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Beyond compliance: public voluntary standards and their effect on state institutional capacity in Vietnam

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ABSTRACT

Public certification standards have received limited scholarly attention, especially the institutional capacity of public authorities that develop and implement these standards to address complex challenges, such as the promotion of industrial ecology and industrial symbiosis for enhancing resource use efficiency. This research uses an institutional capacity assessment framework to examine the ways in which a voluntary public standard for certifying eco-industrial parks affected the Vietnamese state's capacity to coordinate and implement industrial ecology. The article draws upon the interviews and a review of official documentation to show that the benefits of public standards extend beyond compliance to the enhancement of state capacities to coordinate complex policy domains such as industrial ecology. The findings contribute to providing a basis to redesign standard-setting processes to move beyond end-user compliance and provide insights into how public actors can more effectively address 'systemic' sustainability challenges – from circular economy ambitions to the Sustainable Development Goals.

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Introduction

Environmental voluntary standards are designed to incentivize compliance to certifiable requirements for environmental conduct and performance either in the absence or in explicit support of public regulation (Bartley, 2014; Tuczek et al., 2018). They are developed and applied by both private actors, such as NGOs and private companies, and public actors, such as national governments and international organization, across a broad range of resource and service sectors (Auld et al., 2018; Tröster & Hiete, 2018; Zeng et al., 2021). Their voluntary status means they are used to stimulate environmental performance, by guiding compliance with fragmented public regulation (Renckens, 2020) and/or establishing legitimate forms of production to meet market demand in the absence of credible public regulation (e.g. Zhang et al., 2019).

Private voluntary standards and certification have been widely researched, including their effect on both their uptake by target actors and their effect on state rule making and governance (Anh et al., 2011; Gulbrandsen, 2014; Kalfagianni et al., 2020; Ponte et al., 2021; Vandergeest et al., 2015). Research on public certification standards, while having received relatively less attention, has focused on their use by national governments to (1) guide end users through regulatory compliance (Samerwong et al., 2018; York et al., 2018), (2) create vanguard objectives that extend beyond legislation (Daddi et al., 2016), (3) foster legitimacy by states for products in export markets (Samerwong et al., 2018) and/or (4) reclaim rule-making authority back from private

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certification initiatives (Giessen et al., 2016). The motivations and capacity of target groups to comply with public voluntary certification standards have been a key focus of this research (Da Silva et al., 2019; Samerwong et al., 2020; Tröster & Hiete, 2018), as well as the interplay between these standards and public regulation (Gulbrandsen, 2014; Ponte et al., 2021). What remains less clear, however, is the effect that these public certification standards have on the institutional capacity of public authorities themselves, especially those in the global South, who develop and implement these standards to address complex challenges like the promotion of eco industrial park and industrial resource exchange (symbiosis) to enhance energy and resource use efficiency.

An eco-industrial park (EIP) refers to a group of enterprises getting involved in cleaner production, making effective use of natural resources and entering into manufacturing cooperation and affiliation in order to tighten resource flows to promote economic, environmental and social efficiency in these enterprises (Dong & Chuc, 2018; Massard et al., 2018). Developing EIPs can also contribute to addressing 'systemic' sustainability challenges – from circular economy ambitions to the Sustainable Development Goals. Take for example Vietnam, where the development of industrial zones first only focused on attracting domestic and foreign investment and developing production and business efficiency, neglecting the environmental consequences of industrial development. Since 2016, the Vietnamese state has sought to transform existing industrial zones into EIPs with the goal of reducing pollution, ensuring economic and social benefits, and sustainable development. In 2018, this objective was formalized through Decree 82/2018/ND-CP (or 'Decree 82') on the Management of Industrial Parks and Economic Zones, which established criteria for a public voluntary certification for the investment, development and application of new forms of management and technology to promote EIPs.

In this article, we examine the development of Decree 82 to understand the ways in which different stages of developing a voluntary public standard can affect the Vietnamese state's capacity to coordinate and implement EIPs. This standard codified under Article 42 of Decree 82, was instigated by the United Nations Industrial Development Organization (UNIDO) with the Vietnamese Ministry of Planning and Investment (MPI) (UNIDO, 2018). In the process of developing the standard, multiple governmental Ministries and Departments responsible for investment, financing, environment, social security of EIP formation were involved. The aim of this article is to assess how the institutional capacity of these governmental bodies was affected through their involvement in the development of a public standard and the effect of this capacity on supporting systemic and inter-ministerial support for transformation towards industrial symbiosis.

Institutional capacity refers to the ability of private or public actors to work through a system of rules, norms, values to achieve a specified collective goal (Fresneda Fuentes & Hernández Borreguero, 2018; Johansson et al., 2017; Willems & Baumert, 2003). To realize EIPs and enhance effective use of natural resources in the processing and manufacturing sectors (Nguyen & Ye, 2015), coordination is needed both between: (1) firms coordinating by-product exchange and utility sharing and (2) government bodies across multiple levels controlling rules and resources needed to enact this exchange and sharing (Jiao & Boons, 2017; Spekkink, 2013). As earlier research has shown, institutional capacity is considered to be key for acquiring resources, accessing knowledge for improving environmental performance, and developing the relations and coordination necessary for establishing and using opportunity structures for developing EIPs (Boons & Spekkink, 2012; Healey et al., 2003; Wang et al., 2017).

The following two sections present the institutional capacity assessment framework used in our analysis and our methodology for data collection. We then outline the content of the Decree 82 before presenting our empirical findings. The article concludes with a discussion of these findings, reflecting on wider significance of understanding the effect of public voluntary standards on the institutional capacity of public authorities in Vietnam and beyond.

Institutional capacity

Institutional capacity refers to the ability of private or public actors to work through a system of rules, norms, values to achieve a specified goal (Boons & Spekkink, 2012; Johansson et al., 2017). Institutional capacity, as a

framework of analysis, has been developed in close association with the wider academic concepts of industrial ecology and symbiosis (Neves et al., 2020; Nguyen & Ye, 2015) to understand government and inter-firm cooperation for linking industrial processes through by-product exchange and utility sharing to achieve resource efficiency (Jiao & Boons, 2017; Spekkink, 2013). Industrial ecology and industrial symbiosis are related terms focused on collective approaches for industries to exchange raw materials, energy, water, and/or by products (Baldassarre et al., 2019). An EIP is considered a model for eco-efficiency at the industrial zone scale by establishing collaboration to implement resource exchange between firms (Massard et al., 2018).

In this article, we extend the institutional capacity framework to understand the effects of standard creation on those responsible for defining and implementing them. In doing so we go beyond the deontic logic of compliance to prescriptive rules and norms (Ostrom & Basurto, 2011), to emphasize the capacities needed for shaping the rules, norms and values that enable learning, and foster trust and collaboration between rule-making public actors. We apply an institutional capacity framework to understand how the design of Decree 82, which provides a framework for the voluntary certification of EIPs, affected the institutional capacities of government bodies responsible for supporting development of eco industrial parks. Based on the definitions from Healey et al. (2003), Boons and Spekkink (2012) and Trang et al. (2022), this framework is comprised of relational, knowledge, and mobilization capacities (as summarized in Figure 1).

Relational capacity refers to the ways in which public or private actors affect trust and mutual understanding between themselves and other actors related to industrial resource efficiency (Healey et al., 2003; Wang et al., 2017). We apply relational capacity to understand how government actors engaging in standard development enhance their trust and mutual understanding between themselves and both non-state private actors and other parts of government (Watkins et al., 2015). Here we examine which different government bodies expanded or reduced their range of relationships with other public and private actors through the design and formalization of Decree 82 (Yoon & Nadvi, 2018). We then analyse the morphology of these relationships by identifying the types and spatial and temporal elements of interaction among government and other actors in their networks to understand how, where and when governmental actors interact with other actors, e.g. via official document, face-to-face discussion, three times a year (Domenech & Davies, 2011; Yoon & Nadvi, 2018). Finally, we explore the integration or 'depth' of the new collaborations by examining the effect of standard development on trust and mutual understanding within these networks (e.g. de Abreu & Ceglia, 2018).

Knowledge capacity refers to the ability to identify and acquire the knowledge necessary for implementing EIPs (Barry, 2012). We use this capacity to assess how the development of Decree 82 affected how knowledge was developed and exchanged between government bodies in order to align policy support for both

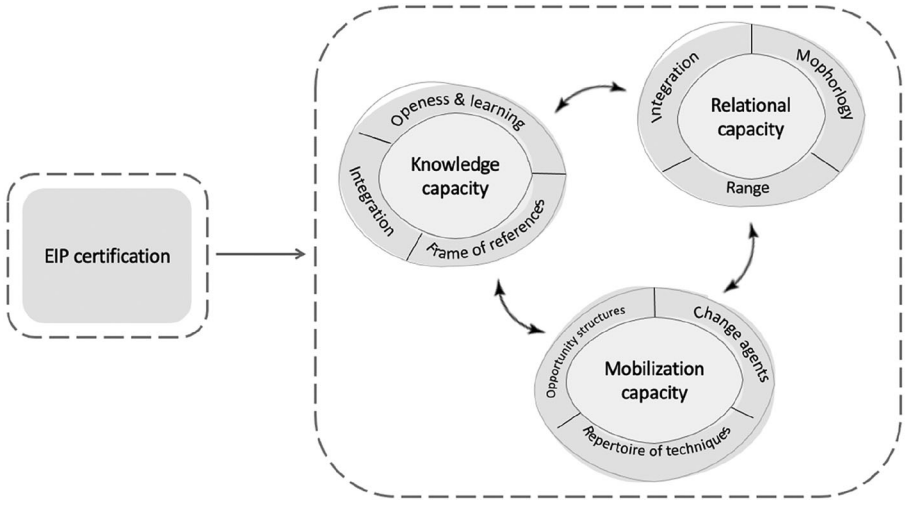

Figure 1. Influence of eco-industrial park certification on governmental institutional capacity.

technological and organizational innovation (e.g. Lai et al., 2014). Following Healey et al. (2003) and de Abreu and Ceglia (2018), we first analyse the extent to which key actors were open to applying existing and new knowledge in providing the definition and developing standard criteria of EIP. We then analyse how the frames of reference of these actors, including problems, opportunities and interventions, affected the identification of these knowledges (Healey et al., 2003). Finally, we examine the ways in which the knowledge of these actors was integrated either directly in Decree 82 or in legislation and policy supporting its implementation.

Mobilization capacity refers to the ability of public and private actors to enable 'collective action based on the existence of a shared strategic vision and the presence of actors within the community that are willing and able to take the lead' (Spekkink 2015, p. 134). We apply mobilization capacity to identify the extent to which government actors were, through their involvement in the definition of criteria set out in Decree 82, better able to engage and motivate industrial zones and industrial companies to support implementation. We first examine the opportunity structures – such as rules, norms and incentives – that enable both government and private actors to support the design and adoption of EIPs (Boons & Spekkink, 2012; Healey et al.). We then examine the extent to which government actors reshape EIP regulation and policy in response to voluntary standard development. Following Wickham et al. (2009), we do this by focusing on the ways government actors understand the effectiveness of current regulations, and communicate the benefits of EIP certification to industrial zones. By providing these opportunity structures, governments mobilize actors in their network to support voluntary compliance to certification criteria. Second, we examine the repertoire of mobilization techniques (see Healey et al., 2003) applied by government to mobilize support for the design and implementation of Decree 82. Finally, we analyse the emergence of change agents through the development of Decree 82 – that is, key persons or organizations that provide leadership by motivating other actors to align their actions to the achievement of a specified goal.

Healey et al. (2003) and Boons and Spekkink (2012) also emphasized that to analyse institutional capacity the interaction between relational, knowledge and mobilization capacity is relevant. They describe how, for example, significant knowledge and relational resources help to mobilize actors to achieve a shared goal. From their research, they concluded that the starting point for changing or improving institutional capacity is first a changed relational capacity, after which knowledge capacity and mobilization capacity follow. In addition, Boons and Spekkink (2012) argue that the most significance capacity is mobilization capacity, because the active participation of actors relevant to the exchange of resources or materials is an essential condition for making it happen. In this article, we are not only exploring the interaction between the three capacities, but will also analyse the chronological order of this interaction. We examine which capacities are more prominent when, and how – through interaction – they become cumulative over time throughout different stages of the promulgation process of Decree 82.

Methodology

Eco-industrial parks offer an exceptional case for understanding the effect of public standards on state institutional capacity because of the degree of systemic or inter-ministerial coordination it requires. To analyse the effect on state institutional capacity, we compared the experiences of four purposefully selected industrial zones in Southern Vietnam. Two of these industrial zones located in the Can Tho province (Tra Noc 1 and 2) were selected that joined the UNIDO led pilot for implementing Decree 82. A further two industrial zones located in Ho Chi Minh City (Hiep Phuoc and Tan Thuan) were selected that chose not to join the UNIDO pilot project. These four case industrial zones enabled us to identify and record a variation of experiences of key provincial and national level government actors involved in developing and implementing Decree 82.

The data for this case study research was collected from December 2018 to December 2019 and consists of semi-structured interviews and a review of official documentation. Face-to-face, in-depth, semi-structured interviews (see Supplemental Materials for an overview and interview questions asked) were conducted with Representatives from Ministry of Natural Resource and Environment (MONRE) and MPI who both participated directly in the promulgation of Decree 82 and EIP standards. Other actors involved in the development of Decree 82 were also interviewed, including the Can Tho Export Processing Zone and Industrial Zone

Authority (CEPIZA), the Tra Noc Industrial Zone Infrastructure Company (Tra Noc IZIC) and industrial enterprises operating in Tra Noc 1 and 2 industrial zones. In addition, we interviewed representatives of two other Industrial Zones Infrastructure Companies of Hiep Phuoc and Tan Thuan Industrial Zone of Ho Chi Minh City and the Ho Chi Minh City Export Processing Zone and Industrial Zone Authority (HEPZA) to better understand the influence of Decree 82 on (1) promoting resources efficiency in EIPs, (2) overcoming difficulties and challenges relate to implementing EIP criteria, and (3) the identification of compliance areas that require further state support.

Interview questions focused directly on perceived changes to the institutional capacity of government actors during the design and promulgation of Decree 82 following the framework outlined above. All interview transcripts were analysed by deductively coding based on the themes of relational, knowledge, mobilization capacity and the dimensions of each capacity as presented in the previous section and Figure 1. Unclear or irregular data from the interviews were triangulated with government regulation and reports from UNIDO, MPI and, where possible, the academic literature.

Decree 82

Decree 82 defines industrial symbiosis in EIPs as 'cooperation between enterprises … to optimise the use of input and output factors, such as raw materials, water, energy, wastes and waste products … and build networks' for developing shared infrastructure, improving technological innovation and promoting business and production efficiency (Article 2, Decree 82/2018/NĐ-CP). The five voluntary criteria for certifying EIPs set out in Article 42 are (1) Compliance with regulation and ISO management internal management systems; (2) Provision of basic environmental management utilities and services (3) Awareness and application of effective resource use cleaner production; (4) Allocation of land for greenery, traffic works and public utilities in conformity with national construction standards; (5) Minimum number of enterprises in industrial parks shall plan to participate in industrial symbiosis (see Supplemental Materials for detail). These criteria include guidance for investors to comply with legislation in the development of shared infrastructure, and basic utilities, as well as thresholds for the proportion of companies in these parks to be aware of and apply cleaner production technologies, green construction standards and the application of industrial symbiosis strategies.

Article 43 outlines the process and incentive structures for EIP certification, including self-assessment of compliance to the specified criteria. The certification process is voluntarily initiated by the industrial zone's management board who applies to the four designated key Ministries; MPI, MONRE, the Ministry of Industry and Trade (MOIT) and the Ministry of Construction (MOC). After assessing compliance, EIP certification can be awarded, affording tax incentives on income, export and import duty as well as land rent exemptions and relief. Certified industrial zones also have access to preferential loans from the Vietnam Environment Protection Fund, the Vietnam Development Bank to 'construct technical infrastructure of industrial parks, implement cleaner production methods, efficiently use resources and industrial symbiosis solutions' and 'priority in providing information related to the technology market and the possibility of cooperating in effecting industrial symbioses in the scope of production and business activities of these enterprises' (Article 43, Decree 82/2018/NĐ-CP).

Chapter 5 of Decree 82 also provides an overarching set of guidelines for distinguishing the authority and responsibilities of eleven Ministries, the Government Inspectorate, the Provincial People's Committees and the industrial zone Management boards (see Supplementary Materials). These guidelines, in addition to the criteria in Article 42 and the incentive structure in Article 43, were the focus of negotiation in the development of Decree 82. They are also the focus of our analysis on whether and how this negotiation affected the institutional capacity across these different parts of government during the problem identification, experimentation and promulgation phases of developing the Decree.

Changing institutional capacities

The promulgation process of decree 82 was divided into three phases: (1) problem identification, (2) experimentation and (3) promulgation. We use the institutional capacity framework to understand how, during

the three phases of the design of Decree 82, this regulation changed the institutional capacity of the government to support the development and implementation of EIP in Vietnam.

Problem identification phase

The main goal of UNIDO in the problem identification phase was to create a common understanding of the principles of industrial symbiosis and industrial ecology that would underlie the criteria and incentives of Decree 82. They did this by bringing together four key Ministries with the Vietnam Environmental Protection Fund to develop a common understanding of industrial symbiosis, industrial ecology and its relevance for developing a voluntary certification for EIPs. As we will show in this section, by participating, these Ministries had the opportunity to expand both their knowledge and relational capacity.

During the problem identification phase, particular emphasis was given to introducing the concept of industrial ecology and industrial symbiosis, both of which were new to many of the Ministries involved. Subsequently, staff from the Ministries reported seeking expert knowledge that could improve their understanding of the challenges industrial zones face in complying with eco-industrial park requirements. As Respondent #1 reported, 'the concept of eco-industrial parks has [been] introduced to the government and helps them to think about industrial symbiosis'. Through their involvement with UNIDO, the Ministries were also challenged to identify technologies for reducing and reusing waste and energy that could enable a minimum number of enterprises to comply with industrial symbiosis goals under Decree 82. As outlined by Respondent #3, this in turn led to demand for ways to 'continuosly monitor the improvement of energy and water use efficiency'.

The focus on collective solutions to industrial waste and resource use in turn enabled these Ministries to identify knowledge resources that would be more relevant to Vietnamese industrial zones for understanding industrial ecology – including solutions for resource reuse, energy and water use efficiency (UNIDO & MPI, 2018). Knowledge resources were disseminated through a series of workshops run in Can Tho, Da Nang and Ninh Binh in 2016 by MPI, who brought in experts from both the Vietnam Cleaner Production Centre and international experts from SOFIES – an international sustainability project management and consulting firm from Switzerland. The workshops enabled MPI to make decisions on the content of the criteria and incentives in Decree 82. For instance, a representative from MPI (interviewee #4) described how 'based on feedback from industrial zones' they 'recognized that industrial symbiosis and industrial ecology is not only related to technology'. It also involves finance regulations and incentives needed to stimulate coordination of how technologies are implemented and used.

During this initial phase, the ministries were also exposed to new knowledge sources relevant for industrial symbiosis and industrial ecology. The same UNIDO workshops also brought in experts from international organizations including the Global Environment Fund, World Bank, German Corporation for International Cooperation (GIZ), private consulting companies such as PricewaterhouseCoopers France, and international and national universities including the University of Cambridge, University of Ulsan and ETH Zurich. These international organizations introduced new knowledge related to industrial symbiosis and industrial ecology that went beyond the prevailing technical focus of industrial organization and industrial environmental management in Vietnam. For example, European-based experts introduced new forms of inter-firm collaboration, and experts from China, Korea and the U.S. introduced new approaches for policy design and planning relevant for implementing industrial symbiosis and industrial ecology.

The problem identification phase also brought opportunities for different government actors to expand their frames of reference for defining both problems and solutions. High-ranking Ministry officials were given the opportunity to visit EIPs in Japan (Fukuoka, Kawasaki) and China (Yixing, Tianjin and Beijing) in 2016 and 2017. As respondent #5 argued

> They were confronted with experiences of using different mixes of policy instruments for incentivizing industrial zones to include goals on renewable energy and integrating technologies for solid waste treatment and air pollution and the role of networks between industrial enterprise for fostering shared management strategies there.

All of these points contributed directly to the development of Article 42. But importantly, also enhanced the capacity of Ministry officials to identify and source relevant knowledge that could ultimately assist in the development of EIPs.

In addition, the workshops and visits in this initial phase also enhanced the relational capacity for cooperation between different ministries and industrial zone authorities. Participants had opportunities to discuss and share information about the implementation of EIP and also used these deliberations to draft Article 43 – such as the need for expanded relationships with domestic and international experts and donors. In particular, MPI expanded and strengthened the range of their relationships with, for example, UNIDO, the Global Environmental Fund, and the State Secretariat for Economic Affairs, Switzerland. At the same time, other key ministries involved indicated that their trust in the capacity and responsiveness of industrial zones also improved through the problem-identification phase. As the respondent #3 explained:

> Normally, the ministries just have annual training programs, but only for industrial zones authorities, and then let them spread to industrial zones. But for this project, we directly come to the industrial zones, see, discuss and share [information and experiences] about the benefits of improving resource efficiency with them every 3 months.

Finally, the problem identification phase also enabled key Ministries to recognize the ongoing guidance, to provide an 'opportunity structure', for industrial zones to achieve eco-industrial certification. In particular, the Ministries became more aware that setting high-level criteria alone would not increase compliance. As a representative from MONRE (#2) explained, 'the criteria … still [need] to be more developed to avoid [being too] general … [for this they need to] take into account … multi – disciplines' which, they concluded, requires further guidance by the government through instruments like policy 'circulars'. Recognition of the need for these circulars represents greater awareness by MONRE on the needs of industrial zones. Once developed, the circulars supported the implementation of Article 43 in practice by, for example, providing guidance around key incentives such as preferential loans. However, no link was made by any of the respondents on how the implementation of these circulars enhanced the scope and range of relations with domestic and international actors, or enhanced their ability to identify the knowledge needed for complying with the criteria of Article 43.

Experimentation phase

The experimentation phase of Decree 82 was based around pilot programs designed to implement and assess the benefits of cleaner production and resource efficiency and provide evidence to the MPI when drafting Articles 42 and 43. This experimentation phase enabled various Ministries to enhance their mobilization capacity in four key ways.

First, the four key Ministries contributing to the development of Articles 42 and 43 were confronted with the challenges industrial zones faced with existing regulation related to energy and resource efficiency and reuse. By directly visiting the four industrial zones participating in the experimentation phase, the Ministries better understood why current regulation was ineffective by becoming more aware about how regulation constrained progress towards eco-industrial zone development. As argued by an industrial zone authority representative (interviewee #5), MONRE recognized the inadequacy of mandatory policies that did not enable new resource efficiency practices to be put in place. This further enabled them to identify key motivational programs support for industrial zones to adopt cleaner production and efficient use of resources and provided further support for them to develop preferential loans from state financial institutions such as the Environmental Protection Fund.

Second, when designing the criteria in Article 42 and Article 43, the government applied different mobilization techniques to support the design and implementation of Decree 82. Government actors were confronted with the need for improved coordination between government bodies and mobilizing resources in support of industrial zone compliance. In response, the MPI established a series of steering committee meetings designed to enable greater cross-level coordination between national government (MPI, MONRE, MOST), local authorities (e.g. the Ho Chi Minh City People's Committee and the Industrial Zone Authorities),

research and academia, international development organizations (UNIDO, GEF, SECO), banks and firms operating in industrial zones. This included discussions on policies and guidelines relevant for EIPs spread amongst different Ministries and the need for common methodologies for identifying and engaging relevant and motivated stakeholders. Through this process, the various Ministries involved were also confronted with the need to develop a common set of criteria for stimulating cooperation between enterprises and setting incentives such as preferential access to funding. As outlined by one respondent from MPI (interview #4) 'this activity contributes to help [us] to think about and build the incentives to certification of eco-enterprises for enterprises that participate in cleaner production, efficient use of resource and industrial symbiosis' – which in turn helped them to jointly define the incentive structure set out in Article 43.

Third, the process of defining Article 42 and 43 also enabled the key Ministries to develop opportunity structures that enabled them to mobilize industrial zones to think through solutions for enhanced resource efficiency and cleaner production. MPI used a survey of 60 companies to explore synergistic strategies for shared energy and water use, as well as the recycling and reuse of chemicals. Through this survey, the Ministry was able to stimulate greater understanding by firms of the constraints and opportunities for implementing shared waste or by-product reuse strategies. MPI also subsequently fed the knowledge gained on from this survey back into the design of Article 42 and 43. As a respondent from MPI (Interviewee #3) argued, the survey enabled us to not only 'develop the details of the criteria' it also enabled MPI to better define what industrial symbiosis and industrial ecology means when answering questions firms have related to 'what is an eco-industrial park'? Following the survey, the other activities such as the expert group meeting were organized in 2018 to engage different levels of government, industrial zones and enterprises to better define the roles and support provided by different levels of government in implementing and managing EIPs. A representative from HEPZA (interviewee #10) confirmed this by explaining how these discussions also fed back into 'defining the specific responsibilities and authority of Ministries and Industrial Zone Authorities under Decree 82'.

Fourth, MPI enhanced their mobilization capacity by identifying change agents in the experimentation phase. These change agents include the Ministries involved in the UNIDO project (MPI, MONRE, MOST and MIT) who, as interviewee #4 explained, gave 'comments for this design of Decree 82'. More importantly, however, MPI and other ministries identified their own role in developing EIPs (see Table S1), which included enabling firms to better understanding key concepts of resource use efficiency and how to develop compliance strategies. For example, MONRE decided through this process to prepare Circulars for guiding reuse of waste and energy, and MOST decided to develop technical guidance to industrial zones for inspecting and evaluating the reuse of waste.

Promulgation phase

By July 2018, the Ministries moved to promulgate the eco-industrial certification scheme under Decree 82. This phase required both the Ministries and the Industrial Zone Authorities to not only understand the challenges of implementing EIP principles, but also to ensure that existing policies and regulation across the full spectrum of government was aligned to support the implementation of Decree 82. As respondent #5 explained, they were faced with having to formalize 'the definition of eco-industrial zones, [as well as the] criteria and incentives needed to integrate into the national regulation to embed the development of EIPs with central policy system'. In doing so the Ministries involved enhanced their mobilization capacity, which in turn positively affected other institutional capacities.

First, the Ministries developed a series of Circulars designed to guide the implementation of Decree 82. These Circulars, as one respondent from MONRE (interviewee #1) argued, are important because they 'serve as national technical guidelines for both industries and government authorities'. This meant that when writing these circulars, the Ministries were forced to understand how their existing regulations and policies affect the capacity of industrial zones to develop strategies for industrial symbiosis and ecology and, as such, compliance to Decree 82. This led to Ministries stipulating the need for those working in government to review and evaluate and adjust legal documents when conflicts of ambiguities emerge. As the respondent #8 outlined, the Circulars enabled 'companies interested in achieving that certification, [to overcome being]

hesitant and [enabling them] to start the [certification process]'. By adjusting these legal documents, the Ministries provided opportunity structures to mobilize industrial zones, not only enabled investments and compliance to Decree 82 – but also improved the governance of resource use efficiency in a wide range of industrial zones across the country. As a representative from MPI (interviewee #3) argued, 'the national EIP guidelines provide a mechanism to operationalize the development of EIPs in Vietnam and its institutional framework in more than 300 industrial zones across the country'.

Second, during the promulgation phase the government bodies involved realized the need for a new formation of the National Steering Committee, the Central Management Agency of the IZs, and the Development Center of IZs in each province, and coordinating the transition of industrial zones to eco-industrial zones. The idea for this committee was first raised during an intensive two-week training in Switzerland in 2019 and then elaborated through discussions with UNIDO and World Bank. The committee, Central Management Agency and Development Centers provided a new means of not only establishing but continually reflecting on the effectiveness of the eco-industrial zone program as a whole, including the iterative adjustment of regulation and policies to guide and support the transition to certification under Decree 82. It also enabled the Ministries to ensure that industrial ecology principles became more widely employed than only within the certified industrial zones. The knowledge gained from the initiation and experimentation phase were, as such, shared more consistently between government departments and with industrial zones, which has in turn set a basis upon which to maintain and improve knowledge and mobilization capacities into the future. In addition, the MPI also more clearly understood their role in steering this transition as a *change agent* – again building on the previous two phases. A representative from MPI (interviewee #4) argued 'we saw a faster decision and promulgation process of this decree compared to other policies, within a year'. Not only has this surprised those working in MPI, they already see opportunities for using the capacities they had developed during the development of Decree 82 to revise or develop new policies into the future.

Discussion

Our results demonstrate the effect of developing a voluntary public standard for certifying EIP on the institutional capacity of the Vietnamese government. In doing so we show how the impact of public standards can extend far beyond the linear, deontic logic of rule compliance (Ostrom & Basurto, 2011). These results also go beyond an understanding of effect in terms of institutional interplay between standards, policy and regulation – commonly understood in terms of driving alignment or a 'ratcheting up' of stringency (e.g. Anh et al., 2011; Gulbrandsen, 2014; Ponte et al., 2021). Instead, we observe four ways in which public standard creation affects the institutional knowledge, relations, and mobilization capacities within the Vietnamese state with positive consequences for achieving EIP beyond the certification program alone.

Our results first demonstrate the role public standards play in enhancing the capacity of the state to better coordinate EIP when faced with new, fragmented or complex regulation and policy. The standards and certification mechanism outlined in Articles 42 and 43 of Decree 82 provided a 'boundary object' (see Dong & Chuc, 2018) around which government actors were confronted with EIP by creating a common set of principles, criteria and incentives for other government actors (including relevant Ministries and Industrial Zone Authorities). The standard-setting process forced those Ministries involved in setting these standards to identify policies and regulation that were either not aligned or created confusion amongst industrial zones in terms of the goals and/or sources of support for implementing energy and resource efficiency strategies. The process of developing Decree 82 also enabled them to enhance their capacities for gathering knowledge, mobilizing other parts of government to change policies and regulation, build relations in and outside of Vietnam, and ultimately change their own policy processes to enable industry zones to learn and comply with ambitions for EIPs. Seen as such, these public actors did not only 'learn' about institutional limitations, as is commonly observed, but also developed a converging set of capacities that hold the potential for extending the overall ability of the state to govern sectors beyond energy and resource efficiency of EIPs.

We also observe a chronological effect of public standard development on the institutional capacity of the Vietnamese government. Similar to Boons and Spekkink (2012), who argue that relational and knowledge

capacity are the starting point for institutional capacity change, we found that Decree 82 first enabled the knowledge and relational capacity of the state. Across the three phases of problem identification, experimentation and promulgation we observe how different parts of the Vietnamese government gained new knowledge on industrial ecology when faced with defining principles, criteria and the incentive structures. Reflecting the findings of others (see Gale & Haward, 2011; Gulbrandsen, 2014; Lister, 2011; Tollefson et al., 2009), the definition, testing and experimentation of standards enabled the government to not only transfer knowledge to industrial zones. However, it also enhanced the capacity of Ministries and the Industrial Zone Authorities to create new opportunities for iterative knowledge exchange around the achievement of eco industrial park that would not have otherwise taken place (cf. private standards - Martinez & Poole, 2004).

Third, our analysis indicates that the different demands of the different phases of standard setting led to different knowledge needs. This meant that the Ministries and Industrial Zone Authorities moved beyond exchange and learning around the definitions of EIP, to establishing ongoing problem-oriented knowledge exchange in the experimentation and promulgation phases. Confronted with the problem-oriented knowledge exchange required the concurrent improvement of relational capacity as these state actors sought national and internationally partners who could assist with innovations for technology, policy and incentive structured for promoting industrial ecology. This combination of knowledge and relational capacity together enhanced the mobilization capacity of the state by strengthening the incentive structures for industrial zones and enterprises to comply with existing regulation. This demonstrates the different ways in which these actors use prevailing opportunity structures to mobilize other government bodies to engage with industrial zones to comply with Decree 82.

Finally, we find that enhancing institutional capacity of public actors that define public standards can enable states to develop and employ new ways of organizing and performing industrial coordination, especially in complex policy areas, such as EIP, that are covered by multiple parts of government. While compliance by industrial zones remains the functional goal of these public standards, the improvements to state institutional capacity enabled by these public standards – across the key phases of problem identification, experimentation and promulgation – demonstrates their broader and potentially more systemic impact. Enhanced institutional capacity, as such may be even more important than other observed effects of public standards – including guiding regulatory compliance (Samerwong et al., 2018; York et al., 2018), creating vanguard objectives (Daddi et al., 2016), fostering legitimacy (Samerwong et al., 2018) and/or reclaiming rule-making authority (Giessen et al., 2016). This recognition holds opportunities for more explicitly using the standard-setting processes as a means of coordination rather than just for the technical definition of principles and criteria. The three institutional capacities outlined in this article could then be used as a set of 'input' criteria to organize internal interaction between different parts of government and between government and supportive non-state actors (Mena & Palazzo, 2012). By making capacity development a goal of public standards, albeit a non-assessed goal, the role of public standards in complex environmental governance settings can be far more precise than is currently the case.

While focused on the development of a public standard, our results also hold relevance for understanding the wider institutional effects of private standards (building on, for example, Gulbrandsen, 2014). The effects of private voluntary standards have predominantly focused on state rule making and governance (e.g. Bartley, 2011), as well as (albeit in limited way) the capabilities of end-users (Samerwong et al., 2020). Applying the institutional capacity framework outlined in this paper to study effects of private standards on state actors remains an open question. Given these state actors play a far lesser role in the development of private standards their impact on governmental institutional capacity may be limited. However, extending the chronological perspective developed here, the effects of private standards on the institutional capacities of the state may occur at different moments in the process of compliance or standard revision. Such analysis could extend a wider understanding of how changing institutional capacities in response to standards (both public and private) can enable the achievement of the complex goals beyond, as argued above, the deontic logic of rule compliance.

Conclusions

Based on our assessment of how the institutional capacity of the Vietnamese state changed as a result of the development of Decree 82, we conclude that the benefits of public standards extend beyond improving end-user compliance with environmental standards, the focus of much of the current literature. Furthermore, we develop an improved understanding of how public standards can enhance the capacity of state actors to develop the kind of inter-ministerial coordination needed for engaging in complex transitions to industrial ecology. These findings, as such, hold relevance for understanding the effect of certification and standards in other fields beyond standard compliance alone.

More specifically we show that an institutional capacity offers a framework for understanding how standards improve coherence between different parts of government when faced with fragmented and complex regulatory settings. The approach also provides a basis to redesign standard-setting processes to move beyond end-user compliance to create a systemic approach for enhancing the capacity of public actors to engage with industrial ecology and develop EIP, that require coordination across multiple policy domains. From this perspective, institutional capacity, and its relation to rule making in general terms, can provide insights to how public actors can more effectively address 'systemic' sustainability challenges – from circular economy ambitions to the Sustainable Development Goals.

What potential institutional capacities are affected by public (and private) standards addressing these wider challenges are an area if further research. This could include further investigation on the effects of the public standard and how enhanced capacities affect their implementation in practice. We also see opportunities for extending the framework to examine the effect of voluntary private standards on the state.

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