Conceptualization value co-creation towards sustainability in national electricity

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Abstract. The energy transition which is taking place to cause sustainability in the electricity system has become one of the highest priorities discussed globally. The background of the paper was aimed to explore the concept of value co-creation in supporting sustainability in the context of the electricity system expert's role. The paper qualitatively analyzed the opinions of selected experts to voice their co-creation thought in supporting sustainability. With the main focus on the social, economic, and environmental aspects as the triple-bottom-line (TBL) of sustainability as value, the discussion considered co-creation in collaboration activities in the domain of the national electricity system. The main issues were illustrated using qualitative study data from an in-depth interview and focus group discussion. The results show that there is a lack of connectedness of thought to utilize collaborative thinking as a shared resource. This creates a gap in thinking to complement reciprocal. The paper expresses its contribution as a conceptual model from the stakeholders and resources view that provides benefits for the transition to sustainability in the electricity sector. Further research will complement the role of experts in providing empirically confirmed uses.

Keywords: conceptualization value, value co-creation, national sustainability, electricity sustainability

1. Introduction
Sustainability has become a major goal in the global energy transition to a low carbon energy system. Likewise, electrical energy also experiences a transition that leads to decarbonization, decentralization, democratization, and sustainability. Indonesia, a country with abundant energy resources, is also in a wave of it [1]. The energy transition makes renewable energy in power generation technology easier and affordable. It creates conditions that enable consumers to transform into electricity producers [2]. A transformation strategy is needed to support the energy transition process in Indonesia towards universal and sustainable access, in the electricity system. The transformation strategy must raise awareness of appropriate technology to switch to low-carbon renewable energy, increase the utilization of local resources, together with all stakeholders able to increase the value of sustainability [3].
The transformation of consumers into electricity producers is a development towards the democratization of energy [4]. That situation opens up opportunities for more parties to be involved in the supply of electricity [5]. When the involvement of many parties comes to the fore, it is necessary to conceptualize a well-organized collaboration between the parties concerned in facing severe challenges to the development of the latest technology. The conditions that occur make most of the challenges stem from the difficulty of the process to participate effectively in an organization in order to optimize the role of the parties [6].

The occurrence of those phenomena becomes important, considering that until now the national electricity utility in Indonesia is still assigning its experts to handle engineering activities to deal with the energy transition in Indonesia. Meanwhile, the emergence of energy democracy that opens opportunities for community involvement to become suppliers of electrical energy on a micro-scale also needs to be considered, because of the potential complexity that results from such broad involvement [7,8]. All of these are the focus of the objectives of this study, to investigate how the role of electricity experts in the national electricity utility in dealing with trends that occur.

Sustainability according to the triple bottom line, social, economic, environment, plays an important value that is materialized co-creatively [9]. Co-creation of value will be operationalized according to the aspects of dialogue, accessibility, shared risk perception, and transparency or abbreviated as DART [10]. The work was supported by a preliminary review of studies on the literature relating to the transition of energy in the electricity system towards sustainability in the corridors of social, economic, environmental. Furthermore, it is also carried out in the literature on the value co-creation according to DART in the context of sustainability. The remainder of this paper outlines research methods and contexts that focus on sustainability as shared values. The results are explained and the conclusions point to future work.

2. Sustainability

The concept of sustainability is first introduced as the Brundtland Report which states that development meets current needs without reducing the ability of future generations to meet their own needs [11]. The next concept of sustainability is also expressed as a Triple Bottom Line (TBL) [12], where sustainability must meet three dimensions, namely, social, economic, and environmental, which means that sustainability focuses on social justice, economic prosperity, and the environmental quality. The TBL concept emphasizes that economic development must come from a balanced relationship between a just social situation and a quality environment and has a pattern that can be continuously applied in every era [13]. Ideally, the balance here means that all three dimensions must receive equal weight. The underlying argument is due to the current misperception that social and economic aspects are generally about the welfare of the current generation, while environmental aspects are about caring for the future, then the perception that emerges is the first two is twice important than the last [14,15]. This violates Brundtland's that development should not occur at the expense of future generations, therefore, sustainability is proposed here to use the meaning referred to in the Brundtland Report, namely that sustainability must become a guideline for preserving productive capacity for an unlimited future [16,17].

Overcoming the tendency of TBL imbalance, it is necessary to have well-organized governance that takes into account all aspects of interests within and outside the organization. Therefore organizations must meet the desires and expectations of stakeholders, avoiding actions that reduce the ability of stakeholders, including future generations, according to the standpoint of stakeholder theory [18]. The organization is called sustainable when it successfully satisfies or exceeds the demands of its stakeholders [18,19]. So that overall sustainability will involve time-periods measured for centuries, involving the interests of future generations and their natural environment [20].

According to its natural source, electrical energy used daily is secondary energy, the result of the conversion of primary energy contained in coal, gas, oil, water, sun, wind, etc. [21]. Therefore electricity sustainability cannot be separated from overall energy sustainability [22]. Energy sustainability is defined as energy that is reliable, affordable, and accessible and that meets economic, social, and
environmental needs in the context of overall community development, but with a fair distribution in meeting those needs [23].

3. Value co-creation
The concept of value co-creation is initially introduced by Prahalad and Ramaswamy (2000), who see that the paradigm has changed roles between parties called customers and suppliers in a market. This interaction has developed towards collaborative equality of position to achieve situations and conditions that enable value co-creation to occur so that it can and should create better benefits for both customers and suppliers [10]. Value co-creation is a strategic function of the interaction of the parties whose interests to jointly contribute to creating a unique experience [25]. Based on that, the DART model was developed, namely Dialogue, Access, Risk, and Transparency, as elements needed for the value co-creation. Initially, the DART Model was created to reduce information asymmetry between customers and companies or between stakeholders [26,27], where this model serves to support the process of building trust [28].

The development of the DART model evaluates the dimensions of the experience environment among stakeholders, intending to measure the diagnostic readiness of the organization's environment in the creation of strategic shared value [29]. According to the DART model, all parties must engage in interactive collaboration and become equal partners in dialogue. Therefore, producers and consumers, service providers, and recipients, as well as stakeholders must be prepared to share information, so that it helps in answering shared problems. Dialogue, as the first aspect of DART, offers opportunities for interactivity, engagement, equal communication and learning for both parties that help companies recognize the social, emotional, and cultural context of consumer experience [30]. Dialogue provides benefits in the development of trust between parties that facilitate the creation of value from knowledge to enhance the excellence of developing a service [31].

The second aspect of DART, access, is ownership of knowledge, tools, or expertise to help them build their own experience. This is incompatible with the idea that ownership is the only way to experience value [28]. So, by only having access, consumers can enjoy the benefits while simultaneously creating value with producers. This is confirmed by the argument that the second component of the DART model, access, facilitates dialogue and allows parties to optimize when, where, and how opportunities are available to create value together [29].

Risk, as the third component of the DART model value co-creation, can be assessed by recognizing that open access and dialogue also play an important role in the value creation process [32]. According to the producer-consumer context [33], an effective risk assessment is to provide consumers with complete and accurate information about the costs and benefits of their contribution, so as to facilitate the consumer's decision based on information about the risks associated with this value co-creation. Meanwhile, because the value co-creation involves both parties to bear the risk of each other, there will be a perception from the consumer side that they are the creators of value, so they will demand more information about potential risks because must assume more responsibility for managing these risks [28].

The asymmetry of information that occurs between companies and consumers will make companies switch to be more open and transparent to consumers [10], and applies to individuals [30,34]. To be transparent, companies must initiate business-related information updates, for example, price information, this increases consumers' willingness to accept the quality of their products and services [26,27]. With the transparency of information, it will open up opportunities for customers to participate effectively in creative modes together to build trust between companies and consumers [28]. As technology advances, electronic platform infrastructure and social media enable the DART model to build experience for consumers of what they value while representing the business value to organizations [10]. Therefore, transparency, which is the fourth component in the DART model of value co-creation, is formulated as the availability of reliable, up-to-date information that can facilitate and empower its users for the sake of creating quality value.
4. Methodology
In order to capture the importance of the sustainability of the national electricity system embodied by value co-creation, the research begins with a comprehensive literature study by reviewing, identifying topics that can support a better understanding of the sustainability of the national electricity system by value co-creation. However, after searching for many journals related to this topic, only a few works were found. This shows the lack of research in this area or gaps in the literature.

Based on that reason, the study continues with qualitative methods which provide open-ended questions to the national electricity system experts in Indonesia about the importance of sustainability as an important value that collaboratively created. The opinions of the electricity experts are obtained by the method of in-depth interviews and focus group discussions (FGD). Observations are also made through electricity seminars focusing primarily on the three pillars of sustainability, social, economic, and environmental-related to the electricity system in Indonesia. The in-depth interviews and FGD participants are voluntary. Semi-structured interviews are conducted and discussed in a variety of key issues related to research questions and used in FGDs and in-depth interviews [35].

All conversations from in-depth interviews and FGDs are recorded and transcribed verbatim into Indonesian. Then the transcript is rechecked against the recording. In-depth interview data and FGDs were combined for data completeness and confirmation. Hence, to ensure integration of FGD data and in-depth interviews, repeated readings are carried out between data sets to find data convergence, divergence, and complementarity [36]. Thematic analysis is used to identify, analyze, and report this research pattern [37]. The themes formed from the main research questions impact all activities. Data from the FGD and interviews are combined, transcripts are read in detail, and broad themes are recorded. Then, in-depth analysis is performed using a constant comparison process, where differences and similarities are analyzed for identification of themes. The final stage is to reconfirm the experts in a discussion, enriched with the knowledge and experience of researchers in the electricity sector.

5. Result
The results of in-depth interviews are analyzed following the main issues previously described in the literature review. The gaps are identified then they drive the main topic on which to develop the interview. The main findings are grouped into the sustainability triple bottom line and value co-creation.

There are opinions from electricity experts regarding the sustainability of the electricity sector. It is revealed that the state-owned electricity enterprise initially has a long-term plan for the next 30 to 40 years. Then in its implementation continue to be evaluated by looking at developments that occur, so that shortened to 10 to 20 years. It reveals that several plans seemed to be too focused on the proposal to provide electricity supply which is not based on the tendency of the dynamic conditions of the overall electricity demand. As a result, there is a large gap between electricity supply and demand. Where the gap arises due to the asymmetry of the relationship between supply and demand according to the DART perspective [10].

There are also opinions that the leaders tend to be too busy to excel at shareholders' boards to show that the company is making a profit during its tenure. That opinions say that it comes up to the questions of why there is a large gap between supply and demand so that conditions do not support sustainability in the long run. Furthermore, that caution in following the trend of changes that occur, due to the pursuit of these achievements also causes excess installed capacity that is not in accordance with the characteristics of the electricity consumption. Moreover, the excess installed capacity is actually derived from the use of coal, whose characteristics cannot be flexible and agile in following changes in load. Therefore, it should be technically adjusted between the ratio of fossil energy supplies that are still large with the characteristics of the load that requires high quality and supply stability. There is also an opinion about the investment contracts that have not yet ended and the validity of the economic life of the power plants. This results in an enormous effort are needed to overcome the energy transition gap, from non-renewable to renewable in Indonesia. In addition to the asymmetry of the relationship between supply
and demand, the available situation also illustrates the occurrence of performance asymmetry in the strategic function of the triple bottom line of sustainability [25].

There are several opinions regarding cooperation with other parties in the context of the sustainability of national electricity. It is said that academics partners whose main activities and responsibilities are not dealing directly with the electricity sector, it would be natural if it lacked a role and participated in providing advice during joint activities with the industry and the government. However, in further said there is a different experience when the academics are bound to a business institution that provides professional services. While in the opinion about the role of electricity experts when collaborating, it is said that because they work in a state-owned enterprise (SOE), there is a tendency to professionally maintain the confidentiality of data that is very important because it is a state secret so it cannot be shared openly without a special agreement. Therefore, it arises a tendency that seems to be a barrier to the cooperation process. On the opinions on the role of governmental partners, it is said that under the mandate of the electricity law, SOE is assigned as the main service provider of the electricity sector in Indonesia, so that in any collaborations, the government always considers SOE as a strategic working partner. This condition also shows the occurrence of asymmetry of strategic performance which also influences the environment in systemically [25,29].

All the results indicate that there is a tendency of the parties to be very fixated on prioritizing their own performance. It shows that there is a lack of an orchestrated process of co-creation with the main objective to place the triple bottom line of sustainability as an important value. Even though, achieving sustainability requires a balance from all lines, from all perspectives, and from across the present ages to the future [13,38–40]. Continuing that, departing from thoughts on the triple bottom line of sustainability that might be used as an important value from the results of co-creation in the electricity system, results in the model in Figure 1.

![Model for the Transition to Sustainability](image)

**Figure 1.** Model for the Transition to Sustainability

### 6. Conclusions

The energy transition in the electricity system towards decarbonization, decentralization, democratization, and sustainability, on the one hand, provides good news for Indonesia's electricity world. But on the other hand, there is the potential for a decline in electricity sales and stranded assets from SOE. Furthermore, this is feared to have an impact on systematic failures for the conventional electricity industry business model, due to the validity of investment contracts and the economic life of the power plants. Surprisingly, this condition is still followed by setting targets for the composition of the energy mix in the national electricity plan, which tends to only prioritize the supply side optimistically. Moreover, there is still an allocation plan for the construction of electricity supply from
coal power plants which still occupies the largest portion, which means there will still be the construction of new coal power plants [41].

The results of the research show that initiatives for sustainability in the electricity system are still scarce in Indonesia’s electricity sector. The interviewees, electricity experts, have an understanding when they were asked about the meaning of sustainability. If it is considered in their activities there is a disclosure that leads to a sustainability mechanism. All argued that there were internal problems of each party which was not taken into account. They show the difficulty of sharing their important thoughts in understanding the meaning of sustainability, because of their binding interests.

Based on the aforementioned, it is necessary to have strategies and actions towards sustainability to be disseminated and integrated into a conceptual model for collaborative value creation. Positive results from incorporating sustainability issues in collaborative activities can be expected if adequately linking sustainability to economic benefits, social development of stakeholders, and mitigation of environmental impacts.

The findings of the research contribute to the literature related to the role of electricity experts in Indonesia. Some opinions about the understanding and wisdom of thought are identified, underlined, and made a key action that must be taken. In addition, the research provides additional discussion about the importance of conceptual models as instruments to support value co-creation to sustainability which is largely absent in the current literature.

Despite this potential contribution, it becomes clear that there is still an imbalance in the implementation of the triple bottom line of sustainability. The negative environmental impact is still one of the main challenges that must be overcome. The potential for social impacts has become increasingly apparent. All of which will support the sustainability of the economy. Future research must address not only this perception but also the strategies and value co-creation processes that are appropriate for balanced sustainability objectives in the electricity sector.

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