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Participatory stakeholder approaches to and systemic thinking in agricultural production and resource use in Central Asia

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ABSTRACT

Rural development across the Central Asian states (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan) is predominantly shaped by top-down decision-making in which powerful state bodies take centre stage. While their directives in agriculture and livestock production are informed by upgrade-inspired growth thinking, the social-environmental complexities inherent to agro-ecosystems receive less attention. The present special issue of the Central Asian Journal of Sustainability and Climate Research (CAJSCR), based on the stakeholder workshop organized by Germany's Eberswalde University for Sustainable Development (HNEE) and held at the German-Kazakh University (DKU) in Almaty in the fall 2024, explores different approaches to participatory stakeholder involvement in sustainable rural development. The compilation canvasses the corresponding methodologies, including their strengths and weaknesses, novel to the Central Asian Region (CAR).The articles of the special issue argue that the participatory engagement of smallholder farmers, students, pastoralists, and ordinary citizens in systemic thinking and participatory mapping processes augments their agency in decision-making and opens up fresh and so far untapped prospects for local development in the CAR, which provides a new angle of engagement not only for local-level state executive entities, but likewise for CSOs, international cooperation and applied research actors.

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1. Introduction

Since the end of the Soviet Union and five states (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan) gaining independence more than three decades ago, Central Asia (CA) – a region rich in land and other natural resources – has faced numerous socio-economic and social-ecological challenges. With the Central Asian economies above still heavily reliant on oil, gas, and coal, the evolvement of a more sustainable renewable as well as a bio-based economy building on the region's agrarian and other natural resources in the face of pressing climate change issues is still at its outset. Top-down oriented authoritarian rule of varying degree still dominates governance and decision-making across Central Asia, leaving narrow manoeuvre margin for grassroots involvement in decision-making processes on behalf of local stakeholders, especially, but not exclusively, in rural settings away from the national capitals.

This CAJSCR's special issue stems from the workshop held in Almaty, Kazakhstan, in the fall of 2024 by the team of subject-matter experts from the TRANSECT [1] research group of HNEE (Eberswalde University for Sustainabel Development) in collaboration with the Centre for Natural Resources and Sustainability of the German-Kazakh University [ger. Deutsch-Kasachische Universität, DKU] and funded by Germany's Federal Ministry of Education and Research (BMBF). The event brought together practitioners from civil society organizations (CSOs), international development agencies and state administrative bodies, as well as researchers exploring participatory approaches of stakeholder involvement and knowledge co-production in rural development, conservation, natural resource use, and food security. Hence, on the one hand, the workshop served as an effective platform for forging dialogue among various actors on the contexts and formats of applying participatory methods in sustainable development and planning processes locally; and highlighted the outcomes and lessons learnt of deploying such approaches, on the other hand. The event and the contributions to this CAJSCR's Special Issue investigate the following questions:

- How and in what fields of research and decision-making can participatory methodologies be considered meaning- and helpful tools for good governance and societal improvements in Central Asia?
- What are the (practical) strengths and weaknesses of such approaches, and how can the latter be minimised?
- What can be done in policy-making and rural development to enable broader participation in sustainable development planning in CA?

1 TRANSECT, Agrarian Transformations and Social Ecological Complexities. Local Bioeconomy Scenarios in Central and South Asia (2019-2025). The research taskforce and the workshop resulting in this compilation were funded by Germany's Federal Ministry of Education and Research under Grant 031B0753.

The present collection of articles provides an overview of cases from across Central Asia, in which stakeholders and citizenry engaged in knowledge co-generation and more concrete planning and governance processes at the local or oblast (meso-) levels. Depicting the context, in which participatory methodologies were applied, the papers of the special issue furnish insights into the added value of participatory models at the grassroots level amidst top-down authoritarian regimes.

Firstly, the articles illustrate how participatory approaches can render a voice to politically underrepresented people like farmers, pastoralists, rural or urban dwellers in the CAR otherwise deprived of engagement in any decision-making setups. Secondly, the cases from Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan demonstrate application and transfer opportunities for the discussed methods to be applied in other socio-spatial contexts with natural resources under pressure and sustainability matters at stake. The lessons learnt underscore both the achievements and the shortcomings (weaknesses) that need to be addressed to ensure a more impactful application of participatory approaches in sustainable development planning in CA. Hence, this CAJSCR special issue may inspire policy-makers and representatives of CSOs, international development agencies and the academia leverage the apparatus to involve broader public in decision-making and participation processes more proactively and in a just way, and thus foster a higher degree of social-ecological sustainability.

2. Theoretical and methodological remarks

As universally framed in the plethora of national and international policy documents, the shift to sustainable development inter alia entails extensified land use patterns, on the one hand, and a significant increase in biomass (and food) production to abandon the carbon-dominated economic cycle and deal with the global hunger crisis, on the other hand. The lion's share of global biomass and food production boost in the coming years would need to come from the agrarian sector, where much of the global population still resides, and where productivity growth through technological upgrading appears to be the pathway of choice (Spies et al., 2022). To ensure its sustainability, this productivity upturn should be decoupled from negative environmental impacts (ibid.). Higher efficiency, smart farming solutions and other innovative (bio-) technologies like drip irrigation are proposed to minimise inputs, boost yields, and make production more resilient to mounting environmental stresses due to changing climate (e.g., OECD, 2018; EC, 2018; BMBF and BMEL, 2020).

In its current form, global agricultural, fish, and livestock production already exceeds several planetary limits (Spies et al., 2022). The premise behind decoupling production growth from excessive natural resource use has been criticised as unrealistic and wishful thinking, as well as virtually impossible from a biophysical

point of view (Giampietro, 2019; Backhouse et al., 2021). In this sense, sustainable development policies are shaped by what Backhouse (2021, 26) describes as strong 'technology optimism' framed by a rather linear view of biomass and food production, primarily relying on technical solutions and neglecting ecological limits and the complex social-ecological realities of rural production systems (also in Alff & Spies, 2020).

A key critique of sustainable development strategies in land and water management worldwide is their poor attention to the fact that the vast majority of rural populations are smallholder or landless farmers, pastoralists, and artisanal fishers. Similarly, agrarian – and rural development – policies in landlocked Central Asia tend to favour large producers or at least agricultural cooperatives (e.g. Alff et al., 2023). For small farmers and other stakeholders in resource management, many – if not most – of the 'high-tech and smart' solutions currently dominating the debate are not an option due to limited access to financial resources (Spies et al., 2022). Another frequently raised criticism is the lack of involvement of societal stakeholders in sustainable rural development and decision-making (Dieken et al., 2021; Lehmann, 2021; Pissarskoi et al., 2021). In particular, the perspectives, (locally adapted) knowledge and concerns of the majority of smallholder farmers and other stakeholders as well as ordinary citizens often remain neglected in designing and formulating visionary strategies, including by the authoritarian governments of CA transition economies. This, in turn, poses the risk of further marginalising them away by mainstream agricultural policy-making. The inequalities of 'extractive knowledge production', as Backhouse (2021, 33) puts it, not only reproduce or amplify existing social inequalities, but should be also regarded as a missed opportunity. As discussed in a rich body of literature on local and indigenous knowledge, development practice can gain a lot from diverse experiences of local stakeholders and their resource use practices adapted to local contexts (e.g., Berkes et al., 2000; Jiao et al., 2012). Willard and Ismailov (in this issue) share another fascinating example of high-school students in water and resource management, and what one can learn from their everyday experiences. Thus, bottom-up perspectives and acknowledging local land users as experts – alongside technical experts and scientists, whose knowledge is usually considered superior inside the sustainable development discourse – are desperately needed for expanding the debate's scope and deriving alternative visions and trajectories for land and water use development. Some of these pathways may be less productivity-oriented, yet socially and ecologically more sustainable than those put forward and favoured by the dominant modernisation paradigm (Spies et al., 2022). For instance, in many regions of the world, smallholder farmers, pastoralists, etc. have developed heterogeneous agricultural landscapes rich in agrobiodiversity and capable of adapting to environmental threats (e.g., Padoch and Sunderland,

2013; Spies, 2019), with Zhumashev & Mestre's case study of pasture management in rural Kyrgyzstan in this CAJSCR issue being a good case in point.

Whereas much criticism has arisen around the pitfalls in current sustainable rural development discourses, policies and strategies, there is still a lack of concrete, practice-oriented suggestions on what can be done to address them (Spies et al., 2022), which is especially true for Central Asia.

The critical research has moved from quasi-rejecting the concept (Gottwald & Krätzer, 2014; Marsden & Farioli, 2015) to calling for a more constructive engagement with the field by outlining alternative futures and opening up the policy debate to society (Pissarskoi et al., 2021; Backhouse et al., 2021; Dieken et al., 2021). In addition, while top-down rural development policies are to remain dominant, there is a call from rural stakeholders to not only lobby for far-going and systemic shifts at the policy level, but also to mastermind meaningful and locally adapted tools and approaches for co-designing, evaluating and implementing tangible strategies on the ground (Spies et al., 2022). The latter is particularly relevant, since, in this novel debate, much more attention has been given to broadly defined policies than to the actual implementation of locally tailored strategies. This is especially true in the authoritarian context of CA, where decision-making is framed from the national to the local level almost exclusively by state actors – little scope remains for smallholder farmers, pastoralists and other actors to shape their socio-economic futures and elaborate instruments allowing them advance their views.

In this collection of articles, the interdisciplinary authors present and reflect upon the application of systemic participatory methods for elaborating, critically evaluating and implementing locally adapted rural development strategies in CA. The case studies intentionally look behind and go beyond strictly technology- or productivity-oriented efforts. By 'systemic' we mean that social-ecological systems characterising rural areas need to be regarded as complex (adaptive) systems, the dynamics of which are always driven by indeterminacy and non-linear feedbacks (Spies et al., 2022). In our view, these require a holistic understanding of the manifold factors and actors shaping developments on the ground (Spies & Alff, 2020). While primarily designed for local contexts, the approaches showcased in this special issue of the CAJSCR likewise enable structuring and 'formalising' local or citizens' knowledge to elevate it to an equal footing with the so-called 'expert knowledge', in order to better inform broader rural development policies.

3. Approaches to stakeholder participation in rural development in Central Asia – a discussion

Rural production systems in CA are embedded in complex social-ecological contexts that require thorough apprehension prior to implementing policy strategies

potentially bringing along unintended negative side effects. As the large body of critical agrarian and other resource-oriented research demonstrates (e.g. Martínez-Fernández et al., 2023; Garimella & Prakash, 2023), this has been a shortcoming of multiple policies. For instance, the upsurge in soybean use, e.g., in Southeastern Kazakhstan, not only for human consumption, industrial food processing and animal feed, but also for biodiesel and other bio-based manufacturing, domestically and abroad, has forged inequalities and dependencies. What this and other examples of narrowly growth-oriented policy interventions share is not only their lack of systemic embracing of social-ecological circumstances, but also their marginalisation of certain stakeholder groups, who did not have a say in policy elaboration in the first place (Spies et al., 2022).

Thus, in this special issue, we argue that sustainable development strategies and their implementation in water and land use across the CAR require innovation in two paradigmatic ways. First, and as mentioned above, it is necessary to mainstream systemic approaches to local and regional development policy, which rigorously assess the potential social-ecological implications of interventions. Second, and interconnected with the first point, it is essential to design land and water use strategies not only in consultation with professional 'expert bodies' (e.g., research institutes, agriculture ministries, etc.) but also found them in knowledge co-production approaches that include the experiences of local producers and other stakeholders. Participatory approaches, we argue, proffer a range of instruments to make rural development strategies potentially more open, democratic, and just (ibid.). They also enhance public acceptability of related innovations promoting ecological regeneration, ensure long-term sustainability and, at minimum, reduce the risk of negative consequences of previous policy interventions. Last but not least, they provide a voice and agency to otherwise power-deprived groups like smallholder farmers, (agro-) pastoralists, etc.

Based on a recent systematic literature review on stakeholder perceptions, Dieken et al. (2021, 1713) concluded a 'concerning lack of public involvement' in sustainable rural development debates. The global literature on knowledge co-generation and participatory tools for scenario-building and strategy development is abundant, yet its reflection in rural development debate and research is limited (e.g., Roue & Nakashima, 2018; Díaz-Reviriego et al., 2019; Sterling et al., 2019; Pimbert & Barry, 2021) – particularly relevant in the CA context. The field of agroecology is noteworthy in this regard, on the one hand, due to its emphasis on action-oriented research and, on the other hand, because of its holistic – i.e. systemic – perception of farming systems accommodating social, ecological and technical dimensions as inextricably linked (e.g., Bergez et al., 2019; Anderson et al., 2021).

Practical guidance can be also drawn from a set of methods originally rooted in the natural sciences focusing on biodiversity conservation and ecosystem management. The widely used and continuously developing Conservation Measures Partnership's Open Standards for the Practice of Conservation (Open Standards: Conservation Measures Partnership, 2013) manifests an evidence-based research toolbox to propose design, implementation and learning from ecosystem-based adaptation interventions (Spies et al., 2022). Building on the Conservation Standards, another application has redeveloped the assessment of conservation planning, namely the Adaptive MAnagement of vulnerability and RISk at COnservation sites (MARISCO) contrived by the Centre for Econics and Ecosystem Management at Eberswalde University for Sustainable Development (Ibisch & Hobson, 2014). Underlying the contribution of Alff and his colleagues to this special issue, MARISCO views social and ecological services as equally contributing to well-being. Furthermore, by analysing and judging the systemic links leading to certain risks in local settings, the methodology developed by Alff and his colleagues emphasises a broader analysis of local social and ecological complexities, system dynamics and change. This MARISCO-based toolbox – entitled Participatory Strategy Development for Sustainable Biomass Production (PARSCO) (Spies et al., 2025) – thus facilitates formulating locally adapted strategies to make farming systems less risk-afflicted and more sustainable, as well as systematically and critically assessing the local impacts of existing or planned intervention strategies that may have significantly differing perspectives in mind.

4. Conclusion and Special Issue overview

As outlined above, there is an urgent need for systemic approaches that assess the social-ecological implications of natural resources-related interventions not only in CA, but at the global level more generally, in order to grasp the complexities of environmental transformations under accelerating climate change conditions. Through the engagement of the authors to this compilation in sustainable rural development research across CA, we have also established a demand for participatory approaches to sustainable development strategy formulation, in order to incorporate local perspectives, especially the viewpoints of those often sidelined from corresponding processes. This is especially important, we argue, under the conditions of authoritarian rule heavily dominated by state actors often down to the local level of governance. The current CAJSCR's special issue overviews the approaches applied and tested by various researchers and organisations across the region with the aim of connecting rural and urban stakeholders, including smallholder farmers, high-school students and pastoralists, in local-level participatory processes.

In their contribution, Robert Willard & Muzaffar Ismailov focus on Group Model Building (GMB) as a participatory method that empowers communities to develop a

shared understanding of the structures and linkages influencing systemic behavior. The authors assess GMB's viability in a resource-constrained situation, utilise GMB to define environmental degradation from the youth's perspective and understand barriers to effective resource mobilisation through "systems-thinking" based on the example of Janbasqala Village, Karakalpakstan, Uzbekistan – a settlement in the Amudarya River Basin facing rapid deterioration of water access. Through the involvement of students in workshop formats, they produced a local mapping of the Aral Basin's Social-Ecological System (SES). Similarly to Alff et al.'s MARISCO methodology, the SES framework applied by Willard and Ismailov highlights community-based interventions for tackling complex environmental challenges, as well as underscores the importance of engaging local communities in designing and implementing strategies that affect their well-being.

Irene Mestre, in her article, draws attention to community-based pasture management in the aftermath of the Law On Pastures adopted in Kyrgyzstan in 2009. Creating a community-based pasture management and governance system, the law introduced a divorce from the previous management style, arguing that it would contribute to limiting pasture degradation. In practice, the newly established pasture committees gathered livestock owners under the lead of an elected representative responsible for creating pasture management plans, collecting livestock tax, and external donor funding mobilisation. This decentralised management and governance model was assumed to drive fair and just decision-making in sustainable nature resource management. Yet, as Mestre outlines, the reformed pasture governance has not only referred to local-level planning, inter alia pointing to the impact of livestock mobility on resource depletion and emergence of coordination issues between pasture committees vis-à-vis state forest enterprises. The implementation of this decentralised management model, Mestre argues similarly to Alff et al., has become a multifarious process with systemic dimensions, competing historically embedded environmental approaches, and inherent power relations shaping policies and their consequences at the local level.

Thematically connected to Mestre's piece, in their joint paper Henryk Alff and the TRANSECT team offer a glimpse into a participatory systemic mapping and strategy-building tool based on the case study in Tajikistan's major cotton-growing area. The proposed Adaptive MAnagement of vulnerability and RISk at COnservation sites (MARISCO) offers a methodologically sound way to map the knowledge of various local stakeholders by contemplating and discussing a comprehensive model of ecological and social factors relevant to a specific local context. This is typically achieved by engaging a variety of stakeholders in a workshop-like format. By inditing an integrated knowledge map, Alff et al. emphasise, participants can trace the complex interconnections among human well-being targets, social and

environmental services, as well as respective provisioning systems, and – in the long run – identify the key attributes, threats, and factors relating to these systems. Alff and his colleagues argue that the methodology renders tools to plot out the effects of existing and future interventions by depicting the local context (Ibisch & Hobson, 2014; Blumroeder et al., 2018), and aims to co-create environmentally and socially adjusted future management strategies. The authors demonstrate that both social and ecological systems are defined by their emergent properties, yet they are likewise closely interrelated and subject to dynamic non-linear metamorphosis that always involves a multitude of social, ecological and political factors, as well as feedback loops. Thus, Alff et al. suggest that management strategies can only be sustainable if they take these principles seriously, which makes a holistic analysis indispensable.

In the his single-authored contribution rather to the CAJSCR special issue, Henryk Alff lays out his observations as a co-facilitator of a methodologically related approach – Resilience Framework – based on the case of Western Kazakhstan. This workshop-based format, similar to MARISCO, was applied by a consortium of partners from the UK, Kazakhstan, Germany, and Mongolia to map land use and conservation issues in this part of Central Asia. The two workshops held in Uralsk, Kazakhstan, in the spring of 2025 focused particularly on the conflict between pasture users, i.e. the majority of the region's rural population, and the conservation interests around the migrating saiga antelope populations recently soaring up to 2.8 million and blamed for overgrazing. By engaging the stakeholders (representatives of farmers' associations, livestock holders, rural administrations, and conservation agencies), the approach sought to gain a systemic understanding of the local social-ecological context and to carve out sustainable development scenarios, including strategies to be pursued to stimulate them. In his essay, Alff examines certain key findings of the workshop cycle and pinpoints several epistemological issues regarding knowledge generation processes per se that might be worth of additional analysis.

Similarly to Alff for Western Kazakhstan, Murat Zhumashev & Irene Mestre in their essay investigate biodiversity conservation efforts in the Kyrgyz Republic. The authors focus on the Baiboosun Micro-Reserve, a community-driven initiative integrating pasture management and conservation. Zhumashev and Mestre – like Alff in his article focusing on land management and saiga conservation – draw on the challenges of balancing biodiversity protection with local livelihoods, particularly in the context of land use shifts posing threat to wildlife species. The study describes the establishment of a 14,000-hectare protected area and its community-based management plan, which emphasises anti-poaching measures, sustainable pasture management, and community engagement. The authors suggest that the prospects for scaling-up the initiative include developing legal frameworks, elaborating economic models to ensure financial sustainability, and valuing ecosystem services.

This model underscores the potency of community-led conservation for fostering multifunctional management strategies.

Last but not least, in a short communication Sergey Gulyayev – founder and head of Decenta Foundation in Northern Kazakhstan's city of Pavlodar – contemplates the outcomes of his decades-long work in stakeholder involvement. Gulyayev emphasises that so far participatory stakeholder approaches and citizen engagement in self-governance in Central Asia have been applied randomly. Based on the experience of Decenta Foundation, Gulyayev reflects upon participatory decision-making involving ordinary citizens ranging from participatory public budgeting to urban planning at the local level from numerous projects. In his brief essay, the author offers his insights on how participatory methodology at the local and oblast levels can improve decision-making in otherwise authoritarian states, hoping that they may encourage other constituencies, rural districts and municipalities in Kazakhstan, to invite similar initiatives.

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