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Local Governance in Just Energy Transition: Towards a Community-Centric Framework

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Abstract: Knowledge of energy transition (ET) is evolving in developing countries. Yet, it is unclear how the transition should be managed in a way that ensures justice for local stakeholders. We synthesise the extant theoretical ideas and practices of the local governance (LG) related to ET, which are vital in ensuring justice in energy policy at the local level. The paper advances this development by a systematic integrative literature review (N = 569) from the Web of Science (WoS) and highly cited grey literature linked to participation, LG, and ET. The bibliometric analysis indicates that, while the literature on energy justice is growing, limited attention has been paid to LG in just energy transition (N = 36). The analysis further indicates that more than half of the scientific literature is produced by five countries from the global North alone. In-depth scrutiny of highly cited studies and grey literature in LG and ET underlines the lack of a generalised framework of local ET governance, especially in the global South. We address this gap and propose a framework that exhibits a community-centric LG, which is essential for just energy transition.

Keywords: energy transition; energy justice; local governance; just transition; community participation



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1. Introduction

Energy transition (ET), as a strategy to mitigate climate change, has attracted considerable attention from both academics and policymakers; hence, there is a need to understand the transition [1], its governance, and its associated issues of justice [2]. Ideas of justice in the governing of ET that originated in developed countries are equally important for the developing world [3], as well as for local governance (LG) [4,5]. These scholarly developments are anchored in the policy drive to shift from fossil fuel-intensive to environmentally sensitive practices. Environmental concerns have attracted increased attention because of the rise in global temperatures due to our reliance on fossil fuels to meet energy demands [6]. The Intergovernmental Panel on Climate Change (IPCC) has set a target of net-zero carbon emissions by 2050, which will help to keep the temperature rise well below 2 °C above pre-industrial levels [7]. This target is only achievable if countries significantly cut their carbon emissions and shift towards renewable energy resources with low or zero carbon emissions. The question that springs to mind, therefore, is how communities can best plan and achieve their low carbon economy targets. With the growing threat of climate change and developing policy concerns, environmental sociologists argue that energy demands must align with the emerging framework of justice in ET [2–8]. Recent comprehensive work on definitions of ET [1] lists as many as 11 definitions of the term in highly cited papers on Google Scholar, largely recognising a social and technical change in energy requirements and underlining concerns about how to shift from a carbon-intensive state to a low-carbon-emitting economy. Consequently, scholarship is divided on how best to approach a just energy transition (JET)—top-down, bottom-up, or mid-way [9,10].

This conceptual division in approach has also led to varying JET practices, as a clear-cut framework and practice governing ET at the local level has yet to emerge. Much of the

debate has applied the macro framework of justice and the dimensions and governance of just transition, which are gradually developing to include the local governance (LG) of ET. Earlier strategic documents (largely from the global North) underlined stakeholder engagement at the local level as well as the need to strengthen relationships between local governing bodies, government, and business entities [11]. Hence, important questions emerge that require a scientific investigation into the direction of research. The current article contributes to the debate on the LG of ET while providing approaches and an LG framework within ET that can be relevant to societies with multilevel governance that are undergoing such a transition.

Hence, the objectives of this article are twofold. The first objective is to identify the research gaps and trends in local governance of just energy transition. The second objective is to conceptualise a generalised framework for governing the transition locally. We conceptualise a novel community-centric framework for just energy transition broadly from the Indian context and hope the same can be relevant to other societies in governing the community-centric energy transition in a multi-level governance system.

The article is organised in three main sections: review and findings of relevant and recent literature on LG, energy justice (EJ), and ET (Section 1); key findings and discussion (Section 2); and conclusion and recommendations for future research (Section 3).

2. Materials and Methods

We have adopted the systematic integrative literature review technique recently used in scholarly works to build a theoretical framework in the field of ET [12]. The integrative approach supplements the bibliometric analysis [13] that scholars use to identify trends in themes and integrates popular grey literature to draw robust conclusions. The advantage of integrating the grey literature (policy documents, reports, and working papers) is getting the valuable insights to the ideas and practices of policy relevance that sometimes does not get attention in the mainstream scientific community. Hence, it is particularly useful for the emerging topics where research is still evolving, e.g., justice in energy transition and local governance of energy transition.

The bibliometric analysis is not devoid of limitations. For example, it will not provide the documents published before time 'X' (here it is 1994). It will also not feature those documents that face access and publication constraints, e.g., people from poor countries face language, open access publication fee, and other barriers in accessing the scientific outlets to publish their works. The integrative technique, therefore, helps in including those possible left outs. However, this requires a careful manual search on a variety of sources (Google scholar, websites, and repositories of Government and civil society organisations).

The study identified the current trends within the EJ debate in relation to governing ET locally. We applied the keywords 'energy transition', 'energy justice', and 'local governance' in a stepwise manner to the Web of Science (WoS) database to identify thematic developments and gaps in the EJ debate in relation to JET. Figure 1 shows the entire process of the analysis.

In Step 1, we used the WoS database to identify scientific documents produced to date. We used the keywords 'energy transition', 'energy justice,' and 'local governance' separately and in combination to collect the list of relevant documents. Table A1 presents the bibliometric data used for the analysis. Keeping in mind the number of the documents produced, we followed an inclusionary approach for the analysis [12].

In Step 2, we scrutinised the number of documents found per search criterion. Including LG with EJ and ET produced a very small number of studies (36). EJ and ET in combination yielded 569 documents and, bearing in mind our concern to ensure justice in ET, we selected the EJ and ET combination for analysis.

We augmented the WoS search by using highly cited documents from Science Direct and Google Scholar, applying the keyword-based search criteria 'local governance and just energy transition'. Further, highly cited (>100 citations) and recent (last five years) works on LG, community engagement, and ET were considered to enable a discussion

of the theoretical framework in which ET can be localised under the justice framework. Moreover, reports from recognised international bodies such as the United Nations and World Energy Council were included to contextualise EJ, LG, and ET. A few media reports and government circulars on India's coal and energy transition status helped strengthen the discussion.

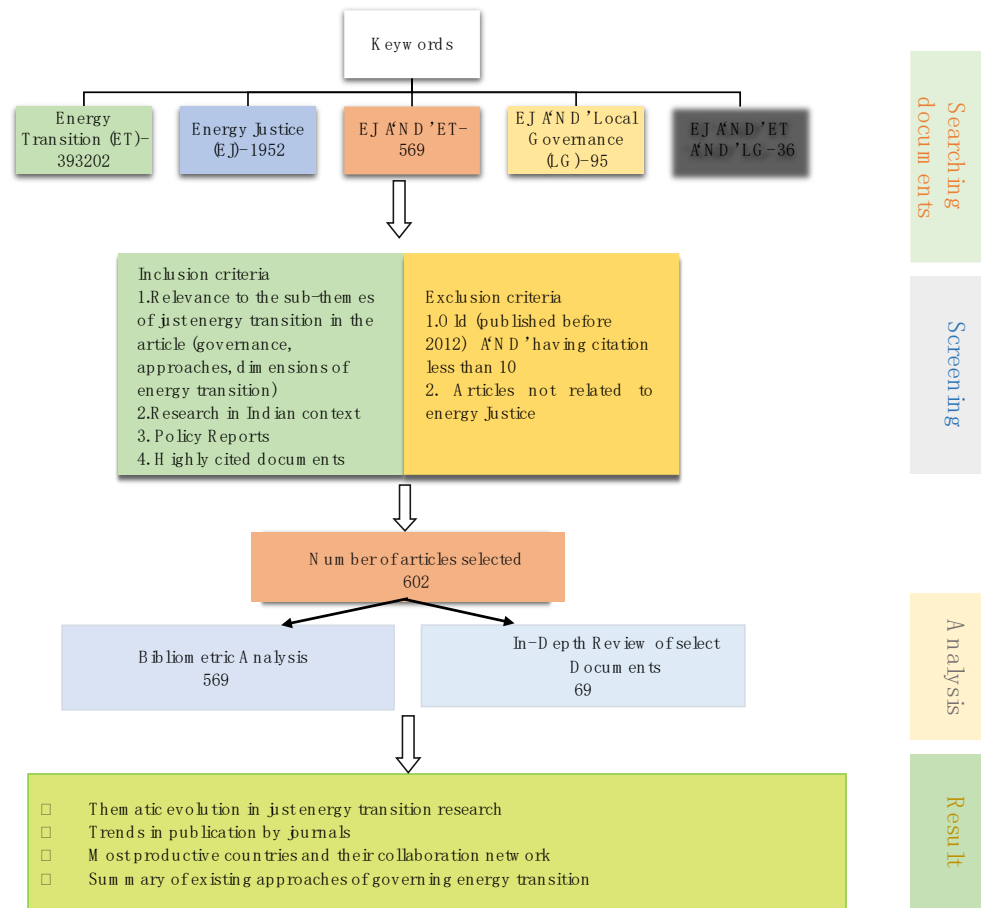


Figure 1. Literature review and analysis flowchart.

We have used bibliometrix package in RStudio and VOSviewer software to analyse and visualize the data [14]. The coming sections will discuss the results of our bibliometric analysis and in-depth review of the select literature.

3. Results

The small number of scientific works on LG, EJ, and ET (36) indicates a dearth of research focusing on EJ and ET at the local level. Another question of interest emerged, namely whether EJ and ET research is uniformly distributed across the world, while the appearance of key themes gave a more comprehensive idea of the scholarly trends in the field. The subsections below show the results of the bibliometric analysis on JET.

3.1. Evolution of Energy Justice in Energy Transition Research

Thematic evolution mapping (Figure 2) of the scientific literature suggests that justice and governance appeared in the post-Paris Agreement period (2016–2022), indicating the fast growth of interest in EJ after 2015. The transition literature shows a noticeable increment in interest in ‘insights’ linked with energy demand and energy dynamics. The small but increasing number of times connections have been drawn between the themes of ‘governance’ and ‘climate change’ since 2015 is an indicator of the importance attributed to justice concerns in the ET process by both policymakers and academics.

3.2. Just Transition Research: Poor Representation of Global South

The countrywide analysis shown in Table A2 indicates that the growth and popularity of the concept of justice in ET has principally been seen in the UK and USA. Moreover, related works are largely produced in the global North countries (USA, Europe, Australia), while countries from the other continents (South Asia, Africa, Latin America) lag. The same is confirmed by the Figure 4 in case of multi and single authored documents.

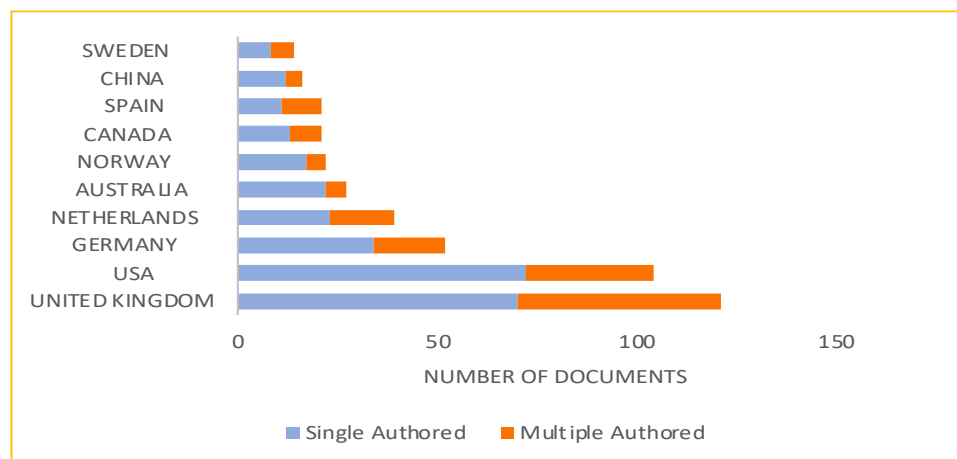


Figure 4. Countrywide production of articles.

The collaboration mapping in Figure A1 clearly shows the concentration of linkages between the USA and European countries in the fields of EJ and ET research. We further used the Louvain clustering algorithm to identify the clusters and leading countries working in collaboration to gain a deeper insight into the global collaboration network (four clusters, N = 25 countries). The clustering results in Figure A2 show that the USA, the UK, Germany, and other European countries (Spain, Denmark, The Netherlands) are the dominant countries, controlling most of the literature produced in the field of EJ and ET (Table A5). Although advanced countries have on occasion collaborated with developing countries, this type of collaboration is also dominated by the USA, the UK, and a few European countries.

The keyword search results suggest that a meagre amount of scientific literature addresses JET from the LG perspective (Table A2).

3.3. Most Relevant Sources in Energy Justice and Energy Transition Research

Figure A3 summarises the production frequency of the top 10 journals. EJ is most popular in Energy Research and Social Science (ERSS), followed by Energy Policy and Sustainability. There is a wide gap between the frequency of its appearance in ERSS and in other journals. The ERSS has produced more than 140 articles featuring the term, whereas no other journal has even approached 100 articles (the second best has produced 63). Thus, justice has yet to be given its due in research into policy affairs.

The analysis and conceptualisation strongly suggest the need to address the absence of a conceptual framework that can locate JET at the local level, within the realm of LG. In the sections below, we discuss the dimensions and approaches of existing governing mechanisms and propose a tentative framework that can be modified to localise ET debates within LG.

4. Discussion: Governing Approaches to and Dimensions of Energy Transition

4.1. How Is the World Governing Energy Transition?

JET is rooted in the tension between two broad bodies of works concerning global development, namely development literature and sustainability literature. The former is focused on economic development and pays very little or no attention to the environment,

whereas the latter is more concerned with the environment and the socioeconomic impact of development interventions [6]. Intensive economic growth relies heavily on fossil fuels to drive energy needs. As the energy system entails a complex relationship between technology and society [15], the social and environmental externalities arising from fossil fuel consumption are putting society in grave danger. Social scientists have mainly raised the concern that transition governance should be inclusive of all stakeholders under the social justice framework of ET. Thus, a paradigmatic shift is required from mere ‘energy transition’ to ‘just energy transition’ [2]. EJ is crucial for all countries and emerges as a core concept generating a growing volume of literature [16]. The four vital conceptual pillars of EJ—distributive (access to resources for all), procedural (participation in the decision-making process), cosmopolitan (human rights governed by moral values), and recognition (vulnerability due to socioeconomic status)—propounded by [8,17] are excellent departing points for any research, as well as practice at various levels. Developing the earlier EJ conceptual framework, Sovacool et al. (2017) [8] added ethical and religious dimensions, including Western and ancient (Indian) philosophical thought.

Alongside this conceptual framework, Sovacool [12] laid down ten principles to achieve EJ in developing countries. Given the West’s philosophical dominance, norms and values from other societies are required to guide ET [18]. Thus, Sovacool [12] expanded the frontiers of EJ by being more inclusive of philosophies from Rome, India (Hinduism and Buddhism), and China (Taoism and Confucianism) to understand human engagement guided by norms and values in the process of ET. Neither the ten principles for developing countries laid down in 2012 nor the revised new frontiers of EJ are fully reflected in strategic documents [19] and scholarly work on the LG of ET [5]. These frontiers of EJ are vital for ET to occur at national, international, regional, and sub-national levels. To operationalise these EJ ideas at the local level, we envision the localising of ET, as shown in Figure 5, below.

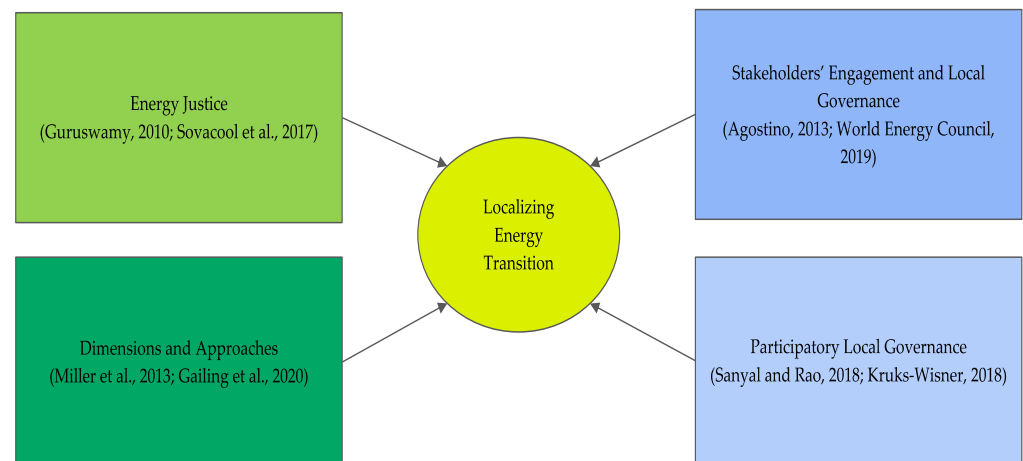


Figure 5. Key concepts in localising energy transition [8,11,15,19–23].

On the one side, we have EJ, along with multiple dimensions and approaches to governing ET. On the other, we have a variety of stakeholders (including workers and resident communities) who, arguably, need to be engaged in the governance process. Therefore, we need to knit together the sociospatial, technical, and political dimensions [15,20], the EJ concept, and LG to develop a suitable approach to governing local transition.

Against this backdrop of the dimensions of ET put forward by scholars and practitioners around the globe, it is essential to understand the policy context of LG.

4.2. Approaches to and Key Actors in Governing Energy Transition

The United Nations Framework Convention on Climate Change (UNFCCC) has an almost universal membership (197 countries), initially led by the developed countries of the OECD located in the northern hemisphere. Hence, an established and substantial body

of policy interventions exists in the global North. For example, Krawchenko and Gordon (2021) [9] discussed policy interventions in Canada, Europe, Spain, and the USA, which have applied various approaches to address justice in transition, mostly top-down. With regard to equity and justice, scholars in the global North have considered participation in the decision-making process crucial to ensure local knowledge and stakeholders are integrated [24]. Broska focused heavily on community, arguing that the social norms and values that shape a community's environmental concerns also shape its engagement. Brummer proposed the concept of community energy, which assumes the underlying demand for community engagement, and analysed the ET scenario in local communities in the UK, the USA, and Germany, where a collective bottom-up approach is considered vital for community engagement. Bush concluded that LG is efficiently building sustainable transition roadmaps for cities in a study of three local governing units in Australia, even though such roadmaps have little focus on community engagement as a bottom-up approach [25]. Multi-national LG frameworks from certain countries and regions around the globe, in contrast, advocate active citizen engagement in LG and recommend bottom-up approaches [19]. An overview of approaches to governing transition will help us conceptualise the ongoing variations in governing the transition. The overview will help us narrow down towards the local governing of the JET.

Canadian task force recommendations submitted in 2018 are now supported by Canadian federal funding. The recommendations emphasise multilevel governance mechanisms to support a just transition by building the labour economy and local infrastructural development. Although Canadian governance provides heavy investment in local infrastructure and economic development, it still needs to address gender [1] and the indigenous community [2]. The federal policy approach, of using a task force to address these concerns, is largely due to the weakness of community-centric LG.

With countrywide variation, the EU has followed a territorial approach and shown its commitment to address climate change through dedicated funding support and a differentiated policy response. The EU plans to establish a dedicated 'just transition fund' that member countries will match, namely the European Region Development Fund and European Social Fund Plus. Aiming to raise EUR 150 billion, the EU will encourage investment in clean energy and social infrastructure with a loan facility leveraged by the European Investment Bank. With these initiatives, EU member states will come up with a territorial transitional plan by 2030. Within the EU, Spain has gone one step further by building partnerships with key stakeholders—trade unions, governments, and coal firms—with a primary focus on labour welfare, training, and retirement activities in coal-dependent communities. Likewise, Germany has established a commission to reduce energy emissions and ensure the phase-out of coal by 2035 or, at the latest, by 2038 [9]. Germany has a phase-out coal law, duly supported by a national compensation mechanism, which has resulted in a regional approach to addressing transition while building partnerships at provincial levels. Alliances have also been formed by European and North American countries, led by the UK–Canada-founded Powering Past Coal Alliance (104 members, across governments and business units). The coalition is committed to phasing out coal-fired power stations and is currently reported to be gaining momentum in its mission.

These efforts on the part of nations and regional alliances largely focus on labour welfare and jobs, with very little or no attention paid to local environmental restoration and land management policies. Even very countable numbers of countries committed to zero-carbon emission address the industrial transformation (08 in EU) in their action plans.

Development towards JET has only just started to emerge in policy interventions and talks in the global South, and much of the conceptual development and groundwork in the LG of ET had already begun in Europe and other Western countries. There are case-specific insights of structural reform of LG bodies for an inclusive and just transition [5,26], and those of protesting procedural injustice due to technocratic, top-down solar energy interventions from the global South [27,28]. Multiple dimensions of ET have been discussed by scholars, including community, politics, space, time, social, spatial, technical, and

economic aspects [15,20,29]. Considering these dimensions facilitates the construction of a framework that applies at international, national, regional, and local levels. The spatial context is subsequently critical to governing transition locally. Utilising these dimensional aspects facilitates the identification of stakeholders and problems, so they are more likely to be part of the transition. The context of LG and JET discussed in the literature could be broadly summarised across five key dimensions that can lead to understanding justice in governing local resources and communities.

Contrary to the developed countries in the north, there is very little enthusiasm for coal phase-out in the global South, especially in the foremost coal-based economies, of China, India, and Indonesia. Southern countries have, to date, also been neutral or less enthusiastic about joining global North alliances.

4.2.1. Key Dimensions in Governing Energy Transition

Technical Interventions and Conflict with Local Community

We often look to science and technology to answer our problems but should sound a note of caution when designing technological solutions to our environmental and energy woes [18]. Moreover, the technical dimensions of energy are valid for sustainability needs only when the technology has social acceptability [30,31]. This fits well with the LG agenda, as the technology-carrying capacity of LG institutions is not as strong as that of multinational technocrat agencies. Technology to produce, store, and distribute green energy is an essential requirement for a successful transition. From installing large grids and establishing energy parks to building small storage devices, input from science and technology is pivotal. Low-cost and consumer-friendly technology is preferred, and the challenge of absorbing left-behind fossil fuel workers is clear. Within renewable sources, solar is argued to have a higher potential than wind and other non-fossil energy resources to generate a volume of jobs that will match the coal mining segment [32]. Courtiers in the global South, for example, in India, have invested heavily in solar energy systems and have been extremely active in entering foreign collaborations and installing solar plants. The installation of such plants is generally directed from the top, and local actors are little involved. The procedural injustice of top actors marginalising locals by deciding on the policy of installing solar plant technology is a concern [27]. She has outlined how poor tribal people are subjected to the grave danger of losing their land and livelihood in land acquisition to establish a large-scale solar plant in Kerala, South India [27]. The loss was, however, not a one-way loss of local community, as the proposed plant size was reduced by three fourths of the envisaged size of 200 MW capacity in the locality. Thus, there is always a significant risk involved in top-down interventions of renewable energy. Hence, from the justice standpoint, technical-laden top-bottom interventions have the power to marginalise local communities because intervening coalitions accumulate land and profit [28]. Hence, technology actors forming business–government coalitions must look for a technology intervention that achieves community cooperation.

Economic Losses of the Stakeholders Involved

Preventing job losses among coal workers by preparing them for the renewable ET is an urgent task at the grassroots level, as workers are at the bottom of the stakeholder pyramid. Western countries have adopted welfare plans and interventions to ensure income for affected coal workers [9]. Strengthening LG systems by providing significant budgetary support is also key to a successful transition, as it helps minimise conflict with business firms and facilitates stakeholders' participation in multilevel governing mechanisms [33]. A contest in Germany between the local senate and consumers over energy grid revenues underlines the need for a local revenue sharing plan in which consumers are properly represented [34]. In countries where LG has a poor tax-generating capacity, such as India, separate state finance commissions, appointed to look after fund allocation and audit local body accounts, play a pivotal role in ET [35]. Funding by the national and state finance

commissions/committees should be wisely handled to strengthen local bodies' declining tax revenue and income due to mining closure.

Further, restructuring the economy and market to fit the renewable energy demand–supply is required. The economic restructuring will require more work at the local level. Establishing large-scale solar plants requires large land area coverage, and cases of local conflict in due process are a warning to investors to devise inclusive plans for such interventions [27]. In addition, such an area coverage must be accompanied by a thorough feasibility study and land acquisition reports.

Social Concerns for Workers and Residents in Energy Transition

There is a great concern about local coal workers who lose their jobs or are forced to migrate due to mine closures [9,29]. Social capital is yet another essential social entity under threat from ET: as workers and residents are displaced from their homes, detachment will bring community disintegration and there will be a loss of place-attachment-linked social capital, which is recognised as an effective support system [35]. Addressing this decline in social capital and building alternative social support systems is another serious concern for policymakers.

Locating gender in ET is another important social concern in binary form (women vs men), as a recent study from Canada, Kenya, and Spain found that women from indigenous communities are absent from the transition debate [36]. Extending the binary conceptualisation of gender, EJ scholars recommend consideration of multiple gender identities in ET in modern times [8]. Such gender concerns must also be central to the LG planning of ET.

Political Participation in Energy Transition at Local Levels

Restructuring LG mechanisms and reinforcing democratic community engagement at local levels in mining areas is crucial. One cannot leave politics out of the discussion in any policy intervention, as it is designed by politicians. However, how can local politics influence JET? The political system of LG is run by local councils in a bureaucratised and politicised fashion in many countries and is therefore an essential element of procedural justice that can ensure democratic stakeholder engagement. Through decentralised LG institutions, the state can regulate the benefits of welfare schemes in favour of the poor [21]. However, elite capture and brokerage in community engagement at the grassroots level are evident in multiple studies from south Asian countries [22,37,38]. LG, as with other political levels, has the potential for leakage and corruption in the regulation of policies, including when it comes to ET. Blanchet uncovered the local politics of the energy system, called energy grids a 'political tool' in Germany, and stated that they were influenced by the federal government. The absence of participatory practices has yielded a great deal of conflict, and policy interventions are forcing the energy transition over the community [39].

Spatial Dimension in Local Governance of Energy Transition

The LG literature acknowledges the shift away from institution-based LG to regional spaces created by new technology and infrastructural advancements [40]. In connection with this shift, scholars suggest following local, regional, national, and international approaches to successfully execute JET [20,41–43] because multilevel governing mechanisms have temporal and strategic dimensions that are crucial in policy implementation [44]. Resource-wise, the distribution of renewable resources varies with regard to the land and other natural resources (sunlight, wind, water) required to produce clean energy. Most national governments are primarily focused on clean energy production to offset the economic damage likely to occur due to the reduction and termination of coal production. Therefore, there has been an upsurge in the creation of energy hubs based on the availability of clean energy resources. Hence, at local levels, municipalities, town area committees, and village-governing units are vital and must not only span levels of governing structures but will also face varying degrees of challenges due to location differences.

Table A5 in Appendix A summarises the key interventions around the globe and the approaches taken. Most countries have used a heavy investment policy in the form of compensation, infrastructure development, or a rehabilitation package for affected communities. Most have recognised the role of trade unions but have not fully addressed the concerns of residents and all other dependents in the locality under transition. Largely, LG and regional governance did not receive full attention by the scholars that could consider all the dimensions discussed in the article. Moreover, the heavy investment solution seems affordable for a few developed nations and regions such as the EU; however, developing nations cannot afford capital-intensive plans. Therefore, we need an alternative low-cost yet community-centric governance mechanism to successfully localise ET. For this purpose, existing LG mechanisms seem the best community-level institutions, as participatory development scholars have long debated how best to build participatory local self-governance institutions that can successfully carry the spirit of development interventions and welfare policy to people at sub-national levels [45]. These governing institutions are run by locally elected people and are closest to the stakeholders in any given locality [46]. Hence, we need to understand existing LG systems and identify the scope of the modifications required to design and implement the policies pertaining to JET. EJ and LG should go hand in hand. In this regard, we need a framework that can connect and, at times, help in governing existing stakeholders at the local level in the realm of JET.

5. Towards a Justice-Enabled Local Governance Framework

The justice framework draws attention to the most vulnerable sections so that the local community does not carry a disproportionate amount of the burden of transition. For national governments, these concerns coincide with employment requirements to ensure economic health and social harmony. The community, especially workers at local levels, are often weak in negotiating such transitions as they have less access to knowledge and power than governments and business alliances. The necessary justice can prevail if everyone is involved in the decision-making and policy implementation process. The sustainable development goal (SDG) related to energy suggests that stakeholders (scientists, workers, business groups, policymakers, and other individuals in the energy supply chain) try to engage with each other to meet these transitional challenges. These engagements are vibrant at international levels, given the regional alliances that have been made across countries. LGs are a focal point of top-down and bottom-up interventions for the good governance of JET but are constrained by their jurisdictional territories. Hence, JET's socio-spatial dimension suggests the need for regional policies along with international and national ones [20,40]. Inter-LG alliances could be an excellent way to effectively govern transition, and one that involves local stakeholders who might have a reach that goes beyond LG jurisdictions. However, these alliances must be in tune with national policies. At local levels, the government of transition needs to identify local actors who are likely to influence or be affected by JET. The role of the national/federal system is to build the capacity of LG institutions by providing sufficient funds and the necessary training for human resources engaged in the LG mechanism. At the same time, bureaucrats' training and skill-building (especially the ability to deal with the public) need continuous improvement to strengthen the operational efficiency of LGs [47]. Decentralised LGs are essential for the local community's inclusive participation to ensure that policy benefits reach the poor in each state [21,22]. Likewise, EJ (mainly procedural justice) can prevail in the ET if the decentralisation of LGs is kept in mind when carrying out top-down technology-driven clean ET.

Figure 6 represents the conceptual framework of local ET with a tentative stakeholder representation that can vary from place to place depending upon the structure of government and the relationship between government bodies and a variety of stakeholders.

The thin arrows represent communication flow (ideally two-way). However, the nature of such communication may differ that may be unidirectional, with orders and strict guidelines; equally, it may be two-way, allowing for feedback. The diagram may be used

to fit the EJ concept at various stages. For example, distributive justice will take place largely at the national level, in terms of providing market access and equitably regulating top-down scientific renewable energy interventions, whereas recognition justice is largely applicable at the bottom of the pyramids. The inverted pyramid can be useful for a macro-level reality, whereas micro-level nuances within the sub-levels and stakeholders (shown by the boxes) are equally important when talking of the LG of ET. To assess the framework's applicability, we apply it to an Indian scenario to better grasp the reality of connections between stakeholders and integration of the demand–supply process. As we are familiar with India and work closely with the stakeholders under discussion at local levels, we discuss the framework in an Indian context; however, we think it can be generalised to other places, with modifications.

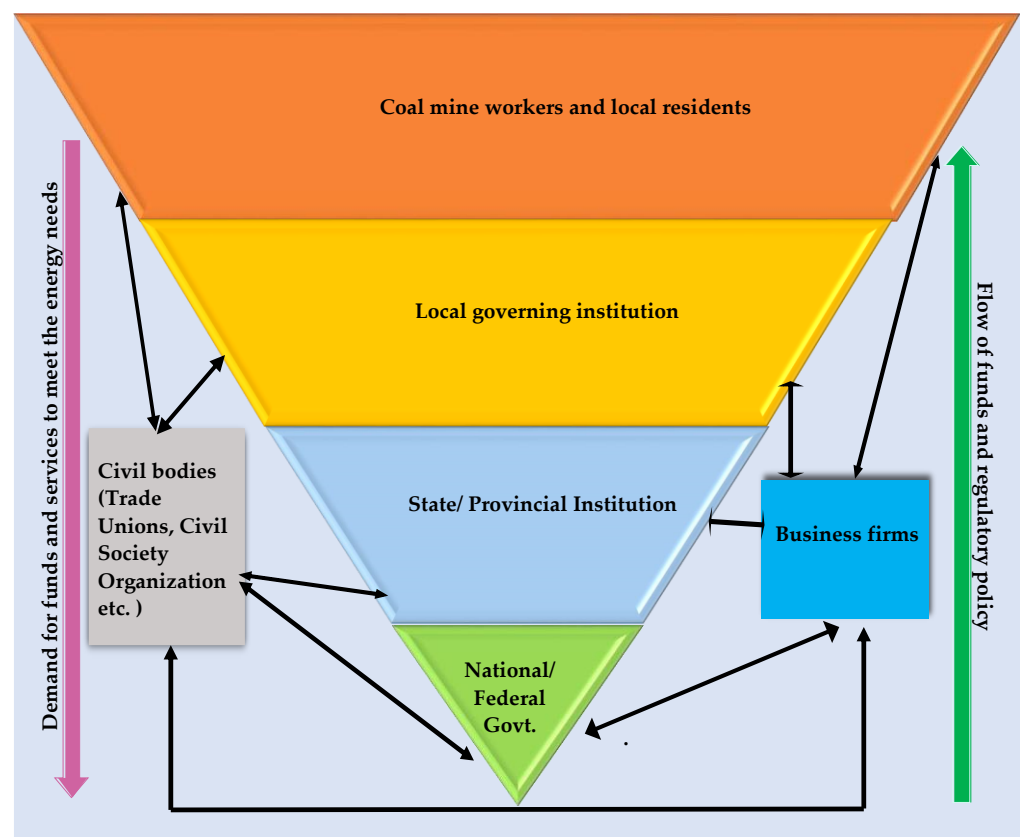


Figure 6. Framework involving key stakeholders in localising energy transition.

Generalised Framework Derived from the Indian Case

The case of India is significant as it is a rapidly growing economy that features among the top carbon-emitting countries globally. India is the fifth largest reserve of coal and the fifth most vulnerable country to climate change. Indian energy needs depend on coal-intensive energy production, with a 47% dependence on the primary energy supply. India is the world's largest consumer of coal, and the country set a target in 2019 that the nation should soon be a net exporter. Recent reports by the Electricity Authority of India suggest there will be a marked decline in the growth of coal-driven energy (30%) and a comparatively massive surge in solar energy (700%) by 2030 [48]. This projection is supported by the fact that a recent auction attracted no foreign bidders and witnessed a significantly low number (no bidders for 70%) of bids for coal blocks [49]. Further, India aims to phase-out coal mining by 2050 [50] and will transition to renewable energy. As with other countries, India is concerned about how to implement ET locally. The country's diverse socioeconomic and geographical dimensions exacerbate this challenge, but it also has the advantage of having LG institutions that have evolved through a series

of administrative reforms since India's independence (in 1947) and were eventually given constitutional shape through an amendment in 1992–1993. In PRIs, the village-governing body is the Gram Panchayat (GP). The electorate, made up of all village residents over the age of 18, is called the Gram Sabha (GS). The GS members elect the GP Chief (Pradhan) and between nine and 15 village council members every five years. A similar structure prevails at higher levels, where an elected individual heads a committee (village council) at intermediary (block) and district levels [1].

These LG mechanisms function as a nodal point for the disbursement of all the national (federal) and state (equivalent to provincial) welfare policy programs.

Energy, training, and goods needs are notified from the bottom up through a grass-root consultation and open meetings, for example, in occasional employment guarantee schemes such as the Mahatma Gandhi National Employment Guarantee scheme (for details about the scheme, please see [51]). Whereas the demands of worker communities can be represented by trade unions (at least theoretically), residents are represented by their LG institutions. Hence, if we need a JET to occur at the local level, we must keep LG in mind as it can exclusively represent residents' concerns and frequently those of worker communities as well. LG institutions play a vital role in organising corporate social responsibility (CSR) activities with companies and trade unions in India.

At the bottom of the pyramid, engaging communities in policy formulation, implementation, and monitoring is a crucial aspect of any policy intervention, as advocated by participatory development schools [52], and building participatory local self-governing institutions is vital to realise community-centric LG [45]. With fossil-fuel-dependent communities at the bottom of the pyramid, JET fits well with the focus of community-centric LG. Hence, participatory development practices such as participatory rural appraisal are critical for interventions with the local community [53]. These participatory approaches can achieve a win-win situation with local people after the intervention [54]. However, their inclusiveness is debated by participatory scholars in the case of local village meetings [22]. Local socioeconomic diversity, especially gender representation, has been a serious concern for scholars of participatory development schools [55–57]. These concerns are even more important in the context of communities where there are a variety of means of representation, for example, where workers are represented by trade unions and residents by LG representatives. At the local level, there are further categories of people represented by business unions and cooperatives who are likely to be hit by any unplanned closure.

Anecdotal cases indicate that centralising JET can weaken a community's sensitivity and response; the decentralisation of decision-making to the local level is an essential step towards localising JET [58,59].

Maintaining local democracy and successful decentralisation at the local level is key to a participatory LG mechanism [22,57]. This is particularly crucial for the largest democracy of the world (India) where nearly 68% of people are still living in a rural area. Moreover, despite having a decades-old history of local government reforms, the country is facing a local democratic deficit, and the community demands the further decentralisation of power in village councils [60]. Therefore, the decentralisation and local governance are very relevant to the EJ during mining closure and in areas where new installations are built. Community engagement at the local level could be a way to ensure recognition and procedural EJ [61]. Trade unions also play the role of key political actors in the local areas, being representative bodies of workers and thus representing a hybrid type of engagement of a social and political nature.

Primarily, distributional justice is the subject of federal agencies, and, through a top-down strategy, nations practise it around the globe. The other three pillars of EJ are crucial to the sub-national level (procedural and cosmopolitan for local political institutions and recognition justice for the ethnically diverse coal-worker community). The dimensions (socio-spatial and technical) and principles of EJ should be kept in mind when engaging and regulating (through LG) stakeholders in the transition process. Necessary constitutional amendments and participatory law making can help strengthen LG institutions in terms

of the necessary clauses for the resources required for transition, as well as to engage communities at local level in the due process.

We do not claim the framework we give fits to all. Instead, it will give a direction to review the existing mechanisms of governing the transition in various countries. For instance, a constitutional or legal review can be a good starting point to assess whether local governing mechanisms are decentralised enough to allocate land to install renewable energy industries. It will also be useful to assess the existing relationship patterns between the key stakeholders discussed in the framework. On the international level, it will be of further interest to policy makers and academicians how the inter and intra stakeholder relationships vary across the countries.

6. Conclusions and Future Research

In this article, based on a systematic review of the literature, we first explored the gaps and thematic trends in research of local governance of just energy transition. Further, integrating the grey literature, we critically examined the concepts and dimensions of, and approaches to, governing ET with a focus on local approaches governing JET. In the end, we devise a novel community-centric framework for localising just energy transition. The conclusions are threefold: (1) There exists a wide gap of knowledge in relation to JET processes and their outcome at the local level. (2) Intervening agencies localising just energy transition should engage key local stakeholders other than trade unions and workers. (3) There is a need to evolve and strengthen the necessary institutions to decentralise JET through a LG system.

The immediate future research should test the applicability of principles of just energy transition for developing countries using our proposed framework in their localised context. Accordingly, the scholars can propose a widely accepted framework for a successful energy transition at the local level. Policy-wise, replicable models of implementations at local levels using the conceptual designs must be developed for both developed and developing countries that can be useful for theory construction and policy interventions.

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Appendix A

Table A1. Bibliometric Data for Analysis.

Timespan	1994:2022
Sources (journals, books, etc.)	148
Documents	569
Average number of years since publication	3.38
Average citations per document	16.73
Average citations per year per document	3.443

Table A1. *Cont.*

References	
document types	
Article	473
Articles; early access	18
Article; proceedings paper	9
Book reviews	1
Corrections	2
Editorial material	8
Letters	1
Reviews	55
Reviews; book chapters	1
Reviews; early access	1
document contents	
Keywords plus (ID)	1332
Author's keywords (DE)	1650
authors	
Authors	1692
Author appearances	2545
Authors of single-authored documents	117
Authors of multi-authored documents	1575
author collaboration	
Single-authored documents	126
Documents per author	0.336
Authors per document	2.97
Co-authors per document	4.47
Collaboration index	3.56

Table A2. Document Summary of Local Governance and Just Transition Production.

Timespan	2016:2022
Sources (journals, books, etc.)	19
Documents	36
Average number of years since publication	2.69
Average citations per document	13.44
Average citations per year per document	3.07
References	2678
document types	
Articles	31
Articles; early access	1
Articles; proceedings paper	1
Editorial material	1
Reviews	2

Table A2. *Cont.*

Timespan	2016:2022
document contents	
Keywords plus (ID)	177
Author's keywords (DE)	188
authors	
Authors	114
Author appearances	115
Authors of single-authored documents	8
Authors of multi-authored documents	106
author collaboration	
Single-authored documents	8
Documents per author	0.316
Authors per document	3.17
Co-authors per document	3.19
Collaboration index	3.79

Table A3. Countrywide Production of Documents.

Country	Articles	Ratio against Total Production	SCP	MCP	MCP/(SCP + MCP)
United Kingdom	121	0.2138	70	51	0.421
USA	104	0.1837	72	32	0.308
Germany	52	0.0919	34	18	0.346
The Netherlands	39	0.0689	23	16	0.410
Australia	27	0.0477	22	5	0.185
Norway	22	0.0389	17	5	0.227
Canada	21	0.0371	13	8	0.381
Spain	21	0.0371	11	10	0.476
China	16	0.0283	12	4	0.250
Sweden	14	0.0247	8	6	0.429

MCP = Multi-authored Country Production, SCP = Single-authored Country Production. A high ratio of (MCP/(MCP + SCP)) suggests a high collaborating tendency of the respective country.

Table A4. Key WoS Literature on Local Governance of Just Energy Transition.

Key Literature Findings	References
Energy infrastructure transitions, changing land use, morphing social identity in sociospatial and environmental justice dimensions	[62]
Social approach to the governance of economic relations in renewable energy sector in EU to address factors that can alleviate energy injustice	[63]
Decentralisation of power below sub-national levels to ensure energy justice in urban municipality governance in France	[59]
Everyday practices such as cooking can deliver just, local, sustainable development while emerging as a sociotechnical innovation in rural Thailand	[64]

Table A4. *Cont.*

Key Literature Findings	References
Community governance in residential energy demand in the UK	[65]
Energy democracy, citizen participation	[66]
Informal urban governance and social justice in energy transition	[67]
Shift away from top-down approach with generalised globally applicable solutions to more inclusive governance and policy formulation	[68]
The emerging role of households and community organisations in generating and distributing renewable energy	[69]
Applying technical, social, and spatial dimensions of a just transition in EU regional plans	[70]
Legal, smart governance of energy transition and collective action	[71]
Centralisation and disempowerment of local community in energy transition in South Africa	[58]
Framework to empower local sociocultural contexts for an equitable energy transition	[72]

Table A5. Worldwide Approaches in Governing Energy Transition.

Countries/Region	Major Energy Policy Interventions	Approaches
Canada, USA, UK	Labour economy and local infrastructure development through a federal council and task force-based system at local levels	Largely top-down with a hint of local collective engagement
EU	Fundraising and exclusive attention to JET	Regional approach by multiple countries with top-down initiatives
Spain	Contract with trade unions and stakeholders	Bottom-up concerns with top-down legal and financial initiatives
Germany	Strong federal support with a mix of cases of energy grid management at local levels	Top-down with occasional strong bottom-up practices
Australia	Local governments are making policies and decisions for clean cities and urban spaces	Bottom-up with top-down funding
India	Strong commitment for net zero (by 2070) and national policy with a heavy investment in renewable energy	Top-down

Table A6. Country Collaboration Clusters.

Country	Cluster	Centrality
USA	1	186.74
Germany	1	85.41
China	1	0.00
Japan	1	0.00
Italy	1	0.29
France	1	0.19

Table A6. Cont.

Country	Cluster	Centrality
India	1	0.00
Brazil	1	0.00
Korea	1	0.00
Russia	1	0.47
Israel	1	0.00
New Zealand	1	0.00
Luxembourg	1	0.00
United Kingdom	2	155.26
The Netherlands	2	27.86
Norway	2	7.44
Denmark	2	9.20
Ireland	2	0.00
South Africa	2	3.93
Mexico	2	0.00
Portugal	2	0.00
Belgium	2	0.00
Kenya	2	0.00
Nigeria	2	0.00
Estonia	2	0.00
Spain	3	34.96
Australia	3	0.00
Canada	3	11.82
Sweden	3	2.14
Finland	3	0.96
Austria	3	0.07
Switzerland	3	0.25
Turkey	3	0.00
Egypt	4	0.00
Saudi Arabia	4	0.00



Figure A1. Country collaboration network on just energy transition literature.

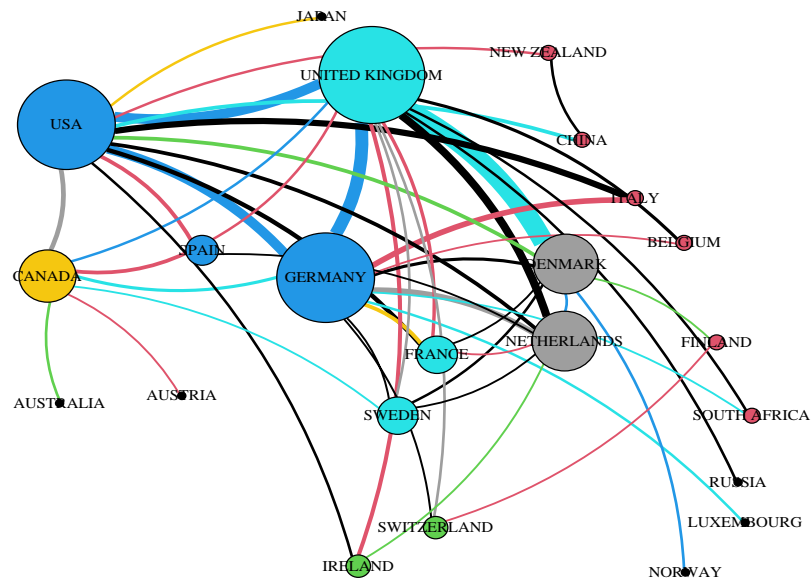


Figure A2. Leading countries in the country collaboration clusters.

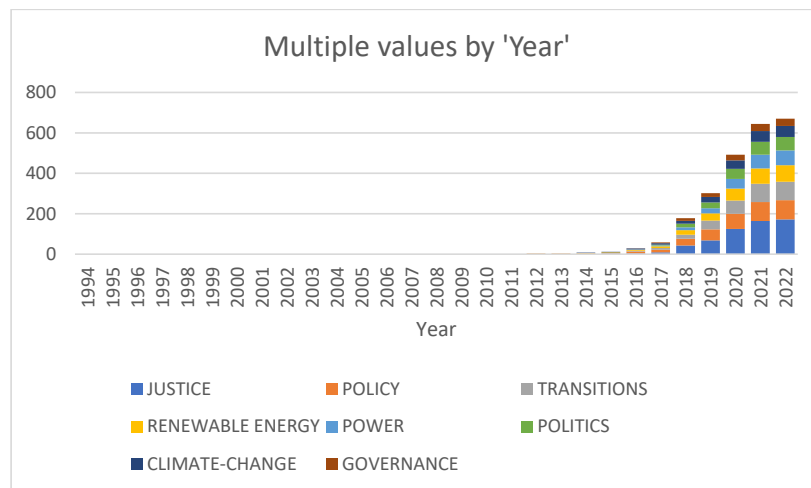


Figure A3. Growth of keywords over time.

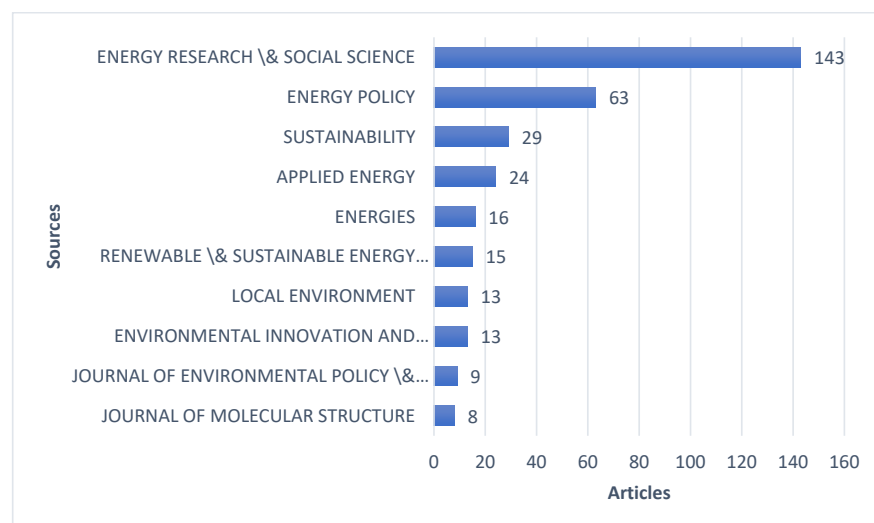


Figure A4. Most productive sources.

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