolving demands of the public sector(Matunga et al., 2021). Initiatives aimed at professional development, continuous training, and knowledge enhancement can contribute to building a cadre of highly skilled procurement professionals equipped to navigate the intricacies of modern procurement methodologies and drive positive outcomes for public procurement in India.

**Issues in various procurement practices in India**

Central Public Sector Enterprises (CPSEs) play a pivotal role in the public procurement landscape of India, contributing significantly to the acquisition of works, goods, and services. The Government of India has taken strides towards modernizing the procurement process through initiatives like the Government e-Marketplace (GEM) and a central public procurement portal. However, the absence of a comprehensive procurement legislation poses a significant challenge to driving transformative changes in the system. Currently, public procurement matters are governed by the General Financial Rules (GFR) of 2017, issued by the Ministry of Finance, which predominantly emphasizes the Least Cost (L1) method of procurement(P. V. Singh et al., 2013).

While many developing and emerging markets globally emphasize increasing competitiveness, enhancing transparency, and reducing corruption through value procurement practices, India still predominantly relies on the traditional approach of least-cost procurement(Kartika, 2022). The nation has been hesitant to open its government procurement market to the world and has not signed the World Trade Organisation (WTO)’s Agreement on Government Procurement (GPA) since 2010. While supporting domestic suppliers is crucial, there is an equal need to boost the global competitiveness of these suppliers by focusing on quality and service delivery to facilitate their participation in the international market.

The intricacies of public procurement in India become particularly apparent when linked to public service delivery. The process is entangled with bureaucratic complexities, constitutional arrangements between states and the central government, varying regulatory compliances, and a lack of functional institutional arrangements(Hazarika & Jena, 2017). The procurement process faces several hurdles, including inefficient monitoring processes, limited accountability and governance, and low awareness. Key challenges encompass the absence of a comprehensive procurement act, lack of standard bid documents, delays in the procurement cycle, unfair practices, corruption, anti-competitive behaviors, biased qualification criteria leading to low participation, the absence of independent grievance redressal mechanisms, and competency and skills issues among procurement professionals(Goyal, 2019).

To overcome these challenges, there is a pressing need for India to consider comprehensive procurement legislation, standardized bid documents, and the establishment of independent grievance redressal mechanisms(Bhagat & Jha, 2023). Addressing competency and skills issues among procurement professionals and fostering a shift towards quality-focused procurement practices would further enhance the efficiency and transparency of the public procurement process in the country.

**The QCBS system of value procurement**

In the QCBS system, the selection of the winning bid considers both technical and financial proposals, assigning varying weightages to each. Typically, technical proposals receive the majority of the weightage, ranging from 70% to 80%, while financial proposals carry weightages ranging from 20% to 30% (Mishra et al., 2023b). The primary objective is to identify the strongest technical proposal at the most favorable prices, with the selection of the winning bid based on the highest average weighted score. However, it is susceptible to corruption and may lead to cartelization among suppliers, as influential suppliers can manipulate the system, introducing subjectivity into the bid comparison process and allowing for arbitrary changes in favor of familiar bidders(Kartika, 2022).

For instance, NHAI's ( National Highway Authority of India) "2 stage, 2 Envelope" bidding process, resembling the QCBS system, raised anti-competitive concerns(Gilbile & Vyas, 2023). There were apprehensions about cartelization among foreign bidders who were shortlisted based on highly technical qualification criteria. The dispute was only resolved through strong directives from the Ministry of Finance(Rawat & Raju, 2021).
While the L1 system, though not always the optimal procurement method, has significantly propelled the uptake of the solar sector in India by reducing solar tariffs from INR 16 per unit a decade ago to around INR 2 per unit today, it has its limitations. Post-award negotiations in L1 bidding often result in disputes, as winning bidders may attempt to increase prices citing various reasons.

Aggressive low-price bidding in L1 and inflated higher-price bids in QCBS are major concerns. While tools like performance guarantees deter aggressive bidding, there is no equivalent deterrent for artificially inflated higher bids in QCBS(Kumar, 2022). The QCBS system allows subjective grading of bidders, making it prone to manipulation in favor of deep-pocketed bidders, particularly in consultancy contracts where technical or financial bars are raised to restrict new entrants.

However, the L1 system may not be the ideal procurement strategy for all scenarios. Given India's economic growth and technological innovations, there is an urgent need to reevaluate the country's procurement strategy(R. Singh, 2018). An all-inclusive approach that considers alternative procurement strategies for best value, moving from the traditional Value for Money (VFM) to the emerging Value for People (VFP) concept, is essential to maximize overall value in the procurement process.

**Best Value Procurement through alternative procurement strategies**

When it comes to managing risks and enhancing value through procurement, traditional methods like Least Cost Method (L1) and QCBS prove to be less effective. Best Value Procurement (BVP), originating in the USA, offers a distinctive approach designed to elevate project value by minimizing risks and promoting transparency during the bid evaluation stage(Tran et al., 2017). BVP seeks a delicate balance between price, quality, and performance within competitive procurement frameworks, aligning with specific selection criteria. The method places significant importance on conducting a comprehensive cost-benefit analysis of the entire life cycle of the project(Benavides Mendoza & Quintero O'meara, 2023).

The concept of best value takes into consideration the total life cycle cost of a project(Le et al., 2020), prioritizing overall value over the cost offered by the lowest bidder. Bidders are encouraged to thoroughly evaluate all factors contributing to the project's overall value. The assessment methodology for best value procurement systems encompasses a broad spectrum, including policy and regulatory frameworks, institutional arrangements, market practices, procurement operations, and considerations of accountability and transparency. Supplier evaluations cover technical competence, independence in bid evaluations, organizational stability, and maturity(Scherz et al., 2023).

Criteria and weightages are meticulously decided based on their relative importance to the contracting authority. Once established, there is limited room for variation, and bidders are informed well in advance. The determination of the best value can be based on the overall points scored or the relative order of importance of specific parameters, without necessarily assigning numerical values(Matunga et al., 2021).

In contrast, traditional procurement by government agencies, often employing the L1 method, primarily seeks value for money (VFM). However, the absence of a public sector comparator (Ismail et al., 2012)in this approach may not yield the best value for a project. The global shift towards achieving Sustainable Development Goals (SDG) by 2030 has prompted governments to prioritize financially stable, environmentally sustainable, and economically viable projects for the long term. This shift emphasizes social equity and places people at the core of projects, signaling a transition from Value for Money (VFM) to Value for People (VFP)(Cruz & Marques, 2012).

The emerging People First Public-Private Partnership (PPP) model, currently receiving government attention, places substantial weight on the welfare and well-being of society(Jílek et al., 2018). This approach positions consumers/beneficiaries at the forefront of projects, aligning with the principles of Best Value Procurement. Alternative procurement strategies, such as quality-based selection, quality cum least cost-based selection, procurement based on life cycle cost, and Swiss challenge, are gaining popularity among government agencies for PPP procurement(Le et al., 2020). Best value procurement, particularly for social sector infrastructure projects like water delivery, health infrastructure, and waste management, emphasizes the life cycle cost, giving due consideration to superior infrastructure quality, lower maintenance, higher productivity, and increased service uptime (Mishra et al., 2023a). Waste to Energy projects qualify under social sector infrastructure projects as the returns are not significant in such projects. Thus, best value procurement as applied to any social sector projects works well for such projects where the total life cycle cost of the project is considered to derive value out of these projects (Kumar et al., 2019).

***Analysing Risk in Best Value Procurement***

Another vital aspect of BVP projects involves a thorough analysis of risks and the establishment of a system aimed at minimizing these risks before the commencement of the project(Bhagat & Jha, 2023). In PPP procurements that embrace risk-sharing concepts, where risks are identified, analyzed, and judiciously distributed to parties capable of handling them effectively, an enhanced value is added to the system (Dixit et al., 2018). It is imperative, prior to project awarding, to identify and foresee potential risks that may arise throughout the project life cycle. This necessitates the implementation of suitable systems within the contract document, allowing flexibility to address risks as they emerge. When risk elements are accurately identified and addressed, there is a significant reduction in the overall project cost, resulting in a mutually beneficial scenario for both the supplier and the procurer(Xu et al., 2015).

Typically, procurement agencies utilize a risk assessment tool comprising an overall risk summary (listing all anticipated risks), a scoring mechanism for risks, and a checklist. Risks are categorized based on their impact on the project and the likelihood of occurrence within the project timeline. The scoring system considers the severity of the risk in relation to mitigation measures. For example, the Asian Development Bank (ADB) incorporates risk evaluation based on project scope(ADB, 2018), initial cost estimates, feasibility studies, the nature and specification of inputs, and past experiences with similar projects in its agency procurement assessment(Huang et al., 2018).

In a broader context, implementing a performance rating system for contractors based on their capacity to handle risks is crucial(Roumboutsos & Pantelias, 2021). Once integrated into the bid evaluation system, this rating system exerts pressure on suppliers to maintain the quality of goods and services throughout the project's life cycle. Payments are intricately linked to performance, and any deviation from the agreed-upon performance level results in penalties for the supplier. Consequently, suppliers with commendable past performances and fewer disputes are bestowed with better ratings, enhancing their likelihood of winning projects due to a higher overall score in the evaluation matrix(Gupta & Verma, 2020).

***The Quality factor in Best Value Procurement***

Evaluating the quality of a project is a multifaceted challenge within project planning, necessitating the inclusion of quality criteria in the bid management process(Cheung & Chan, 2011). This integration is achieved through the project specification in the bid evaluation process, ensuring a clear communication of quality expectations to bidders for accurate pricing before project award (Malik et al., 2024). This alignment of expectations is vital for fostering a comprehensive understanding of quality dimensions and preventing misunderstandings that may arise during project execution (Bansal et al., 2021).

Within bid management, quality considerations can be categorized into two specific types. The first category involves conformance-based specifications, which meticulously outline the technical requirements encompassing design, production methods, and service and delivery parameters(Wang et al., 2020). The second category is performance-based specifications, delineating the anticipated results, outcomes, or outputs associated with functional performance requirements. In the realm of best value procurement, the integration of risk assessments and their corresponding mitigation strategies, coupled with due emphasis on quality considerations, constitutes essential elements that contribute to the success of the overall procurement strategy.

In addition to these crucial aspects, effective bid management(Bidding, PPP, n.d.) should also incorporate a robust feedback mechanism that allows for continuous improvement. By actively seeking and analyzing feedback from bidders, procurers gain valuable insights into potential areas of enhancement, fostering an environment of collaboration and shared learning. Furthermore, this iterative feedback loop contributes to the refinement of future bid processes, promoting efficiency, transparency, and ultimately leading to better project outcomes.

**Best Value Procurement: From VFM to VFP**

Quantifying value proves to be intricate, given its varied interpretations among stakeholders. Within the realm of procurement, particularly in the context of Public-Private Partnerships (PPP), there is a discernible shift towards a heightened emphasis on Sustainable Development Goals (SDGs). It becomes paramount to conduct a comprehensive assessment of a project before contract award. During this scrutiny, an elevated focus on social value, extending beyond the mere economic dimensions of the project, emerges as a critical need(Loosemore et al., 2022). Consequently, best value procurement methodologies are progressively evolving from monetary-centric considerations to transformative instruments that deliver value for both people and the planet. This necessitates a fundamental restructuring of the procurement process, advocating for a novel people-first approach in the procurement philosophy(Gidigah et al., 2022) (Bansal, Rohit. bakshi, 2023). In alignment with this paradigm shift, the United Nations Economic Commission for Europe (UNECE) has formulated the people-first approach to support SDGs, offering a procurement model with SDGs as its primary objective, placing people at its core. The UNECE mechanism involves evaluating and scoring infrastructure and PPP projects to ascertain the extent to which they align with the people-first PPP objective. This transition from Value for Money (VFM) to Value for People (VFP) significantly augments the value derived from the procurement model(UNECE, 2019).

The UNECE model operates on five distinct outcomes: access and equity, economic effectiveness, fiscal sustainability, environmental sustainability and resilience, and stakeholder engagement. These outcomes undergo continuous analysis, benchmarking, and scoring throughout the project's life cycle. The evaluation methodology is applied comprehensively, covering the entirety of the project life cycle. This innovative concept has found adoption in numerous countries as a standard for PPP procurement, reflecting a broader acknowledgment of the imperative shift towards holistic and people-centric procurement practices.

**Examples of Best Value Procurement in Indian context**

*Smart Meter National Programme (SMNP)*

SMNP stands as one of the ambitious initiatives of the Government of India, aiming to replace 25 crores conventional meters with intelligent counterparts across the country. This monumental program is executed through Energy Efficiency Services Limited (EESL), acting as an aggregator to implement the plan nationwide. Operating under the BOOT (Build, Own, Operate, and Transfer) model, utilizing a cost-plus approach, the program ensures that EESL bears all capital and operational expenses at its own cost, alleviating utilities from the need for upfront investments. The total expenditure is distributed over the life cycle of the smart meters, with recovery facilitated through nominal monthly payments from customers. Following cost recovery, the entire infrastructure is transferred to the respective utility at no additional charge.

This approach not only ensures cost-effective implementation but also minimizes risks for the procurer, embodying the principles of best value. EESL rigorously monitors the adherence to quality standards during the procurement of smart meters, ensuring the integrity and efficiency of the entire infrastructure. Ultimately, distribution utilities stand to gain significantly from improved billing and collection efficiency, coupled with demand-side management, all achieved without any initial investment. The enhanced service for customers comes at negligible additional costs. Furthermore, the bulk procurement of standardized smart meters contributes to an overall reduction in meter and infrastructure costs. This strategic initiative demonstrates a

holistic and efficient approach that aligns with the evolving principles of value-driven procurement, particularly emphasizing benefits for both the utility and the end-user (Prince, Kumar Maurya. Rohit, Bansal. Yasmeen, Ansari. Anand, 2023).

***Adoption of Electricity Vehicles (EV) pan India:***
The forward-looking strategy for electric vehicle (EV) adoption in India revolves around the "Total Cost of Ownership" model. Initially, the Government of India is actively promoting EV adoption by offering various incentives, including subsidies for consumers purchasing 4-wheelers, 3-wheelers, and 2-wheelers. Despite the eagerness, consumers exhibit hesitancy towards EV purchases due to challenges like the inadequate infrastructure of charging stations and issues related to battery capacity and standardization.

In this scenario, the optimal value for customers can be achieved when they recognize the total cost of ownership of an EV. Creating awareness through campaigns becomes crucial to enlighten consumers about the significant benefits offered by Vehicle to Grid (V2G) infrastructure(Mojumder et al., 2022). While this concept remains speculative currently, the future holds promise for utilizing EVs to power the grid during idle times. By supplying power back to the grid when needed, EV owners can potentially earn additional income, leveraging their assets. This comprehensive approach ensures that the procurement of EVs provides the best value in terms of financial aspects, contributing to society and the environment, with sustainable development at its core. The realization of the best value extends across the entire life cycle of the EV, serving as a compelling factor to encourage consumers to choose EVs(Høj et al., 2018).

***Waste to Energy projects under best value procurement through competitive bidding in India***
The strategic approach to Waste to Energy (WtE) projects in India focuses around a competitive bidding framework, aligning with the broader goal of fostering sustainable waste management practices. The Indian government has embarked on promoting WtE initiatives through competitive bidding, offering incentives and subsidies to encourage private sector participation. Earlier competitive bidding for WtE projects was not a norm as many project developers were reluctant to venture into this territory knowing well that WtE was not o lucrative prospects for them (Kumar et al., 2020) (FOR, 2018). However, perceptions have changed when government changed its approach by looking WtE projects more so from the perspective of health and environmental concerns rather looking one way from the prism of energy production(Guidelines, MNRE, India, n.d.). Thus, the scenario changed and WtE projects gained strength from its 360 degree perspective and total life cycle approach were considered in the procurement process of WtE.(WTE Tool,2017) While the enthusiasm for WtE projects is palpable, potential investors may harbor reservations related to factors such as technology selection, operational efficiency, and overall project viability.

In this context, the concept of best value procurement emerges as a critical factor in driving successful WtE projects. Beyond the conventional focus on cost considerations, best value procurement underscores the importance of evaluating the holistic impact of WtE projects. This involves assessing not only the financial aspects but also the environmental and societal benefits over the project's life cycle. By instilling awareness about the comprehensive advantages of Waste to Energy projects, competitive bidding processes can attract investors and developers who prioritize sustainable practices and possess the technical prowess to manage these projects efficiently(Nubi et al., 2022).

As the Waste to Energy landscape evolves in India, the integration of best value procurement principles ensures that the competitive bidding process becomes a catalyst for sustainable development. Through this approach, the procurement of WtE projects extends beyond mere financial gains, fostering a balance between economic viability, environmental stewardship, and social impact. The overarching objective is to incentivize the adoption of innovative technologies, efficient waste management practices, and socially responsible approaches, thereby advancing India's sustainable development agenda in the waste management sector. With the focus of environment and health, these factors are well factored into the pricing of any contract related to WtE projects, more so often its bidding criteria for the project. The sensitivity analysis by the project promoter and the ULB agencies focus more on the social value of the project that it brings into the scenario.

Various state regulators utilize the Central Electricity Regulatory Commission (CERC) tariff as benchmarks when determining the tariff for Waste-to-Energy (WTE) projects within their respective states. Additionally, some projects are now being awarded through competitive bidding processes(Shri et al., n.d.).

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Table 1 Competitive bid tariff for WTE for different states

| State | Tariff for WTE project ( Competitive Bid) ( INR/Kwh) |
|---|---|
| West Bengal | 5.12 for 10 years |
| Bihar | MSW ( 7.14), RDF ( 8.13) |
| Chhattisgarh | MSW( 7.22), RDF ( 7.95) |
| Jammu and Kashmir | MSW( 7.04) , RDF( 7.90) |

Private developers are actively participating in competitive bidding for Waste-to-Energy (WTE) projects across various cities. The quoted tariffs generally fall within the range of CERC-determined tariffs, and in some instances, they are even on the lower side due to intense competition. Notably, in the state of Andhra Pradesh, private players are displaying a keen interest in undertaking WTE projects, engaging in aggressive bidding to secure these projects.

Some of the quoted bids are provided below:

Table 2 Quoted bid tariff for WTE in AP towns

| Sl no | Name of the Developer | City Name | Capacity ( Mw) | Quoted Tariff as per bid ( INR/Kwh) |
|---|---|---|---|---|
| **1** | JITF Urban Infra Ltd | Vishakhapatnam | 15 | 6.226 |
| **2** | | Guntur | 15 | 6.165 |
| **3** | | Tirupatu | 6 | 6.794 |
| **4** | Essel Infra Projects | Ananthpur | 4 | 7.50 |
| **5** | | Tadepaligudem | 5 | 7.50 |
| **6** | | Kadapa | 5 | 7.50 |
| **7** | | Machlipatnam | 4 | 7.50 |
| **8** | | Vizianagaram | 4 | 7.50 |
| **9** | Nexus Novas | Kurnool | 1 | 7.50 |
| **10** | Envikare LLP | Nellore | 4 | 7.50 |

To mitigate revenue risks for private players involved in Waste-to-Energy (WTE) projects, the Government of India is actively supporting initiatives undertaken by various Urban Local Bodies (ULBs) through the Swachh Bharat Mission (SBM). Funding is provided to ULBs for waste management projects, with a provision for 100 percent cost reimbursement for the preparation of Detailed Project Reports (DPRs) related to any Municipal Solid Waste Management (SWM) project. Apart from this, central financial assistance is also provided for WtE projects.

**Conclusion**

Best value procurement isn't a fixed destination but an ongoing journey, especially as global dynamics shift with changing world orders, the pursuit of Sustainable Development Goals (SDGs) by 2030, the rapid transition to green energy, and the complexities brought about by the COVID-19 pandemic. Governments, recognizing the need for value over mere cost considerations, are increasingly turning to private partnerships to navigate crises. Reform initiatives are being expedited, evident in the introduction of e-procurement, the preference for open tenders, and the implementation of anti-competitive measures for a more robust procurement process. In India, significant changes are anticipated in public procurement, including amendments to General Financial Rules (GFR) provisions and the standardization of bidding procedures.

While procurement reforms in India are underway to establish a robust system, the overarching theme is a shift towards prioritizing quality, a key facet of best value procurement systems. It's premature to assert that a specific procurement method, be it QCBS, Quality-Based Supply, or alternative systems, inherently offers the best value for procurers. This process is dynamic, continuously evolving based on procurement strategies and system needs. The prevailing approach must pivot towards a standardized procurement process that places greater emphasis on quality, technology, and innovation.

Value, being a subjective term, necessitates measurement through a system that maximizes stakeholder objectives. Best value procurement, in this context, refers to a procurement approach that maximizes value

over the entire project life cycle, ensuring that all stakeholders share in the incremental gains. This iterative and stakeholder-centric perspective marks a departure from the status quo, fostering a procurement culture that places enduring value at its core.

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