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Equipping street-level bureaucrats with green skills for sustainable public policy change



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The shift to a low-carbon economy requires developing green skills across sectors. This paper builds on a recent Perspective¹ article examining how institutional regimes shape green skill formation. Drawing on the microfoundations of management research, we propose a micro-level perspective of public sector green skill formation, thereby emphasizing the role of street-level bureaucrats serving as public servants who directly engage with citizens in implementing public policies and outline a research agenda.

There is broad political, practical, and academic agreement that the global transition to a low-carbon economy requires more than technological innovation and a coherent policy framework: it also demands a workforce equipped with appropriate skills¹ to accelerate the adoption of low-carbon technologies, services and business models but particularly to ensure that climate action is embedded across diverse institutional, economic, and social contexts. However, it remains unclear what such a meaningful skill set exactly comprises. In a recent position paper, the German Federal Ministries of Economic Affairs & Energy and Research, Technology & Space based on expert interviews elicitation highlight three core dimensions of green skills: (1) “The What”—knowledge of causes and effects of emissions and life-cycle assessments (“green knowledge”), (2) “The How”—the ability to identify and implement potential improvements, and to apply outside-the-box network thinking (“transferability competencies”) and (3) “The Why”—Personal values, attitudes and mindset (“sustainability mindset”).^{2,3}

However, the future of green skill development is at risk. On the one hand, governments across the world have started to promote green skill development. As a prominent example, in 2020 the European Commission launched the “Pact for Skills” to support the reskilling and upskilling of more than 25 million working-age individuals in the EU by 2030⁴. Importantly, this initiative assigns a key role not only to firms and employees, but also explicitly targets national, regional, and local authorities as well as social and educational institutions. These public authorities and institutions, in turn, are crucial for designing and implementing sustainable public transformation policies, which have been shown to vary substantially in their effectiveness. On the other hand, the current geopolitical instability—stemming, for example, from shifting priorities within the U.S. government as well as ongoing wars and regional conflicts—could lead to a rollback in public funding for green skills. A prominent example is the recent revocation by the U.S. Environmental Protection Agency (EPA) of the “endangerment finding”, meaning that the agency will no longer treat

greenhouse gas emissions as a threat to public health and welfare⁵. Consequently, in early 2026, the U.S. House passed a bill reducing the EPA’s budget by 4%, bringing funding back to 2012 levels⁶.

With this Perspective article, we aim to advance and connect debates on green skills in the global green transition and on effective sustainable public transformation policies. This consolidation is important for several reasons. First, in the light of expected cuts in public funding, questions regarding the efficacy and efficiency of public programs promoting green skills are likely to become more pressing, not least to secure political and public support. Second, current forecasts point to a substantial shortage of labor supply in the public sector in the coming years. For Germany, for example, recent studies estimate a shortfall of around 500,000 employees in the public sector, including services, education, and infrastructure⁷. Third, research in human resource management on AI competencies highlights the importance of non-business actors as strategic substitutes for skill development to reach societal groups that have so far been inadequately addressed by conventional skill development approaches⁸. Fourth, and arguably most importantly, relevant insights from the private sector⁹ are only partially transferable to the context of public management¹⁰.

As the theoretical foundation for our arguments, we draw on the microfoundations literature in management research^{11,12} and on the concept of street-level bureaucrats. In contrast to an established line of research on public servants focusing particularly on central government bureaucrats¹³, we explicitly target frontline agents who interact directly with citizens in their daily work and implement policy programs and directives¹⁴. Microfoundations underscore the significance of individual actors’ agency within organizational contexts¹⁵. In line with this micro-level perspective—which complements the institutional perspective being advanced in a recent contribution¹ to this journal—we argue that organizational behavior and outcomes are shaped to a considerable extent by individual actors, and that

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variation in actors' skills can therefore help explain differences in organizational-level outcomes.

Applied to our setting of sustainable public transformation policies, we argue that the green skills of relevant street-level bureaucrats are pivotal for the successful design and implementation of green policy programs. Yet, little is known about the specific skills required to effectively facilitate green policy programs and about the magnitude of the street-level bureaucrats' green skills effect. While our micro-level perspective shares some similarities with the idea of "actor-centered power"—a concept used to examine decentralized, community-based forest governance—we are, in the present context, less concerned with social relationships and power elements building up on coercion, (dis-)incentives and dominant information that alters a person's behavior without recognizing her will¹⁶, or other hidden self-interests securing own economic advantages^{17,18}. Instead, the core aim of our Perspective article is to encourage a more precise conceptualization that enables the operationalization of measuring and comparing green skills among street-level bureaucrats and other relevant actors.

We therefore take stock of existing research on the green skills of street-level bureaucrats and provide conceptual guidance for future work on how green skills at the frontline can shape the implementation of sustainable transformation in public policy.

From microfoundations to street-level bureaucrats and their skills

Microfoundations within organizations have recently received increasing interest in economics and business research. The primary focus of this research is to decompose the collective-level view into its underlying micro-level agents and their respective dynamics. By doing so, it seeks to better understand how individuals and their mutual interactions shape higher-level outcomes at the team, organizational, or institutional level, or—analogously—how relationships at the collective level are underpinned by micro-level (inter-)actions^{19,20}.

Many research domains concerned with policies aimed at transforming organizational regimes and achieving grand-level outcomes still lack a comprehensive understanding of the relevant micro actors involved in these processes¹¹. Environmental sustainability constitutes such a case, because it has traditionally centered its analysis at the collective level. From an economic point of view, this is unsurprising, as many environmental problems exhibit key characteristics of public goods: strong free-riding incentives prevent individual-level action from meeting the collectively optimal provision level of a public good. Consequently, an appropriate institutional design seems appropriate to counteract these free-riding incentives and promote sustainable solutions. However, as formal institutions are not always able to enforce the desired outcomes, informal institutions such as social norms—a predominant micro-driven behavioral pattern within a group—have gained importance²¹. At the same time, this has created space for third-sector "climate intermediaries", which act as "go-betweens" connecting different actors and forms of governance²². While much of the existing empirical research has focused on the adoption of climate policies, future work is likely to pay greater attention to how such policies develop and mature over time, thereby reinforcing the role of intermediaries²³. In line with this argument, scholars contend that the individual-level perspective remains insufficiently examined²⁴ and strongly advocate bringing individuals¹⁹ and their values back into the academic debate²⁵. At the same time, they stress the need for more rigorous empirical analyses since the importance of micro-level agents is ultimately an empirical question²⁰.

The transformation towards a low-carbon economy is one area in which public management frequently engages through green policy interventions to incentivize environmentally friendly behavior of individuals and firms. In contrast to the private sector, the public sector is less flexible in allocating, exchanging, and incentivizing existing workers across new programs. Also, unlike in the private sector, principals in public management—and particularly those involved in the implementation of public policy programs—face constraints in offering sizeable monetary incentives or performance-based payments to their frontline agents. This inflexibility

puts an even stronger emphasis on training and engaging workers in the public management sector, because their skills and motivations are highly relevant for the successful implementation of green policy programs.

The importance of the human factor for the implementation of public policy is well reflected in the concept of street-level bureaucrats as prominently shaped by Michael Lipsky¹⁴. It refers to public servants such as administrative staff in government agencies who as frontline agents interact directly with citizens in their daily work and implement political programs and directives. Concerning the implementation of public policy programs, a wide range of demands arises for administrative staff at the caseworker level. Meeting these expectations significantly influences whether and how political support programs are received by society—that is, whether they are recognized and utilized by citizens, businesses, and other institutions¹⁴. As a key prerequisite for successful implementation, (sustainability) competence includes not only subject-specific knowledge in the field of sustainability but also strong communication skills²⁶. These are essential for developing a communication and information strategy that specifically targets implementation-relevant stakeholders and potential funding recipients—such as companies, associations, research institutions, or private individuals.

In the course of their duties, street-level bureaucrats possess discretionary powers and decision-making authority, which they must actively exercise to manage the complex realities of their work environments. These environments are often characterized by multifaceted and heterogeneous tasks, limited time and financial resources, conflicting expectations, and guidelines that allow for interpretation¹⁴. Through their work, they occupy a unique position of power, derived from their role as intermediaries at the interface between bureaucracy and society—that is, in direct interaction with their clients²⁷.

While the potential of street-level bureaucrats for the successful implementation of green policy programs is widely acknowledged, little is known about the specific skills that enable them to fulfill this role. In the following section, we begin by taking stock of current knowledge on the green skills of these public agents and we further explore the three important clustered dimensions introduced above: expert knowledge ("green knowledge"), process and transfer capabilities ("transferability competencies"), and personal values, attitudes, and mindset ("sustainability mindset").

Literature insights into street-level bureaucrats' green skills

As part of a larger-scale systematic literature review²⁸ on green skills as a general concept, we analyzed a subsample of 43 relevant studies directly speaking to street-level bureaucrats' green skills and classified them along the three skill dimensions "green knowledge", "transferability competencies", and "sustainability mindset".

Our literature analysis yields important insights regarding the composition of the evidence base, the distribution of studies across implementation domains, and the extent to which existing research explicitly addresses green knowledge, transferability competencies, and sustainability mindset. Regarding the evidence base, it is notable that research on green skills among street-level bureaucrats is still in its early stages, but has developed rapidly in recent years. Most studies addressing street-level bureaucrats' green skills have been published since 2021. Moreover, the existing evidence is based primarily on qualitative research designs, with only a limited number of quantitative^{29–31} and conceptual³² contributions.

With respect to the policy areas under investigation, we find that they span a wide range of green domains, including water governance^{33–35}, forest conservation^{36–38}, biodiversity protection³⁹, climate adaptation⁴⁰, and land-use policy⁴¹. A notable concentration of studies can be found in agriculture and agroforestry^{42–45}. At the same time, other public programs that are central to a low carbon economy remain largely unexplored. Energy efficiency programs, for instance, are crucial components of national sustainability strategies. While some empirical studies document the existence of "the human factor" on the performance of energy efficiency programs^{46–48}, only recent empirical investigations have started to take a systematic perspective which explicitly considers a comprehensive set of skills including

personal characteristics, preferences and attitudes⁴⁹. This imbalance contributes to a fragmented understanding of green skills across public policy domains.

This fragmentation is also echoed in a very case-specific approach to analyzing the three dimensions in our literature base, typically in separation from one another. In the area of knowledge, studies show that policy understanding among Swedish water officials shapes implementation choices or they document how groundwater officers in Jordan use local and institutional knowledge to navigate complex actor relationships^{34,35}. Regarding transferability competencies, recent contributions illustrate how forest managers draw on interpersonal connections and advice networks when interpreting and applying biodiversity measures³⁶ or demonstrate that water administrators in drought-prone Indian regions rely on participatory communication and collaborative relationships to address resource scarcity³⁴. Concerning a sustainability mindset, it becomes evident that aspiration and motivational orientation are key elements of policy implementation capacity in desertification control⁵⁰.

Although the small existing literature base reveals important contributions to the emerging field, it only provides hints for a general conceptual understanding of green skills that is necessary for the development of a standardized and quantitative approach to measure green skills across the three identified dimensions and is transferable to other settings in public policy. Our analysis of the topical literature shows that the conceptual understanding of the dimensions of green skills and their operationalization is at an early stage of development. A promising starting point for the conceptualization and implementation of a standardized quantitative approach could relate to the Global Survey of Public Servants¹³ that comprises evidence from 1,300,000 public servants in 23 countries but does not (yet) focus on green skills or include frontline agents.

Outlook

In this final section, we outline a research agenda that builds on our microfoundational perspective on green skills among street-level bureaucrats and connects it to broader debates on sustainable public transformation policies. Our brief review has shown that existing work is fragmented across policy fields, dominated by qualitative designs, and only rarely engages with the systematic formation of green skills across the three dimensions. Future research is therefore needed to (i) sharpen the conceptualization and measurement of green skills, (ii) quantify the magnitude and heterogeneity of the “green skill effect” on green policy effectiveness, and (iii) reconnect micro-level skills to institutional contexts and the skills of other key actors in green transitions.

The first avenue for future research concerns the more precise conceptualization of green skills relevant for the implementation of sustainable public transformation policies. While our typology distinguishes between the three dimensions of expert knowledge (“green knowledge”), process- and transfer-related capabilities (“transferability competencies”), and personal values, attitudes, and mindset (“sustainability mindset”), the existing literature rarely examines these components within a coherent framework. A comprehensive understanding of green skills should clarify which specific skills street-level bureaucrats—and other agents involved in the design and implementation of green policy programs—need to facilitate effective implementation. This might include (but not be limited to) the ability to interpret complex regulatory frameworks, to translate abstract sustainability goals into operational procedures, and to navigate tensions between environmental, economic, and social objectives. Future work should also engage in further conceptual refinement and delineate green skills from related constructs such as CSR competencies and climate or energy literacy. Clearer conceptualization would facilitate the development of an operationalization for measuring green skills among street-level bureaucrats and other relevant actors. From an empirical perspective, systematic skill assessment must meet several requirements. It should, for example, capture the multidimensional nature of green skills and be applicable across policy domains and institutional settings, enabling comparative analyses. Promising methodological approaches thus include, for example, the

development of standardized survey instruments tailored to street-level bureaucrats.

A second major line of inquiry concerns the size and structure of the green skill effect—that is, the extent to which variation in green skills among street-level bureaucrats and other frontline agents translates into differences in the effectiveness of green policy programs. One of our starting points was that robust evidence on the causal impact of green skills on green program outcomes remains scarce. Future research should therefore not only identify which skills matter in principle but also estimate how strongly these skills shape key dimensions of policy effectiveness. Importantly, the green skill effect is unlikely to be homogeneous. We expect substantial variation across policy areas, program types, and institutional environments. Comparative analyses across public sectors, funding schemes, and countries can therefore shed light on how institutional arrangements moderate a potential green skills effect. In this regard, micro-level analyses of street-level bureaucrats and their competencies can complement macro-level institutional perspectives¹ to provide a more complete understanding of how institutional and individual-level factors jointly shape policy outcomes.

A third outlook relates to reconnecting green skills to the broader institutional context and to the skills of other individual actors beyond the street-level bureaucrats. The general management literature has long recognized that individual actors are embedded within organizations that influence their choices, while both are further situated within broader institutional environments that constrain or enable specific behaviors⁵¹. In this vein, our focus on frontline agents has highlighted their pivotal role, yet street-level bureaucrats operate within a multi-level governance system shaped by policymakers, managers in public organizations, private sector partners, and citizens. Policy makers at national and subnational levels require specific green skills to design coherent policy frameworks, to coordinate across sectors, and to anticipate implementation challenges faced by street-level bureaucrats. Managers in public organizations need specific skills to strategically deploy and develop the green skills of their staff and to align organizational processes with sustainability objectives. Citizens, in turn, possess varying degrees of skills to engage with green policies—for instance, in applying for support programs. On the institutional level, the impact of green skills among street-level bureaucrats will, for example, depend on the incentives, resources, and rules provided by public organizations and in a given political context. Recruitment practices, promotion criteria, training systems, and performance management frameworks might enable or constrain the development and use of green skills.

Related to this point, fourth, the relationship between green skill development and economic development warrants more in-depth investigation. Theoretical work⁵² suggests that weak state staffing and capacity directly constrain economic development. Empirical evidence further indicates that a shortage of qualified workforce in the public sector leads to lower-quality public goods provision⁵³. However, the implications of this for determining “optimal” wages remain unclear. A study from Mexico finds that under-competitive public-sector pay may shift talent to the private sector and leave the private sector with a less capable workforce⁵⁴. By contrast, empirical evidence⁵⁵ from Brazil shows that excessive public-sector compensation can draw high-ability workers away from the private sector, resulting in substantial allocative effects and productivity loss. Taken together, these four outlooks point to an ambitious, but necessary, research agenda as we argue. By sharpening the conceptualization and measurement of green skills, quantifying their effects on policy outcomes, and embedding them in a broader multi-actor and institutional framework, future work can substantially deepen our understanding of how individual-level green skills shape the effectiveness of sustainable public transformation policies. In doing so, it will help to move debates on green skills towards evidence-based strategies for building the public sector competencies required for a successful low-carbon transition.

Data availability

No datasets were generated or analyzed during the current study.

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