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Territorial segmentation of key sustainability stakeholders for systemic change: Insights from Hungary

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ABSTRACT

Employing advanced statistical methods on qualitative data, this study explores territorial clusters of municipality leaders (ML) and educational leaders (EL) in Hungary, based on their sustainability priorities. It assesses how these clusters influence stakeholder engagement strategies and decision-making across local, national, and global scales. The analysis reveals synergies and divergences between ML and EL, emphasizing their combined potential in addressing the socio-economic and environmental facets of sustainability. The findings highlight the importance of collaborative ML and EL efforts in fostering systemic change underscoring the pivotal role of local actors in multilevel governance for sustainable development.

1. Introduction

In an era marked by escalating environmental challenges and the imperative of sustainable development (Jabareen, 2008), understanding the dynamics of sustainability transition becomes crucial. This understanding has to be grounded in several key theoretical frameworks. The concept of *systemic change*, as discussed in sustainability literature (Oates, 2021; Abson et al., 2017), highlights the interconnected nature of social, economic, and environmental systems and the need for holistic approaches to sustainable development. The theory of *multi-level governance* (Bryson, 2004; Kumar et al., 2016) provides a lens through which to view the complex interactions between different levels of decision-making and stakeholder engagement in sustainability. The concept of *stakeholder engagement* in sustainability (Bryant and Thomson, 2021; Bandari et al., 2022) is crucial to understanding the roles and influences of different actors. *Collaboration theory* focuses on how synergies can emerge when stakeholders with different values work for a common goal (Chrislip and Larson, 1994; Bowen, 2005). Our inquiry links grassroots perspectives with these overarching sustainability frameworks, thus offering a novel contribution to the discourse on sustainability transitions and governance.

Amidst these varied actors, local stakeholders, particularly ML and educational leaders EL, are pivotal agents of change. Their deep-rooted community connections enable them to tailor sustainable solutions that resonate locally. ML, often at the forefront of decision-making in sustainability initiatives, have a significant policy influence (Lähteenoja et al., 2021). EL shape future generations' perspectives on sustainability (Castillo-Rivero et al., 2023). Their collaboration has the potential to address local needs while aligning with broader Sustainable Development Goals (SDGs), demonstrating the synergy of local actions in the global sustainability context (Biermann et al., 2017, Breuer et al., 2019). They are integral to localizing the implementation of these goals, translating global objectives into actionable community initiatives and play a crucial role in engaging communities, raising awareness about SDG-related issues, and mobilizing local action.

Their distinct sustainability values and priorities are hypothesized to reflect a diverse range of approaches to sustainability, influenced by their unique roles and responsibilities and the territorial level under examination. Clustering them based on their sustainability values (Celliers et al., 2023) is not merely an academic endevour; it has profound policy implications. Recognizing the varying priorities for the different territorial levels can contribute to the development of a comprehensive and integrated approach to sustainability, bridging the gap between local actions and broader national and global goals (Bruyninckx, 2009; Pomeroy and Douvere, 2008). Our approach aligns with the multi-level perspective on sustainability, highlighting the role of local actors in the broader sustainability narrative and how their actions and decisions intersect with national and global sustainability goals.

Based on these theoretical foundations our study aims to answer the following research questions:

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1. *How do the identified clusters of sustainability values and priorities among ML and EL complement each other across local, national, and global scales, and what implications does this have for enabling systemic change in sustainability practices through synergistic collaboration of the two groups?*
2. *In what ways can stakeholder engagement strategies be tailored to align with the distinct priorities of ML and EL clusters, facilitating collaborative efforts towards systemic sustainable transition?*
3. *What is the significance of the clusters for multi-level governance?*
4. *How do the clusters' values and priorities align with the main strategic sustainability priorities of Hungary?*

2. Literature review

2.1. Theoretical grounding

Numerous studies have warned that without systemic change involving large scale societal, economic an environmental transformation, our common future is at considerable risk (Woltering et al., 2019; Scoones et al., 2020). Jänicke (2017) points out that in an increasingly multy-level global governance system it is crucial to support lower level initiatives and stimulate horizontal dynamics. This latter is possible through effective stakeholder engagement (Goodman et al., 2017; Gonzalez-Porras et al., 2021; Moodie et al., 2022) resulting in more synergistic collaboration of key stakeholder groups (Lasker and Weiss, 2003). Lasker and Weiss (2020:122) explain this synergy as "… *a key indicator of a successful collaborative process because it reflects the extent to which a partnership can accomplish more than any of its individual participants and become a whole that is greater than the sum of its parts.*" For this synergy to manifest mapping collaborators sustainability values and priorities is inevitable. It is emphasized by Videira et al. (2012) in a study on how stakeholder engagement in participatory sustainability projects is built on assessing stakeholder priorities, worldviews and values.

2.2. Segmentation by territorial scale

While existing literature provides substantial insights into stakeholder sustainability priorities (Chowdhury et al. 2019; Fischer et al. 2020; Tapaninaho and Kujala, 2019), there remains a significant gap in understanding how these priorities vary across different territorial scales (Allen et al. 2023). Research shows that individuals often exhibit significant discounting tendencies, prioritizing immediate locality issues over those perceived as distant (Lengyel et al., 2019; Sargisson and Schöner, 2020). This knowledge can ensure that policies are not just top-down impositions but are informed by the nuanced understanding of local perceptions, leading to more effective and culturally sensitive sustainability initiatives (Pyhälä et al., 2016).

2.3. Relevance of local stakeholders

It is hard to overstate the importance local actors play in the success of sustainability efforts at any territorial level (Vázquez-Barquero and Rodríguez-Cohard, 2019; Ansell et al., 2022). Local stakeholders often serve as a bridge between the community and higher governance levels acting as „*scale-crossing brokers*", a term used by Ernstson et al. (2010) to denote actors involved in strategic networking with actors of other territorial scales. Their perspectives can help tailor national and global sustainability strategies in a way that resonates with local communities, enhancing public engagement and support for such initiatives. It is all the more important as local governments tend to redefine national policies to better suit local needs (Falleth and Hovik, 2009). Understanding local actors' views on national and global issues can uncover unique sustainability solutions that may be overlooked in top-down approaches. This grassroots perspective is essential for fostering innovation in sustainability practices, as local actors are often more adept at identifying and leveraging local resources and strengths (Smith and Stirling, 2018).

2.4. Focus on municipality and educational leaders

While the majority of segmentation studies in the sustainability domain have focused on the general public and have sought to measure attitudes towards the environment and climate change (Poortinga and Darnton, 2016; Zimmermann et al. 2012), specific stakeholder groups have also been targeted (Han et al. 2020; Jones et al. 2019; Lajimi, 2021; McLeod & Hine, 2019). Earlier literature has pointed out the essential role of ML and EL as central stakeholders (Müller et al., 2020; Cebrián et al., 2022; Rivas et al., 2022) in sustainability efforts. Müller et al. (2020) underscore the importance of the role EL play in shaping the values and mindset of future generations through their decisions concerning education for sustainable development (ESD). At the same time Rivas et al. (2022) discuss how bottom-up collaboration of ML is instrumental in the implementation of the global agenda. Cebrián et al. (2022) used open ended questions to examine the commitment of 36 Catalonian principals to sustainable practices and concluded that professional development programs are needed to develop EL sustainability competencies. Various clustering methodologies are used in studies aimed at ML (Giacomini and Simonetto, 2020; Troisi and Alfano, 2022) and EL (Pedersen et al. 2019; Rinne et al. 2016). However, to the best of our knowledge, no segmentation of these two stakeholder groups has been conducted on nation-wide probability sampled qualitative datasets in the field of sustainability research. Our study is to fill this research gap.

3. Methodology

3.1. Data collection process

Our research employed a comprehensive contact list available through Hungarian ministries, enabling probability sampling and the development of a robust dataset. We specifically targeted municipality leaders (ML) and educational leaders (EL) to assess their sustainability values and priorities across local, national, and global territorial scales. Open-ended questions were used to encourage detailed responses, with anonymity maintained to minimize biases. The same question was asked in connection with the three territorial levels: „*Name the three most important sustainability priorities (in order of importance) that you think are necessary for the long term survival of Your Settlemet/Your Country/Global Human Civilization. There is no length constaint to the answers.*".

Invitations sent in three waves during April and May 2023 resulted in a response rate of 12.84% (405 valid questionnaires) from municipalities and 7.75% (433 usable questionnaires) from schools. In ML, 68%, in EL, 18% of the sample are males. The mean age in both EL and ML is 34. In ML, 33% have a bachelor degree or higher, while in EL it is 66%. Fig. 1. shows how respondents are distributed across the NUTS II regions.

Respondents appear to be distributed across Hungary's NUTS II regions with some degree of evenness, suggesting a diverse yet relatively balanced participation in the study from administrative regions of varying levels of development.

3.2. Data processing and analysis

To preserve the accuracy and original meaning of the responses, we employed the back translation methodology (Chen and Boore, 2010). For the content analysis, we utilized an inductive coding approach (Thomas, 2006; Chandra and Shang, 2019) with the first author overseeing the entire coding process. The units of analysis were value priorities or "meaning units" extracted from the respondents' answers, which were then transformed into codes. Krippendorff's alpha (Krippendorff, 2004)

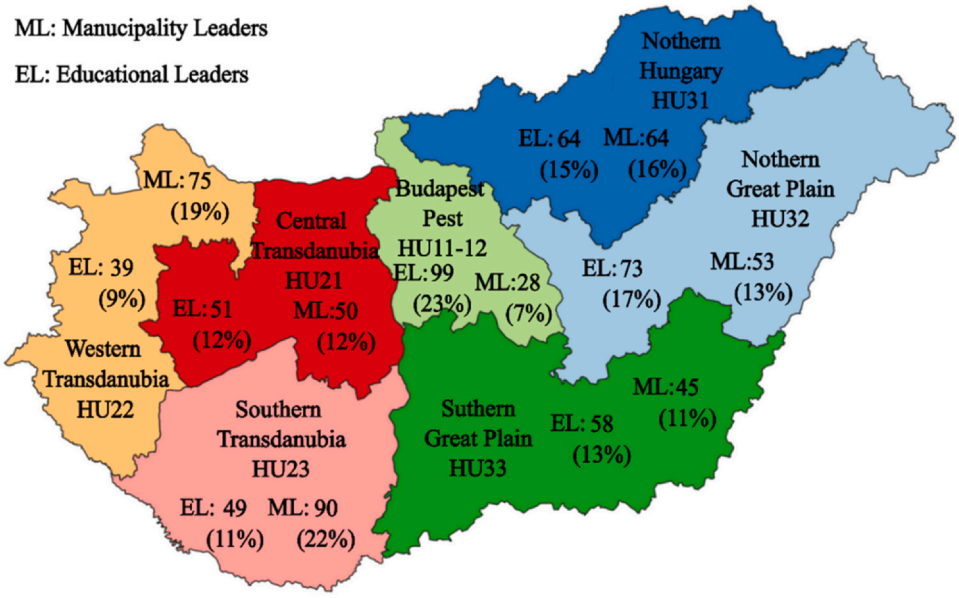

Fig. 1. Distribution of respondents across NUTS II regions.

Table 1
Example responses and anchor samples of coded categories.

Anchor samples	Categories
keeping young people here	demography
self-restraint	reduce consumption
responsible local authorities	local government
drastically changing the human-nature relationship, everyone should understand and respect that "The Earth is not inherited from our fathers, but borrowed from our grandchildren"	change mindset, environmental protection, future generations
money freely available for investment	economy
protecting freshwater resources, reducing waste very drastically	water protection, reduce pollution
changing people's mentality	change mindset
expanding selective collection options	waste management
reducing the cost of solar investments	green technology
mitigating the factors of climate change	climate protection
financial recognition of an honestly done job	decent wages
appropriate education and training systems	education

was used to assess interrater reliability, reaching a satisfactory level in the final assessment (k-alpha = 0.80, $p \leq 0.05$). Anchor samples are provided in Table 1. The number of categories within a cell varies based on the length and complexity of the original responses.

3.2.1. Non-negative matrix factorization and clustering

Because of our data's non-negativity, overlap, unknown number of clusters, and correlations, Non-negative Matrix Factorization was employed to discover hidden thematic structures within the dataset (Xu et al., 2003; Naik, 2016). These steps were followed:

1. **Preprocessing and Term-Document Matrix**: The initial data preprocessing involved removing irrelevant information and noise from the corpus. A term-document matrix (X) was then generated using the 'tm' package in R, where each row represented a term, and each column represented a respondent.
2. **Application of NMF**: NMF was applied to the term-document matrix using the 'NMF' package in R. This process identified underlying topics in the responses, grouping subcategories into clusters and associating respondents with the most relevant topics. The algorithm generated two non-negative matrices: U for terms and V for respondents, facilitating thematic and respondent clustering.
3. **Cluster Validation and Determination**: To validate and determine the appropriate number of clusters, the 'Nbclust' package in R was used. We employed three cluster quality measures (Silhouette, C-index, Dunn) and three methods (Ward, K-means, and complete linkage) for this purpose.

3.2.2. Multiple Correspondence Analysis (MCA) for visualization

MCA is a powerful tool for examining the relationship between qualitative data and capturing patterns geometrically within the dataset (Bock, 2011; Costa et al., 2013). This statistical technique is designed for exploring and visualizing relationships between categorical variables in a dataset (Benzécri, 1973). In our study, MCA was used to analyze the patterns and associations between the various clusters and their corresponding sustainability values and priorities. The primary function of MCA in our research was to reduce the dimensionality of the clustered data, simplifying it into a form that can be easily visualized and interpreted. MCA achieves this by transforming the data into a lower-dimensional space where each point represents a cluster, allowing us to identify patterns and relationships among them. The steps followed were:

1. **Input Data for MCA**: After completing the NMF process and clustering, the resulting data, particularly the matrices U (terms) and V (respondents), were prepared as input for Multiple Correspondence Analysis. This step involved organizing the clustered data in a way that would be suitable for MCA.
2. **Visualization with Moon Plots**: The results of the MCA were then visualized using moon plots, a type of graphical representation that helps in illustrating the relationships and distances between clusters. These plots were created using the 'rthmlMoonPlot' and 'plotrix' packages in R, providing a clear and intuitive visualization of how different clusters relate to each other in the context of sustainability values and priorities. The categories, when positioned near the epicentre of the moon plot, exhibit analogous characteristics to the average pattern, denoting minimal deviation from the central propensity. In contrast, categories stationed farther from the nucleus, closer to the circle's fringe, embody distinct attributes or indicate a larger variance from the average pattern. The spacing between categories signals their mutual likeness or contrast in terms of co-occurrence patterns among respondents. Categories with close territorial association typically co-occur more often than predicted by chance. The nearness of categories also infers a higher level of

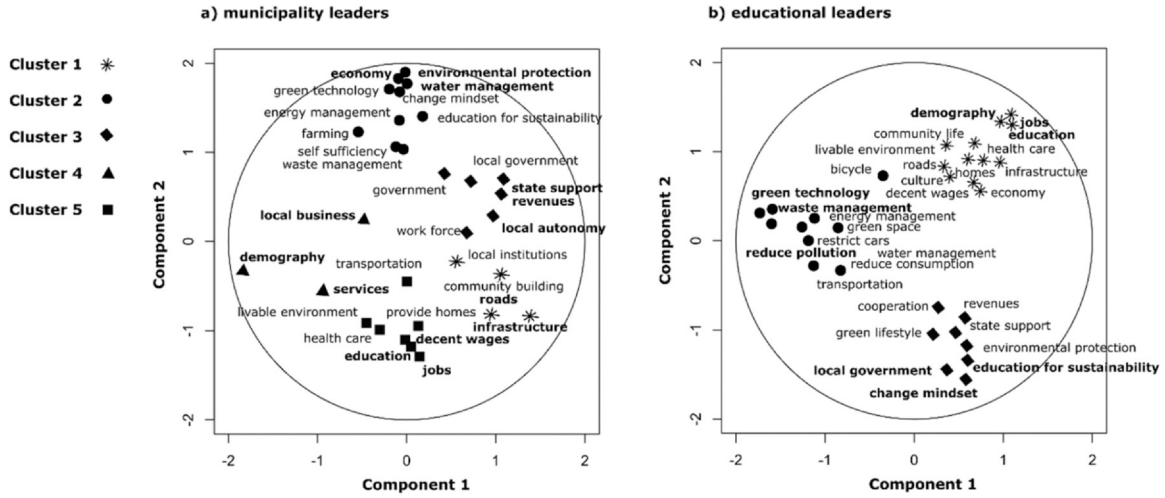

Fig. 2. ML EL clusters at local level.

internal coherence and uniformity within the cluster, thereby rendering it more distinct from other groupings.

4. Results

In the following sections clusters are identified and briefly described. The values in brackets after category names are cluster weights obtained during the NMF process and not depicted on the moon plots. A category with a higher weight indicates that it is a defining feature of that cluster and has a high degree of association with the other categories within that cluster. Moon plots are not described in detail as they are self explanatory. For space constraints only categories with NMF weight higher than 0.01 are displayed. Fig. 2 showcases the outcomes of NMF and MCA conducted at the local level.

4.1. ML clusters at local level

'**Systemic Sustainability Advocates**' (Cluster 2): Prioritizing 'environmental protection' (0.166), 'economy' (0.105), and 'water management' (0.081), this cluster embodies a balanced sustainability approach. 'Change mindset' (0.073) and 'green technology' (0.071) signal a drive towards ecological transformation.

'**Socio-economic Development Advocates**' (Cluster 5): This cluster foregrounds 'jobs' (0.381), indicating the priority given to employment. The focus on 'education' (0.12) and 'decent wages' (0.071) underlines an emphasis on personal growth and fair compensation. 'Health care' (0.055) and a 'liveable environment' (0.054) reflect a concern for overall welfare.

'**Power Balance and Social Development Advocates**' (Cluster 3): This cluster significantly values 'state support' (0.269) coupled with local 'revenues' (0.198), indicating a nuanced perspective on the interplay between central and local financial systems. The concurrent emphasis on 'local autonomy' (0.102), 'local government' (0.077), and central 'government' (0.074) underscores a desire for a balance of power between local and central authorities.

'**Infrastructure and Community Development Advocates**' (Cluster 1): This cluster prioritizes infrastructure, evident from a substantial NMF weight of 0.528. 'Roads' (0.055) and 'community building' (0.04) reinforce the focus on community connectivity. 'Public safety' (0.021) and 'local institutions' (0.026) reflect a commitment to social order and local governance.

'**Population Growth Advocates**' (Cluster 4): The primary focus in this cluster is 'demography' (0.661), signifying a profound interest in changing the negative population trends and dynamics. 'Services' (0.073) and 'local businesses' (0.028) are indicative of a concern for community welfare and economy.

4.2. EL clusters at the local level

'**Socio-economic Development Advocates**' (Cluster 1): This cluster displays a strong emphasis on job creation (0.25) and demography (0.134), highlighting a focus on economic stability and population dynamics. The importance of education (0.09) and infrastructure (0.056) demonstrates a commitment to societal development.

'**Green Initiatives Advocates**' (Cluster 2): The focus of this cluster on 'green technology' (0.218), 'waste management' (0.19), and 'reduce pollution' (0.123) demonstrates a potent commitment to environmental preservation, further reinforced by the importance given to 'green space' (0.084), 'energy management' (0.043), 'restrict cars' (0.031), and 'water management' (0.029).

'**Systemic Sustainability Advocates Plus**' (Cluster 3): The dominant emphasis on 'change mindset' (0.244) and 'education for sustainability' (0.155) suggests a transformative approach towards sustainability. The roles of 'local government' (0.110) and 'state support' (0.088) are acknowledged, revealing the importance of governing bodies in implementing sustainable policies.

4.3. Clusters at the country and global levels

Although the clusters of ML and EL, in the context of both the country and globally, might not provide instantly actionable data, they do furnish valuable insights into their ambitions, concerns, and broader perspectives on sustainability. These insights can influence discussions and decision-making processes, ultimately leading to more harmonized sustainability initiatives across various scales. Figs. 3 and 4 present the NMF-based MCA results at the country and global levels.

4.3.1. ML clusters at the country level

'**Paternal Governance and Social Development Advocates**' (Cluster 1): This cluster places significant emphasis on 'government' (0.502), suggesting a strong reliance on central governance. The presence of 'national autonomy' (0.044) and 'local autonomy' (0.028) indicates a balance of power desired across different governance levels.

'**Systemic Sustainability Advocates Light**' (Cluster 2): This cluster privileges 'economy' (0.352), but respect for 'environmental protection' (0.084) and adoption of 'green technology' (0.039) hint at an eco-conscious economic paradigm.

'**Socio-economic Development Advocates**' (Cluster 3): This cluster underscores the primacy of 'jobs' (0.192), fair pay with 'decent wages' (0.167), and 'demography' (0.154), suggesting a focus on sustainable economic growth and population dynamics. 'Health care' (0.048) underlines the importance of public health.

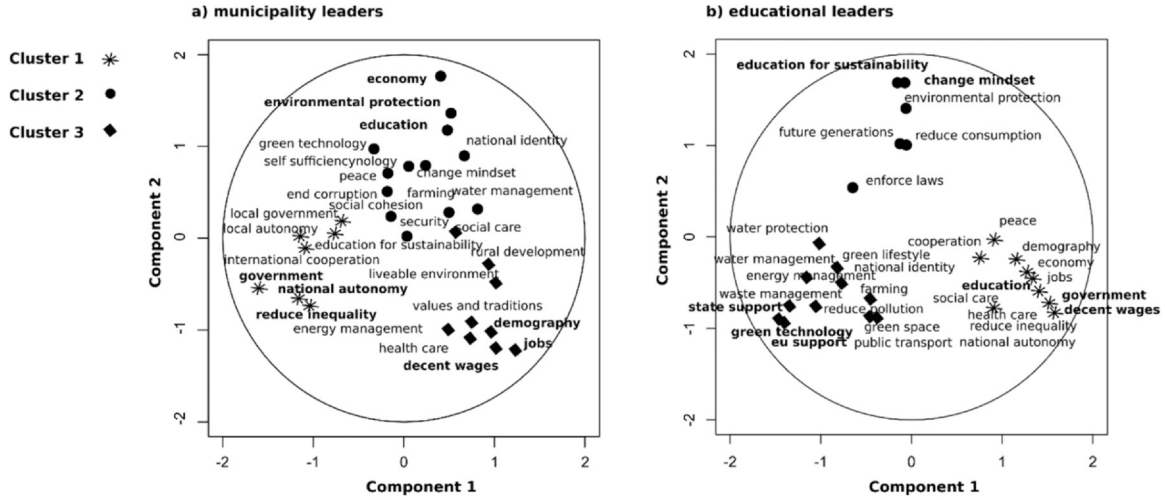

Fig. 3. ML and EL clusters at country level.

4.3.2. EL clusters at the country level

'Socio-economic Development Advocates' (Cluster 1): This cluster reflects a balanced socio-economic approach, with 'decent wages' (0.128) and 'jobs' (0.091) indicating a focus on equitable economic growth. It acknowledges 'government' (0.11) and 'education' (0.098) as pivotal to this development. 'Economic development' (0.072) and 'demography' (0.063) point to a broad societal focus.

'Systemic Sustainability Advocates Plus' (Cluster 2): 'Change mindset' (0.263) and 'education for sustainability' (0.236) underscore the importance of cognitive shifts and informed citizens. 'Environmental protection' (0.147) illustrates the eco-conscious focus, whereas 'reduce consumption' (0.028) and 'future generations' (0.026) indicate an intent for resource conservation and long-term sustainability.

'Environment-centric Economic Development Advocates' (Cluster 3): 'Green technology' (0.333) is most emphasized, pointing to a commitment to innovation for environmental betterment. Governmental roles, such as 'state support' (0.083) and 'EU support' (0.081), indicate the importance of institutional backing. The prominence of 'waste management' (0.079) and 'reduce pollution' (0.071) underscores an eco-conscious ethos.

4.3.3. ML clusters at the global level

'Social-Centric Sustainability Advocates' (Cluster 1): This cluster shows a strong focus on 'peace' (0.19) and 'reduce inequality' (0.167), signalling a desire for social harmony and equitable distribution of resources. The importance of 'international cooperation' (0.109) and 'tolerance' (0.052), highlight an emphasis on global solidarity and mutual respect.

'Green-centric Sustainability Advocates' (Cluster 2): This cluster demonstrates a dominant focus on 'environmental protection' (0.523). The presence of 'demography' (0.057) and 'economy' (0.032) suggests a holistic approach, combining ecological concerns with socio-economic realities.

Systemic Sustainability Advocates Plus' (Cluster 3): This cluster strongly emphasizes 'change mindset' (0.238) and 'reduce pollution' (0.117), indicating a transformative approach towards environmental stewardship. It advocates for lessening consumption levels ('reduce consumption', 0.106) and leverages 'governments' (0.065) to drive change.

4.3.4. EL clusters at the global level

'Socio-environmental Development Advocates' (Cluster 1): This cluster is highlighted by a strong commitment to 'environmental protection' (0.322) and global harmony as reflected by 'international cooperation' (0.103) and 'peace' (0.079). The roles of 'governments' (0.046) and emphasis on 'reduce inequality' (0.046) signify a recognition of social justice and policy intervention.

'Environment-centric Sustainability Advocates' (Cluster 3): This cluster emphasizes environmental conservation, underscored by 'reduce

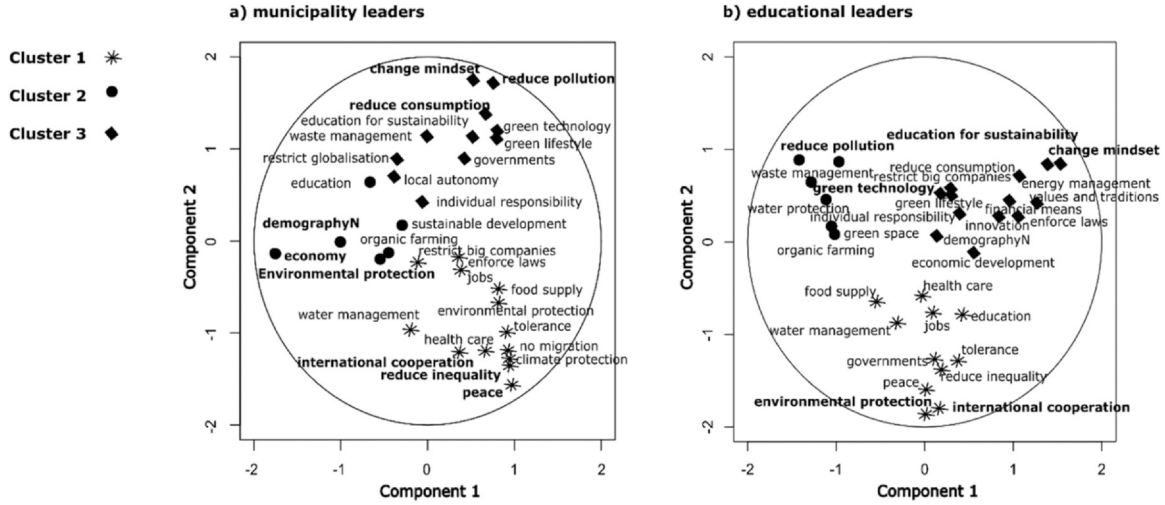

Fig. 4. ML and EL clusters at global level, Note: demographyN = decline in populationis needed.

Table 2
Cluster types and their transformative potential.

	Transformative pole			
Systemic Sustainability Plus	ELlocal	ELcountry	ELglobal	MLglobal
Systemic Sustainability	MLlocal			
Systemic Sustainability Light	MLcountry			
Environment-centric Sustainability	MLglobal			
Green initiatives	ELlocal			
Socio-environmental Dev.	ELglobal			
Social-centric Sustainability	MLglobal			
Environment-centric Economic Dev.	ELcountry			
Power Balance and Social Dev.	MLlocal			
Population Growth	MLlocal			
Socio-Economic Dev.	ELlocal	ELcountry	MLlocal	MLcountry
Infrastructure and Community Dev.	MLlocal			
Paternal Governance and Social Dev.	MLcountry			
	Business As Usual pole			

pollution' (0.413) and sustainable technologies like 'green technology' (0.127). 'Waste management' (0.082) and 'water protection' (0.036) convey an eco-conscious agenda.

'Systemic Sustainability Advocates Plus' (Cluster 3): This cluster highlights the importance of altering attitudes with 'change mindset' (0.339) and 'education for sustainability' (0.184) at its core. It advocates for reducing consumption levels (0.112), suggesting an emphasis on mindful resource use. The presence of 'demography' (0.024) and 'economic development' (0.012) suggest a comprehensive approach to sustainable change.

4.4. Summary of clusters

Table 2 depicts cluster types of ML and EL, also marking at which territorial scales the type of clusters appears. The table shows how the various clusters are ordered from the most "transformative ones" to the most "business as usual" types.

An analytical comparison of ML and EL clusters across local, national, and global scales reveals compelling patterns and disparities. Locally, clusters associated with ML demonstrate a greater emphasis on social facets of sustainability. This reflects their responsibility as elected representatives charged with addressing immediate societal needs and guaranteeing the welfare of their constituents. These results resonate with the findings of a survey of Dlabac et al. (2022) predicated on Fainstein's (2014) concept of a 'Just city', as it indicated that 'economic growth' and the 'development of social policies' were of the utmost importance across four city ML clusters. In comparison, clusters associated with EL at the local level exhibit a more significant focus on the environmental dimension. This is likely influenced by the integration of environmental education in the Hungarian National Curriculum (Borsos et al., 2018), and the pivotal role of EL in influencing educational practices and school culture. Notwithstanding the abundance of research into EL sustainability perceptions within educational contexts (Cebrián et al., 2022; Mogren and Gericke, 2019), no study has hitherto explored their perspective on the long-term sustainability of their settlements.

On the national scale, both ML and EL acknowledge the significance of national and regional actions, policies, and initiatives in propelling sustainability efforts. However, ML clusters on this scale place more emphasis on governance and policy-related elements, reflective of their role in local policy implementation (Ladner et al., 2016). In contrast, EL clusters provide a more balanced view of socio-economic and environmental values indicating an appreciation of the broader societal and environmental repercussions of national policies and initiatives.

At the global level, both ML and EL recognize the indispensability of a systemic approach to sustainability, which extends beyond local and national perimeters (Clayton and Radcliffe, 2018). Their clusters, however, diverge in emphasis. ML clusters predominantly focus on social aspects at the global level, echoing their roles as community leaders and their understanding of the global consequences of social inequality and conflict. Conversely, EL clusters manifest a marked emphasis on environmental aspects, indicative of their roles in advocating environmental education and their understanding of global environmental challenges.

The ranking list presented provides a spectrum of sustainability perspectives, ranging from transformative to more traditional approaches. At the "transformative pole", we find 'Systemic Sustainability Plus', 'Systemic Sustainability', and 'Systemic Sustainability Light'. These clusters represent a comprehensive, forward-thinking approach to sustainability, emphasizing the interconnectedness of social, economic, and environmental dimensions (Chen et al., 2018; Wiek et al., 2012). They embody the essence of sustainability transition, advocating for a systemic shift in societal structures and practices. Towards the "business as usual" pole, categories like 'Socio-Economic Development', 'Infrastructure and Community Development', and 'Paternal Governance and Social Development' are found. These represent a more conventional approach to sustainability, prioritizing immediate societal needs and economic development. They reflect a perspective where sustainability is seen as compatible with existing societal structures and practices.

5. Discussion

5.1. Adressing the first research question

Locally, the possible collaboration of the diverse ML and EL clusters offers a multifaceted approach to systemic change. By combining the strengths of ML's 'Systemic Sustainability Advocates', 'Socio-economic

Development Advocates', and 'Infrastructure and Community Development Advocates' with EL's 'Green Initiatives Advocates' and 'Systemic Sustainability Advocates Plus', a comprehensive and balanced sustainability model emerges. This model addresses environmental protection, economic resilience, and social well-being in unison, essential for a holistic sustainability transition. ML's initiatives in urban planning and resource management (Haus and Erling Klausen, 2011) can be effectively complemented by EL's efforts in integrating sustainability education and awareness programs (Kadji-Beltran et al., 2013). This combination ensures that while environmental and infrastructural concerns are addressed, there is also a strong underpinning of sustainable education and technological innovation. Such a collaborative approach aligns with SDGs 4, 6, 7, 13, and 15.

At the country level, strategies should focus on elevating local insights into broader policy discussions, ensuring that national sustainability initiatives reflect the combined economic, environmental, and educational priorities of ML and EL. This could involve creating platforms for local leaders to contribute to national policy-making processes. ML's 'Paternal Governance and Social Development Advocates' and 'Systemic Sustainability Advocates Light' align well with EL's 'Socio-economic Development Advocates' and 'Systemic Sustainability Advocates Plus'. This alignment reflects a shared emphasis on balanced socio-economic growth, respect for environmental protection, and a reliance on effective governance. The ML's focus on government and national autonomy complements EL's emphasis on education for sustainability and cognitive shifts, suggesting that a well-governed, educated society is essential for sustainable development. This approach aligns with SDGs 4, 8, 13.

At the global level, there should be engagement with international forums and sustainability dialogues to leverage the insights of these local insights. This approach highlights the critical role of local actions and perspectives in shaping global sustainability outcomes, underscoring the importance of grassroots initiatives in international policy arenas. The complementarity of clusters becomes even more pronounced at this level. ML's 'Social-Centric Sustainability Advocates' and 'Green-centric Sustainability Advocates' dovetail with EL's 'Socio-environmental Development Advocates' and 'Environment-centric Sustainability Advocates'. This synergy highlights a collective focus on environmental protection, social harmony, and international cooperation, crucial for addressing global sustainability challenges. The ML's and EL's shared emphasis on peace, international cooperation, and environmental protection signals a common understanding of the interconnected nature of global sustainability issues. This global perspective is critical for achieving SDGs 10, 13, 17.

The apparent cross-scale complementarity underscores the potential for ML and EL to leverage their distinct yet aligned priorities to foster systemic change. At the local level, their actions can be informed and inspired by their broader understanding of national and global sustainability challenges, leading to more globally-informed and locally-impactful initiatives. Furthermore, their ability to collaborate and network across different levels of governance can amplify their impact, advocating for policies and practices that reflect a holistic approach to sustainability.

Challenges: While ML and EL clusters exhibit potential for collaboration at the local level, they face challenges when addressing broader sustainability concerns at national and global levels. The primary challenge lies in aligning local actions with broader sustainability agendas, as local actors may lack direct influence in higher-level policy-making. Additionally, differences in understanding and prioritizing global sustainability issues can lead to conflicts or misalignments in collaborative efforts. Overcoming these challenges requires effective communication channels and strategies to integrate local actions with national and global sustainability objectives.

5.2. Adressing the second research question

To create an effective stakeholder engagement strategy that incorporates the varying priorities of ML and EL clusters, it is crucial to consider the transformative potential of each cluster. This strategy should aim to foster synergistic collaboration among clusters across scales, ranging from those advocating transformative change to those maintaining more traditional approaches ("Business as Usual") leveraging the strengths of each cluster to foster systemic sustainability transition.

Engaging Transformative Clusters: Clusters like 'Systemic Sustainability Plus' (EL at all levels, ML at the global level) and 'Green Initiatives' (EL at the local level) represent the transformative pole. These clusters should be engaged in leading innovative projects and policy formulation. For EL, this might involve integrating cutting-edge sustainability concepts into educational curricula and leading community-outreach programs on sustainability issues (Alkaher and Gan, 2020). For ML, especially at the global level, this could involve advocating for sustainable practices in international forums and policy-making bodies.

Engaging Clusters with Traditional Priorities: Clusters such as 'Paternal Governance and Social Development' (ML at the country level) and 'Infrastructure and Community Development' (ML at the local level) represent more traditional priorities. Engagement strategies here should focus on demonstrating the benefits of sustainable practices within existing frameworks. This could include showcasing how sustainable infrastructure development can lead to long-term economic and social benefits, aligning with their existing governance and development priorities.

Bridging the Gap: For clusters that lie in between, like 'Socio-Economic Development' (EL and ML at both local and country levels) and 'Power Balance and Social Development' (ML at the local level), strategies should bridge transformative and traditional approaches. Engaging these clusters could involve workshops (Macedo et al., 2020) that explore the synergy between economic development and sustainability, highlighting how sustainable practices can enhance economic and social welfare.

Creating synergistic cross-scale collaboration: The key to successful engagement is fostering synergistic collaborations between clusters. This involves creating platforms where clusters with different focuses can come together to share insights and develop integrated strategies. For example, combining the innovative approaches of 'Systemic Sustainability Plus' clusters with the more grounded strategies of 'Infrastructure and Community Development' clusters could lead to comprehensive and effective sustainability initiatives. At the local level, initiatives can focus on tangible community projects and policy implementation. At the national and global levels, the focus should shift to policy advocacy, sharing best practices, and aligning local actions with broader sustainability goals. This ensures that local insights inform national and global sustainability policies, and global sustainability goals are reflected in local actions.

Challenges: Engagement strategies designed for ML and EL, as local actors, must account for their limited operational reach beyond the local context. While they can effectively address local sustainability issues, translating these actions into national and global sustainability can be challenging. Local actors might face constraints in resources, authority, and access to broader policy platforms. Therefore, while formulating engagement strategies, it is crucial to create pathways that connect local initiatives with wider sustainability efforts, fostering an environment where local actions can contribute to and align with larger sustainability goals.

5.3. Adressing the third research question

The diverse clusters of ML and EL, encompassing a range of sustainability priorities, play a pivotal role in shaping multi-level governance. Their significance lies in the way they collectively contribute to and influence governance at local, national, and global levels.

Local governance: At the local level, clusters like ML's 'Infrastructure and Community Development Advocates' and EL's 'Green Initiatives

Advocates' are instrumental in addressing specific community needs and promoting sustainability awareness. 'Infrastructure and Community Development Advocates' focus on tangible infrastructural improvements, directly impacting local policy and development projects. In contrast, 'Green Initiatives Advocates' shape local governance indirectly through educational initiatives and community engagement in sustainability (Blank et al., 2012). These clusters' contributions ensure that local governance is responsive and tailored to the immediate and long-term sustainability needs of the community.

National governance: On the national stage, clusters such as ML's 'Paternal Governance and Social Development Advocates' and EL's 'Systemic Sustainability Advocates Plus' become crucial. They offer perspectives that guide national policy formulation, balancing governance with socio-economic and environmental sustainability. The input from these clusters ensures that national policies are not just top-down directives but are informed by a comprehensive understanding of various sustainability facets, including social development and education (Li and Ding, 2020).

Global governance: At the global level, the significance of these clusters is magnified. Clusters like 'Social-Centric Sustainability Advocates' (ML) and 'Socio-Environmental Development Advocates' (EL) contribute to shaping global sustainability dialogues. Their perspectives offer insights into how local actions and educational initiatives can align with and support global sustainability goals, thereby influencing international policies (Koehn, 2021). This global perspective is crucial in ensuring that international sustainability efforts are grounded in diverse local experiences and needs.

Synthesis in multi-level governance: The integration of these clusters into multi-level governance is key to creating a cohesive and effective sustainability governance framework. Their diverse perspectives ensure that governance at each level – local, national, and global – is informed, inclusive, and responsive to a range of sustainability challenges and priorities (Matsuura and Shiroyama, 2018; Radinger-Peer, 2019). This integration allows for a governance approach that is adaptable, recognizing the dynamic nature of sustainability issues and the need for varied solutions at different governance levels. By integrating these clusters into governance processes at all levels, multi-level governance can become more representative, effective, and equipped to address the multifaceted challenges of sustainability.

Challenges: Influencing governance beyond the local level involves navigating complex political landscapes and building alliances with higher-level stakeholders. Local actors need to leverage networks and partnerships to amplify their voice and impact on broader sustainability governance.

5.4. Adressing the fourth research question

The alignment of ML and EL clusters with Hungary's National Framework Strategy on Sustainable Development (NFSSD) provides a nuanced understanding of local stakeholder perspectives in relation to national sustainability priorities. This section delves into these connections and their implications for policy:

5.4.1. Alignment with NFSSD goals

Demographics and population trends: The focus of the 'Population Growth Advocates' cluster among ML on demography aligns with NFSSD's demographic challenges emphasis, mirrored by EL's 'Socio-economic Development Advocates' with their focus on job creation and population trends.

Education and knowledge: The 'Systemic Sustainability Advocates Plus' from EL, prioritizing sustainability in education, parallels the NFSSD's focus on education, indicating opportunities for enhancing local sustainability education initiatives.

Health and poverty: Health concerns, moderately represented in both ML's and EL's 'Socio-economic Development Advocates', suggest an area for further emphasis in local policies to better align with NFSSD's health objectives. Similarly, the limited representation of poverty-related themes indicates a need for increased local focus and action to align with national strategies.

Environmental sustainability: Clusters like ML's 'Systemic Sustainability Advocates' and EL's 'Green Initiatives Advocates', focusing on environmental protection, align strongly with NFSSD's environmental goals, indicating shared priorities for environmental stewardship.

5.4.2. Areas of divergence

Economic growth and public debt: Economic focus, especially by ML's 'Socio-economic Development Advocates', corresponds with NFSSD's emphasis on entrepreneurship and growth. However, variations in local focus, particularly regarding innovation and fiscal discipline, suggest a need for greater alignment with national economic strategies.

Intergenerational equity, social cohesion, and regional development: The minimal focus on intergenerational equity and social cohesion, as well as regional development, points to gaps compared to the NFSSD's goals. This indicates a need for policy development and public engagement involving clusters like ML's 'Power Balance and Social Development Advocates' and 'Infrastructure and Community Development Advocates'.

Policy implications and broader applicability: This analysis suggests the need for targeted policy interventions to address specific local gaps while aligning with national sustainability goals. Enhancing local educational programs to include health, poverty, and inequality themes, and fostering initiatives that emphasize environmental sustainability and economic growth could better align local actions with national strategies. While rooted in the Hungarian context, the methodology and insights have international applicability. The identification of stakeholder clusters based on their priorities can inform inclusive sustainability policies globally, considering local preferences while aligning with global sustainability frameworks (Szikra, 2014; Óvári et al., 2023; Okitasari and Katramiz, 2022). Nevertheless, applying these insights in different contexts requires an understanding of local dynamics and challenges.

In summary, the NFSSD's goals find both alignment and divergence with the priorities of local ML and EL clusters. This analysis forms a basis for developing more locally responsive and nationally aligned sustainability policies.

5.5. Segmenting sustainability stakeholders for systemic change

Fig. 5 demonstrates how segmenting ML and EL into clusters can drive systemic sustainability change. The greater diversity in ML clusters suggests a wider range of policy perspectives, while EL's fewer clusters point to focused educational priorities. The color gradient signifies the progression from traditional to transformative sustainability approaches. This model illustrates the benefit of regularly assessing stakeholder priorities to enhance engagement, highlighting how diverse cluster collaborations can lead to comprehensive change. It also reflects the necessity of multi-level governance, with the interconnectedness of clusters suggesting an integrated approach to local, national, and global sustainability strategies.

6. Limitations

It is important to recognize the study's limitations. The context-specific nature of the study, focusing on Hungarian stakeholders, may limit the generalizability of the findings. Further research is needed to explore the sustainability values and priorities of different stakeholder groups and in diverse geographical contexts to enhance the universality of the findings. The study relies on self-reported data, which might be subject to bias. The possibility of social desirability bias or role-congruent responses cannot be ignored. Respondents might have reported what they believe to be the 'correct' sustainability priorities, rather than

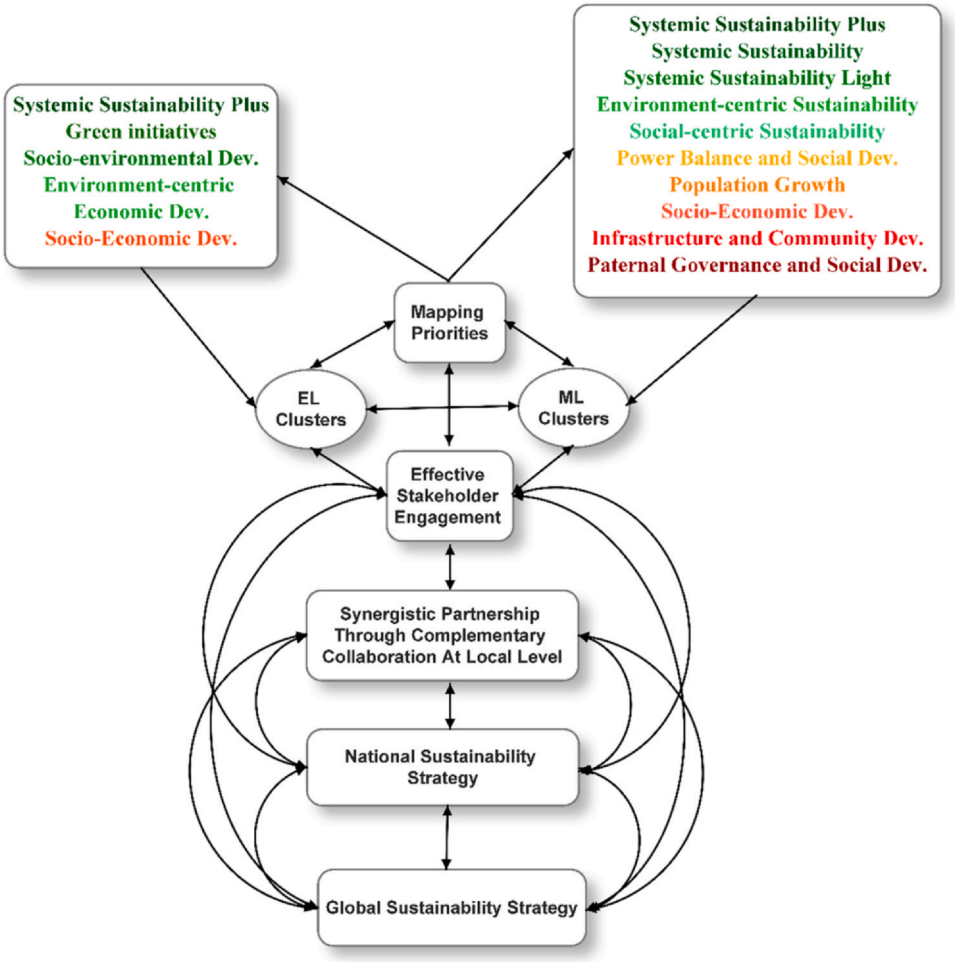

Fig. 5. Model for fostering systemic change through stakeholder segmentation.

their true priorities. Finally, the study does not delve into the underlying motivations or reasons for the identified values and priorities. A deeper understanding of why certain priorities are emphasized over others, and how these priorities are influenced by factors such as personal beliefs, professional roles, or contextual factors, remains an area for future exploration.

7. Conclusion

This qualitative study aimed to fill a research gap by mapping what municipality and educational leaders consider important for the sustainability of their settlement, their country and global civilization and based on the obtained information segmenting them into meaningful clusters. Our findings underscore how their distinct sustainability values and priorities reflective of their unique roles and responsibilities, offer practical insights for translating sustainability theories into effective practice.

The direct influence and actionable knowledge of these stakeholders at the local level offer a robust foundation for developing and implementing sustainability initiatives that resonate within communities. This grassroots perspective is not merely an academic exercise but a vital contributor to systemic change, demonstrating how local actions, when thoughtfully executed, can align with broader Sustainable Development Goals.

While their insights on national and global sustainability are not immediately actionable, they provide an indirect yet valuable lens through which broader sustainability strategies can be understood and shaped. This underscores the importance of integrating local perspectives into national and global sustainability dialogues. Such integration ensures that sustainability policies and practices are not only globally informed but also locally relevant and effective.

Regular clustering based on the evolving values and priorities of sustainability stakeholders facilitates the identification of emerging trends, potential areas of synergy, and gaps in current sustainability efforts. This process is instrumental in developing targeted, effective strategies that bridge the gap between local actions and broader national and global goals. By recognizing and accommodating the varying priorities at different territorial levels, we can contribute to the development of a comprehensive and integrated approach to sustainability, ensuring that each stakeholder's contribution is maximized for systemic impact.

References

Abson, Fischer, D.J., Leventon, J., et al., 2017. Leverage points for sustainability transformation. Ambio *46*, 30–39. https://doi.org/10.1007/s13280-016-0800-y

Alkaher, I., Gan, D., 2020. The role of school partnerships in promoting education for sustainability and social capital. J. Environ. Educ. *51* (6), 416–433.

Allen, C., Malekpour, S., Mintrom, M., 2023. Cross-scale, cross-level and multi-actor governance of transformations toward the Sustainable Development Goals: A review of common challenges and solutions. Sustain. Dev. 31, 1250–1267. https://doi.org/10.1002/sd.2495

Ansell, C., Sørensen, E., Torfing, J., 2022. The key role of local governance in achieving the SDGs. Co-Creation for Sustainability: The UN SDGs and the Power of Local Partnership. Emerald Publishing Limited,, pp. 9–22.

Bandari, R., Moallemi, E.A., Lester, R.E., et al., 2022. Prioritising Sustainable Development Goals, characterising interactions, and identifying solutions for local sustainability. Environ. Sci. Policy 127, 325–336. https://doi.org/10.1016/j.envsci.2021.09.016

Benzécri, J.P., 1973. Correspondence Analysis Handbook. Marcel Dekker,, NewYork.

Biermann, F., Kanie, N., Kim, R.E., 2017. Global governance by goal-setting: the novel approach of the UN Sustainable Development Goals. Curr. Opin. Environ. Sustain. 26, 26–31. https://doi.org/10.1016/j.cosust.2017.01.010

Blank, M.J., Jacobson, R., & Melaville, A. (2012). Achieving Results through Community School Partnerships: How District and Community Leaders Are Building Effective, Sustainable Relationships. *Center for American progress*.
Bock, T., 2011. Improving the display of correspondence analysis using moon plots. Int. J. Mark. Res. 53, 307–326. https://doi.org/10.2501/IJMR-53-3-307-3
Borsos, E., Patocskai, M., Boric, E., 2018. Teaching in nature? Naturally!. J. Biol. Educ. 52, 429–439. https://doi.org/10.1080/00219266.2017.1420679
Bowen, G.A., 2005. Local-level stakeholder collaboration: A substantive theory of community-driven development. Community Dev. *36* (2), 73–88.
Breuer, A., Janetschek, H., Malerba, D., 2019. Translating Sustainable Development Goal (SDG) Interdependencies into Policy Advice. Sustainability 11, 2092. https://doi.org/10.3390/su11072092
Bruyninckx, H., 2009. Environmental evaluation practices and the issue of scale. N. Dir. Eval. (122), 31–39. https://doi.org/10.1002/ev.293
Bryant, J., Thomson, G., 2021. Learning as a key leverage point for sustainability transformations: a case study of a local government in Perth, Western Australia. Sustain. Sci. 16, 795–807. https://doi.org/10.1007/s11625-020-00808-8
Bryson, J.M., 2004. What to do when stakeholders matter: stakeholder identification and analysis techniques. Public Manag. Rev. 6, 21–53. https://doi.org/10.1080/14719030410001675722
Castillo-Rivero, L., Elbakidze, M., McCann, P., Sijtsma, F.J., 2023. Depopulation and ecological degradation, two dimensions of marginalization, and peripheralization. Ecosystem integrity as an assessment factor in local revitalization. Reg. Sci. Policy Pract. https://doi.org/10.1111/rsp3.12706
Cebrián, G., Mogas, J., Palau, R., et al., 2022. Sustainability and the 2030 Agenda within schools: A study of school EL engagement and perceptions. Environ. Educ. Res. 28, 845–866. https://doi.org/10.1080/13504622.2022.2044017
Celliers, L., Rölfer, L., Rivers, N., et al., 2023. Stratification of stakeholders for participation in the governance of coastal social-ecological systems. Ambio 1–13. https://doi.org/10.1007/s13280-023-01844-1
Chandra, Y., Shang, L., 2019. Inductive Coding. Qualitative Research Using R: A Systematic Approach. Springer,, Singapore, pp. 91–106. https://doi.org/10.1007/978-981-13-3170-1_8
Chen, H.Y., Boore, J.R., 2010. Translation and back-translation in qualitative nursing research: methodological review. J. Clin. Nurs. 19, 234–239. https://doi.org/10.1111/j.1365-2702.2009.02896.x
Chen, J., Yin, X., Mei, L., 2018. Holistic Innovation: An Emerging Innovation Paradigm. Int. J. Innov. Stud. *2*, 1–13. https://doi.org/10.1016/j.ijis.2018.02.001
Chowdhury, M.M.H., Agarwal, R., Quaddus, M., 2019. Dynamic capabilities for meeting stakeholders' sustainability requirements in supply chain. J. Clean. Prod. 215, 34–45. https://doi.org/10.1016/j.jclepro.2018.12.222
Chrislip, D.D., Larson, C.E., 1994. Collaborative Leadership: How Citizens and Civic Leaders Can Make a Difference, 1st ed. Jossey-Bass,, San Francisco.
Clayton, T., Radcliffe, N., 2018. Sustainability: a systems approach. Routledge,, London.
Costa, P.S., Santos, N.C., Cunha, P., et al., 2013. The Use of Multiple Correspondence Analysis to Explore Associations between Categories of Qualitative Variables in Healthy Ageing. J. Aging Res., 302163. https://doi.org/10.1155/2013/302163
Dlabac, O., Zwicky, R., Carpenter, J., et al., 2022. Towards the 'just city'? Exploring the attitudes of European city ML. Urban Res. Pract. 15, 215–238. https://doi.org/10.1080/17535069.2020.1739323
Ernstson, H., Barthel, S., Andersson, E., Borgström, S.T., 2010. Scale-crossing brokers and network governance of urban ecosystem services: the case of Stockholm. Ecol. Soc. *15* (4).
Fainstein, S.S., 2014. The just city. Int. J. Urban Sci. 18, 1–18. https://doi.org/10.1080/12265934.2013.834643
Falleth, E.I., Hovik, S., 2009. Local government and nature conservation in Norway: decentralisation as a strategy in environmental policy. Local Environ. *14* (3), 221–231.
Fischer, D., Brettel, M., Mauer, R., 2020. The three dimensions of sustainability: A delicate balancing act for entrepreneurs made more complex by stakeholder expectations. J. Bus. Ethics 163, 87–106. https://doi.org/10.1007/s10551-018-4012-1
Giacomini, D., Simonetto, A., 2020. How ML perceive the influence of social media on the policy cycle. Public Organ. Rev. 20, 735–752. https://doi.org/10.1007/s11115-020-00466-5
Gonzalez-Porras, L., Heikkinen, A., Kujala, J., Tapaninaho, R., 2021. 14. Stakeholder engagement in sustainability transitions1. Res. Handb. Sustain. Agency 214.
Goodman, J., Korsunova, A., Halme, M., 2017. Our collaborative future: Activities and roles of stakeholders in sustainability-oriented innovation. Bus. Strategy Environ. *26* (6), 731–753.
Han, Y., He, T., Chang, R., Xue, R., 2020. Development trend and segmentation of the US green building market: corporate perspective on green contractors and design firms. J. Constr. Eng. Manag. 146, 05020014. https://doi.org/10.1061/(ASCE)CO.1943-7862.000192
Haus, M., Erling Klausen, J., 2011. Urban leadership and community involvement: Ingredients for good governance? Urban Aff. Rev. *47* (2), 256–279.
Jabareen, Y., 2008. A new conceptual framework for sustainable development. Environ., Dev. Sustain. 10, 179–192. https://doi.org/10.1007/s10668-006-9058-z
Jänicke, M., 2017. The multi-level system of global climate governance–the model and its current state. Environ. Policy Gov. *27* (2), 108–121.
Jones, S., Keane, A., St John, F., et al., 2019. Audience segmentation to improve targeting of conservation interventions for hunters. Conserv. Biol. 33, 895–905. https://doi.org/10.1111/cobi.13275
Kadji-Beltran, C., Zachariou, A., Stevenson, R.B., 2013. Leading sustainable schools: Exploring the role of primary school principals. Environ. Educ. Res. *19* (3), 303–323.
Krippendorff, K., 2004. Reliability in content analysis: Some common misconceptions and recommendations. Hum. Commun. Res. 30, 411–433. https://doi.org/10.1111/j.1468-2958.2004.tb00738.x
Koehn, D., 2021. Local insights, global ethics for business Vol. 111 Brill,.
Kumar, V., Rahman, Z., Kazmi, A.A., 2016. Stakeholder identification and classification: a sustainability marketing perspective. Manag. Res. Rev. 39, 35–61. https://doi.org/10.1108/MRR-09-2013-0224
Ladner, A., Keuffer, N., Baldersheim, H., 2016. Measuring local autonomy in 39 countries (1990–2014). Reg. Fed. Stud. 26, 321–357. https://doi.org/10.1080/13597566.2016.1214911
Lähteenoja, S., Schmidt-Thomé, K., Päivänen, J., Terämä, E., 2021. The Leadership and Implementation of Sustainable Development Goals in Finnish Municipalities. Sustainable Development Goals for Society Vol. 1: Selected topics of global relevance. Springer International Publishing,, Cham, pp. 203–217.
Lajimi, H.F., 2021. Sustainable Supplier Segmentation: A Practical Procedure. In: Rezaei, J. (Ed.), *Strategic Decision Making for Sustainable Management of Industrial Networks*. Greening of Industry Networks Studies. Springer, Cham, pp. 119–137. https://doi.org/10.1007/978-3-030-55385-27
Lasker, R.D., Weiss, E.S., 2003. Creating partnership synergy: the critical role of community stakeholders. J. Health Hum. Serv. Adm. 119–139.
Lengyel, A., Kovács, S., Müller, A., et al., 2019. Sustainability and subjective well-being: How students weigh dimensions. Sustainability 11, 6627. https://doi.org/10.3390/su11236627
Li, X., Ding, Y., 2020. Holistic governance for sustainable public services: Reshaping government–enterprise relationships in china's digital government context. Int. J. Environ. Res. Public Health *17* (5), 1778.
Macedo, P., Huertas, A., Bottone, C., del Río, J., Hillary, N., Brazzini, T., Penha-Lopes, G., 2020. Learnings from local collaborative transformations: Setting a basis for a sustainability framework. Sustainability *12* (3), 795.
Matsuura, M., Shiroyama, H., 2018. Stakeholder Perspective and Multilevel Governance. Biofuels Sustain.: Holist. Perspect. Policy-Mak. 17–24.
McLeod, L.J., Hine, D.W., 2019. Using audience segmentation to understand non-participation in invasive mammal management in Australia. Environ. Manag. 64, 213–229. https://doi.org/10.1007/s00267-019-01176-5
Mogren, A., Gericke, N., 2019. School leaders' experiences of implementing education for sustainable development—Anchoring the transformative perspective. Sustainability 11, 3343. https://doi.org/10.3390/su11123343
Moodie, J.R., Salenius, V., Kull, M., 2022. From impact assessments towards proactive citizen engagement in EU cohesion policy. Reg. Sci. Policy Pract. *14* (5), 1113–1132. https://doi.org/10.1111/rsp3.12473
Müller, U., Lude, A., Hancock, D.R., 2020. Leading schools towards sustainability. Fields of action and management strategies for EL. Sustainability 12, 3031. https://doi.org/10.3390/su12073031
Naik, G.R. (Ed.), 2016. Non-negative Matrix Factorization Techniques. Springer,, Heidelberg.
Oates, L., 2021. Sustainability transitions in the Global South: a multi-level perspective on urban service delivery. Reg. Stud., Reg. Sci. 8, 426–433. https://doi.org/10.1080/21681376.2021.1995478
Okitasari, M., Katramiz, T., 2022. The national development plans after the SDGs: Steering implications of the global goals towards national development planning. Earth Syst. Gov. *12*, 100136.
Óvári, Á., Kovács, A.D., Farkas, J.Z., 2023. Assessment of local climate strategies in Hungarian cities. Urban Clim. *49*, 101465.
Pedersen, M.J., Favero, N., Nielsen, V.L., et al., 2019. Public management on the ground: Clustering managers based on their behavior. Int. Public Manag. J. 22, 254–294. https://doi.org/10.1080/10967494.2017.1396273
Pomeroy, R., Douvere, F., 2008. The engagement of stakeholders in the marine territorial planning process. Mar. Policy 32, 816–822. https://doi.org/10.1016/j.marpol.2008.03.017
Poortinga, W., Darnton, A., 2016. Segmenting for sustainability: The development of a sustainability segmentation model from a Welsh sample. J. Environ. Psychol. 45, 221–232. https://doi.org/10.1016/j.jenvp.2016.01.009
Pyhälä, A., Fernández-Llamazares, Á., Lehvävirta, H., Byg, A., Ruiz-Mallén, I., Salpeteur, M., Thornton, T.F., 2016. Global environmental change: local perceptions, understandings, and explanations. Ecol. Soc.: a J. Integr. Sci. Resil. Sustain. *21* (3).
Radinger-Peer, V., 2019. What influences universities' regional engagement? A multi-stakeholder perspective applying a Q-methodological approach. Reg. Stud., Reg. Sci. *6*, 170–185. https://doi.org/10.1080/21681376.2019.1578258
Rinne, R., Järvinen, T., Tikkanen, J., et al., 2016. Changes in education policies and the status of schools in Europe: the views of school EL from eight European countries. Comp.: A J. Comp. Int. Educ. 46, 764–788. https://doi.org/10.1080/03057925.2015.1086631
Rivas, S., Urraca, R., Palermo, V., et al., 2022. Covenant of ML 2020: Drivers and barriers for monitoring climate action plans. J. Clean. Prod. 332, 130029. https://doi.org/10.1016/j.jclepro.2021.130029
Sargisson, R.J., Schöner, B.V., 2020. Hyperbolic discounting with environmental outcomes across time, space, and probability. Psychol. Rec. 70, 515–527. https://doi.org/10.1007/s40732-019-00368-z
Scoones, I., Stirling, A., Abrol, D., Atela, J., Charli-Joseph, L., Eakin, H., Yang, L., 2020. Transformations to sustainability: combining structural, systemic and enabling approaches. Curr. Opin. Environ. Sustain. *42*, 65–75.
Smith, A., Stirling, A., 2018. Innovation, sustainability and democracy: An analysis of grassroots contributions. J. Self-Gov. Manag. Econ. *6* (1), 64–97.
Szikra, D., 2014. Democracy and welfare in hard times: The social policy of the Orbán Government in Hungary between 2010 and 2014. J. Eur. Soc. Policy 24, 486–500. https://doi.org/10.1177/0958928714545
Tapaninaho, R., Kujala, J., 2019. Reviewing the Stakeholder Value Creation Literature: Towards a Sustainability Approach. In: Leal Filho, W. (Ed.), *Social Responsibility and Sustainability*. World Sustainability Series. Springer,, Cham, pp. 3–36. https://doi.org/10.1007/978-3-030-03562-4_1

Thomas, D.R., 2006. A general inductive approach for analyzing qualitative evaluation data. Am. J. Eval. 27, 237–246. https://doi.org/10.1177/1098214005283748

Troisi, R., Alfano, G., 2022. The re-election of corrupt ML: Context, relational leadership and level of corruption. Local Gov. Stud. 1–22. https://doi.org/10.1080/03003930.2022.2087060

Vázquez-Barquero, A., Rodríguez-Cohard, J.C., 2019. Local development in a global world: Challenges and opportunities. Reg. Sci. Policy Pract. *11* (6), 885–897. https://doi.org/10.1111/rsp3.12164

Videira, N., Lopes, R., Antunes, P., Santos, R., Casanova, J.L., 2012. Mapping maritime sustainability issues with stakeholder groups. Syst. Res. Behav. Sci. *29* (6), 596–619.

Wiek, A., Ness, B., Schweizer-Ries, P., et al., 2012. From complex systems analysis to transformational change: a comparative appraisal of sustainability science projects. Sustain. Sci. 7, 5–24. https://doi.org/10.1007/s11625-011-0148-y

Woltering, L., Fehlenberg, K., Gerard, B., Ubels, J., Cooley, L., 2019. Scaling–from "reaching many" to sustainable systems change at scale: a critical shift in mindset. Agric. Syst. *176*, 102652.

Xu W., Liu X., Gong Y. (2003, July) Document clustering based on non-negative matrix factorization. In: Proceedings of the 26th annual international ACM SIGIR conference on Research and development in informaion retrieval. 267-273. https://doi.org/10.1145/860435.860485.

Zimmermann, J.P., Evans, M., Griggs, J., et al., 2012. Household Electricity Survey: A study of domestic electrical product usage. Intertek Testing & Certification Ltd,, Cleeve, pp. 213–214.