*Article*

# Exploring the Strategy Goals and Strategy Drivers of National Mapping, Cadastral, and Land Registry Authorities

Erik Hämäläinen [1] and Pauliina Krigsholm [1,2,*]

1 Finnish Geospatial Research Institute (FGI), National Land Survey of Finland, Geodeetinrinne 2, FI-02430 Masala, Finland; erik.hamalainen@aalto.fi

2 Department of Built Environment, Aalto University School of Engineering, P.O. Box 12200 Aalto, FI-02150 Espoo, Finland

* Correspondence: pauliina.krigsholm@nls.fi

**Abstract:** In many western countries, publicly led mapping activities and recording information of land parcels and buildings and the related rights, restrictions, and responsibilities have established their roles as important pillars of a functioning society. National mapping, cadastral, and land registry authorities as public agencies responsible for conducting these tasks are in a key position in shaping the development of the whole land administration sector. Most of these authorities have formulated their purposes, directions, and goals in the form of strategies. There is, however, a lack of understanding of the type of goals these authorities pursue through their strategies and why. Using an online questionnaire as a method, this study explores the strategy goals as well as the strategy drivers of national mapping, cadastral, and land registry authorities. We find that the strategy goals converge to a great extent and relate particularly to digitalization, data properties, customers and needs of society, and organizational development. Further, we observe that the strategy work of these authorities is most often driven by changes in the customer needs and by changes in the government's policies. The contribution of the study lies in providing an overview of how national mapping, cadastral, and land registry authorities frame their near-future development and in highlighting that albeit the goals, for the most part, align with the qualities of a good, neutral land administration system, the authorities show low tendency to pursue transformative or paradigmatic changes through their strategies.

**Keywords:** land administration; cadastral systems; public agencies; strategy; authoritative geospatial information

## 1. Introduction

Land is a scarce resource subject to many competing interests. Virtually everything we do happens on land, is produced on land, or is built on land. Land administration is widely considered as "a key component of the infrastructure that supports and facilitates the way that society interacts with land to ensure sustainable development" [1] (p. 340). Land administration supports, for instance, the efficiency of land and real estate markets, land valuation and taxation, security of land tenure and land rights, and different uses of land (e.g., agriculture, forestry, and real estate development) [2]. Land administration systems (LAS) are institutional frameworks that facilitate the implementation of land policies in their respective country [3]. In this context, land policies are national-level policies that promote nationally important objectives, such as economy, social justice, and political stability, through activities and institutions such as taxation, land markets, and land use planning [1].

The key operational tool of LAS is the cadastral system [4,5]. A cadastral system records the physical location of real properties and lists real property rights, often through three basic elements: cadaster, land registry, and a cadastral map. Cadastral systems are dynamic by nature. Throughout their existence, they have evolved as the people-to-land

relationship, and the needs of societies have changed [6]. Commonly, four development phases, from fiscal and juridical cadasters to planning and multi-purpose systems, are recognized for cadastral systems [1]. The pressure to further develop and modify cadastral systems has not disappeared, by any means, as several megatrends from digitalization to urbanization and the increasing trend towards transparency, accessibility, and open data, continue to shape the operational environment of cadastral systems [7]. How such drivers of change will impact the nature, role, and technical solutions of cadastral systems remains a matter of speculation and debate, as do all topics related to the future, see [8,9]. Some signs of how the changes in the operational environment impact cadastral systems should be, however, detectable through the way the authorities responsible for land administrative tasks frame their own near-future directions in documents that guide and foster their actions, i.e., in their strategies.

In many countries, the authorities responsible for land administrative tasks can be categorized as public agencies. Public agencies, in general, can be defined as units responsible for the execution of public policy [10]. They have some unifying features, such as some degree of autonomy from political direction; pre-established strategic direction through political decision; budgeting autonomy; financing from a combination of its own revenues, earmarked contributions, and subsidies from the government budget; and public accountability defined by law and tradition [11]. Despite these shared features, public agencies are also highly diverse, and their functioning is characterized by path-dependency as well as by the content of their primary task [10]. Johanson [11] (p. 873) has noted that administrative duty is at the core of public agencies' functioning: they are set to "execute government functions under delegated authority by way of legal obligation". Hence, in terms of accountability, public agencies have accountability to higher authorities, such as ministries or politicians (upwards accountability) [12]. However, at the same time, their duties can be defined in such a way as to produce accountability to broadly parallel institutions (horizontal accountability) or to lower-level institutions or groups, such as citizens (downward accountability) [12].

Many authors have argued that we need to understand the characteristics of the public sector to understand strategy work in public organizations, including public agencies, e.g., [13,14]. The literature on strategies in the private sector tends to put emphasis on themes such as "gaining market share" or "growth through competition" [11]. Public organizations, in contrast, often navigate in a pluralistic context where multiple internal and external interests must be met [15]. This might even create tensions within the organizations [16]. Höglund and Svärdsten [17], for instance, have noted that many competing discourses are present in the strategy work of public sector organizations. They propose that strategy in the public sector needs to be understood in relation to following localized discourses, or as they call them, interpretative repertoires: cost savings, need to measure performance, collaboration, societal outcomes, responding to customer needs, the rule of law, and steering from the government. They further argue that these identified repertoires can be associated with higher-level public-sector management discourses that are often used to characterize the development of the western public sector, namely Public Administration (PA), New Public Management (NPM), and New Public Governance (NPG) [17]. These discourses should not be seen as consecutive stages but rather as coexisting and overlapping modes, see, e.g., [18,19]. Public Administration (PA) that, among other features, puts a strong focus on policy implementation and following the rule of law was the dominant paradigm much of the 20th century, followed by the New Public Management (NPM) paradigm that instead emphasizes managerial techniques from the private sector, such as input and output control, and evaluation. New Public Governance (NPG) is the most recently emerged paradigm of the three. NPG draws theoretically from organizational sociology and network theory and emphasizes service processes and outcomes. Höglund and Svärdsten [17] point that civil servants need to balance their strategic work with these discourses. For example, the repertoire "cost savings" that draw from the NPM discourse is

often privileged over the repertoire "societal outcomes" that draws from the NPG discourse in the public sector strategy work [17].

Strategy itself is a blurry and debated concept, see, e.g., [20]. Hambrick and Fredrickson [21], for example, have noted that strategy has become such a broad term that it can mean almost anything. Conceptual and semantic debates aside, a strategy is ultimately about purpose, direction, and goals: a way to formulate objectives for intended change in any form from general ideas to concrete measures, e.g., [11]. Therefore, for example, the content, focus, degree of concreteness, and spatial and temporal scale of strategies vary between organizations. There should be, however, a common element of "looking ahead" instead of largely "regulating the status quo" in all strategies, as Weiser et al. [22] have pointed out. This future-oriented outlook makes strategies an interesting study subject. They provide a window into how organizations—may they be private or public organizations—are responding to changes in their operational environment: what are the central matters to organizations, i.e., which goals they have selected to pursue through their operations. The question of why an organization selects certain goals to pursue also has relevance, particularly in the case of public agencies, due to the inherently complex and politically influenced decision-making environment at these agencies.

This study zooms in on one specific subgroup of public agencies—national mapping, cadastral, and land registry authorities. We note that systems of land registration vary between jurisdictions, and the duties and responsibilities of these authorities are organized differently in different jurisdictions (see, e.g., [23,24]). Some countries have separate authorities responsible for a legal registry that records real rights in immovable property (often referred to as land registry), for a technical register that records and preserves information, for instance, about the location of real property units, the use of land, and the value of land (often referred to as cadaster), and for the visualization of geography and the contents of the technical register (often referred to as cadastral mapping). Some countries, on the contrary, have combined these responsibilities under a single authority. Despite the differences in organizational structures and duties, all national mapping, cadastral, and land registry authorities contribute to land administrative tasks and to the production, upkeep, and delivery of what is considered to be cadastral information, and thereby inflect the development of the land administration sector in their respective countries, and also globally.

The potential future directions of land administration and cadastral systems have gained some substantial attention in recent years, see, e.g., [7–9,25–27]. However, no prior studies have examined how expectations about future directions translate into strategies at the units responsible for carrying out land administrative tasks. This study addresses this gap and aims to understand how the national mapping, cadastral, and land registry authorities frame their own near-future directions in their strategies. Specifically, the study explores what type of goals the authorities pursue with their strategies. We also ask whether there has been temporal variation in their strategic focal points during the past decade. In addition, we ask what drives the strategy work of these authorities to explore how the pluralistic context inherent to public agencies affects their strategy work. It should be noted that questions related to strategy implementation and performance of these authorities are outside the scope of this study. An online questionnaire is used to collect data from a sample of national mapping, cadastral, and land registry authorities. Empirically, the study is limited to a European context. In most European countries, publicly led mapping, cadastral, and land registration activities have long, established traditions, and, in addition, many European cadastral systems have adopted multi-purpose ideals of land administration early on [8].
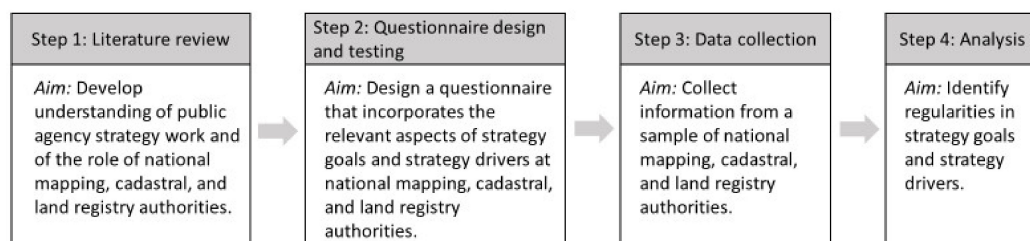
The study contributes to the land administration literature by providing an overview of the strategic focal points and the drivers of strategy work of national mapping, cadastral, and land registry authorities. This kind of knowledge is important for understanding the near-future directions of the whole land administration sector. In addition, this type of knowledge allows, for instance, to evaluate to what extent the authorities strive towards the widely agreed-upon qualities of a good, neutral LAS [3]. Our study finds strong

connections between the national authorities' strategic focal points and the four qualities of an "ideal" LAS formulated by Enemark et al. [3]: (1) a LAS services the needs of governments, business, and the public, (2) a LAS utilizes the latest technologies, (3) a LAS services rights, responsibilities, restrictions (RRRs), and risks in relation to land, and (4) a LAS delivers much broader information about sustainable development. The strategies show a strong interest in serving the citizens and responding to customer needs, and they widely promote the use and possibilities of the latest technologies. The authorities likewise widely aim to account for the RRRs and risks related to land through their strategies, even though they seem to share a rather static view on RRRs. Interestingly, we find that the authorities do not explicitly pursue the United Nations (UN) Sustainable Development Goals [28] or the delivery of information about sustainable development through their strategies. Regarding the drivers of strategy work, we identify responding to changing customer needs and policy changes by the government as the strongest influences for strategy contents of these authorities.

The paper proceeds as follows. In Section 2, we describe the study design and the methods used to collect and analyze the data. Section 3 presents the findings of the study. In Section 4, we discuss our findings in light of the land administration literature as well as the literature on public agency strategy work. Section 5 concludes the paper.

## 2. Materials and Methods

A questionnaire was considered a suitable research strategy as the overall objective of the study is to provide an overview of the strategic focal points and of the drivers of strategy work of national mapping, cadastral, and land registry authorities. A questionnaire suits this type of explorative examination and allows us to access a geographically dispersed group of professionals working at these agencies in a resource-efficient way. The study design is presented in Figure 1. In this qualitative inquiry, the prior literature is reviewed before commencing data collection and analysis to help to contextualize and orient the study and to develop clarity in thinking about concepts and theory development, see, e.g., [29]. The four steps of the inquiry are described next in more detail.



| Step 1: Literature review | Step 2: Questionnaire design and testing | Step 3: Data collection | Step 4: Analysis |
|---|---|---|---|
| *Aim:* Develop understanding of public agency strategy work and of the role of national mapping, cadastral, and land registry authorities. | *Aim:* Design a questionnaire that incorporates the relevant aspects of strategy goals and strategy drivers at national mapping, cadastral, and land registry authorities. | *Aim:* Collect information from a sample of national mapping, cadastral, and land registry authorities. | *Aim:* Identify regularities in strategy goals and strategy drivers. |

**Figure 1.** The study's design.

First, we conducted a critical review of the academic literature focusing on the features of public agency strategy work and the role of national mapping, cadastral, and land registry authorities. The aim of the review was to develop a conceptual understanding of the studied topic and to help to direct the data collection. We relied on a continuous critical assessment of the literature in identifying and interpreting relevant texts (i.e., we did not use a pre-determined list of search words or a focused screening and inclusion strategy), and hence the approach to the literature search can be described as hermeneutic [30]. There is extensive literature on strategy work in general, but our review was targeted to gain an understanding of the relevant concepts and theories of public sector (including public agencies) strategy work. In addition, we reviewed the land administration and cadastral system literature to ensure that the recognized concepts and theories were applied in a meaningful way.

The second step of the process was to design and test the questionnaire. The questionnaire consisted of a total of 24 questions and was designed to take 20 to 25 min to complete. Guided by the knowledge accumulated in the literature review phase, the ques-

tionnaire was designed to cover four thematic categories: (1) Strategy process (13 questions), (2) Strategy goals (3 questions), (3) Connection between strategy and practice (6 questions), and (4) Drivers of strategy work (2 questions). Open questions were preferred (16 of the questions were open questions) since we wanted to collect in-depth responses that allow for qualitative exploration. Open questions also provide the respondents an opportunity to answer more freely and in their own style, or even to question the terms and structure of the questionnaire itself, e.g., [31]. Closed and combination questions (8 questions) were included as well to make the questionnaire more approachable. The category lists for the closed questions were developed by relying mainly on prior knowledge of public sector strategy work. The closed questions with categorical options also included an option like "Other, what?" to allow the respondents to give a response outside the pre-determined range of categories. Scaling and attribute information options were determined by following the general guidelines of questionnaire design [31]. To ensure the functionality of the questionnaire, it was tested on two experts from the National Land Survey of Finland (NLS). Some minor adjustments were made to the questionnaire based on the NLS experts' feedback. This study utilizes only part of the questions. Here, we focus on the replies given to the five questions related to strategy goals and drivers of strategy work:

- Please describe the most important themes or goals in your organization's current strategy. (open question)
- If you can, please describe which themes have gained importance in your organization's strategy over the past 10 years, and on the other hand, which have become less important? (open question)
- How would you describe the purpose and mission of your organization in your own words? (open question)
- Which of the following do you consider as the key drivers of strategy work in your organization? (You can choose multiple options) (closed question with eight options provided)
- Please elaborate on which you consider as the most important drivers for your organization's strategy work, and how they affect the work? (open question)

The third step was data collection. A sample of 28 European national mapping, cadastral, and land registry authorities was contacted with an invitation to answer the questionnaire. We acknowledge that a larger group of national mapping, cadastral, and land registry authorities exist but were lacking direct contact information to potential respondents outside the sample. Moreover, we ensured that the sample included authorities from different parts of Europe to mitigate external validity bias. A link to the questionnaire was sent to one expert from each agency. The recipients hold several kinds of positions in the selected agencies, such as senior adviser, strategy lead, business developer, and director general. All were presumed to have the competence to answer the questionnaire. The recipients were also guided to forward the email and the questionnaire link within their agency if they felt they lacked expertise on the topic. The questionnaire was open for two weeks in May 2021. A reminder email was sent to recipients a few days before the questionnaire form was closed.

We received responses from experts from 18 different agencies from 17 different countries (64% response rate). The participating authorities are listed in Appendix A. As noted earlier, the duties and responsibilities of national mapping, cadastral, and land registry authorities vary. Our sample includes authorities with varying responsibilities. Ten of the responded agencies (56%) are responsible for mapping, cadaster, and land registry-related activities, five (28%) for mapping and cadaster-related activities, two (11%) for mapping activities, and one (6%) for land registry-related activities.

The fourth step was data analysis. Both quantitative (one closed question) and qualitative data (four open questions) were collected. The collected material was first read through to get an overview of the responses. In the closed question, the respondents were asked to select categories, and hence for this question, the coding was pre-determined, making the analysis easy and straightforward. The statistics for the categories were obtained directly

from a data analysis tool of the online platform used. The qualitative data allowed a more in-depth exploration of the agencies' strategy goals and strategy drivers. To avoid "closing" open question responses, no pre-determined descriptive categories were used for these questions. Instead, to capture the nuances and complexities of the replies to open questions and to remain open to what is emerging from the data [32], the qualitative data were coded inductively using content analysis, e.g., [33]. The analysis was conducted using Atlas.ti qualitative data analysis software. The main interest in this study lies in the discovery of regularities. Therefore, the codes were grouped to identify the emerging themes for each of the four open questions. Themes were identified independently by two researchers to validate the findings. The analysis outcomes were then discussed to achieve consensus on the final results.

## 3. Results

This section describes the findings of the questionnaire. We start by outlining the strategy goals the national mapping, cadastral, and land registry authorities pursue through their strategies. We also describe how these goals align with the authorities' purpose and mission statements and how the strategic focal points have developed during the past decade. After that, we report the findings related to drivers of strategy work.

### 3.1. Strategy Goals

### 3.1.1. Reoccurring Themes

The respondents were asked to name the most important strategy goals of their respective authorities. Four main themes emerged when the reported goals were analyzed and grouped together: (1) Digitalization and digital services, (2) Quality, quantity, accessibility, and security of data and services, (3) Customers and needs of society, and (4) Organizational development. Table 1 shows the percentages of respondents that brought up one or more strategy goals related to these themes. It should be noted that themes one to three are strongly intertwined and partly overlapping, particularly from a strategy point of view. This also showed in the replies, as the given answers often combined goals related to these themes under a single sentence.

**Table 1.** The four reoccurring themes of strategy goals.

| Theme | The Percentage of Respondents Expressing Related Goal (s) |
|---|---|
| 1 Digitalization and digital services | 75% |
| 2 Quality, quantity, accessibility, and security of data and services | 56.3% |
| 3 Customers and needs of society | 50% |
| 4 Organizational development | 31.3% |

Digitalization and digital services were mentioned in some form as an important strategic focal point in most (75%) replies. As a backdrop, most of the authorities have already gone through the first wave of digitalization, i.e., shifted from paper maps and documents to information system-based registers and electronic services. The replies clearly showed that the focus has shifted from implementation of electronic services to maintenance and updating them into a more efficient and user-friendly form, as well as to thinking of cadaster and land registry data as part of a wider network of authoritative data. One respondent replied that "We want to help create digital solutions with strategic importance for society". Another respondent replied that one of their goals is "sustainable development and maintenance of the national register and information system ecosystems". In a similar vein, in one reply it was said that the goal is to be "active influencer in ecosystems and networks". Moreover, the creation, development, and maintenance of Spatial Data Infrastructure (SDI) was reported as an important strategic focus by several respondents. "Access to modern SDI" was reported as a strategy goal in one reply. Another

respondent also said that their goal is to create a national spatial data infrastructure that will allow the use of public sector spatial data through a single public access point.

The second theme emerging from responses was Quality, quantity, accessibility, and security of data and services, as in total 56.3 percent of the respondents mentioned related strategy goals. Quality of data refers here particularly to accuracy, up-to-datedness, and usability of data. Quantity of data relates to coverage of data. One respondent mentioned that the goal is "full (cadaster) coverage of the country with highest quality standard". In some replies, the coverage of data was seen more as a question related to the range of data sets available to the public (e.g., an objective to provide building-related data was brought up in one response). The accessibility of data and services was also brought up in several replies. For many respondents, the definition of accessibility was something like "services are easy to use, reliable, and accessible to all public and private parties who wish to use them". Moreover, phrases like "easy access to geospatial data" were used to describe the accessibility goals. Overall, the respondents emphasized that they wish to provide data that is actually used rather than just collect data without any meaningful purpose. Some respondents also contemplated the importance of data accessibility a bit further in their responses. It was considered to be a factor supporting economic growth, as well as the basis of a well-functioning society. The security of services was also mentioned on several occasions. For example, one respondent summarized that the main strategic goal of their organization is "high value and secure services for customers".

Customers and needs of society were present in half (50%) of the replies. Most authorities seem to be aiming for "better services" according to the answers. What better means is, of course, context-dependent, and to fully understand that, we should first understand each authority's current standard of provided services. The general direction in service development seems to be towards services that are accessible with mobile technology. The replies also imply that interest to focus on the creation of services relevant to the customers and society as a whole is widely present among the authorities. For example, one respondent replied that the goal is "to be a data-centric organization and provide added value to customers and society at large". In some replies, it was stressed that the goal is to provide services to citizens, the government, and businesses, perhaps to emphasize that cadastral information has several application domains.

The fourth occurring theme was Organizational development. In total, 31.3 percent of the respondents brought up related strategy goals. One respondent said that one of the main goals is to evaluate the structure of the organization as well as the locations of local offices. Another respondent likewise noted that making an organizational reform is a strategy goal. Moreover, "development of sustainable organization" was mentioned in replies. One reply simply used the word "debureaucratisation" to describe the strategic focal points. Moreover, a goal to be an "attractive workplace" was mentioned.

In addition, the respondents mentioned several goals that fall outside these four themes. For instance, the following strategy goals were brought up in responses: 3D cadaster; innovativeness; internal performance; climate change; territory management; urban issues; landscape issues; creating an environment for a functioning land market; and widespread implementation of innovations and research results.

### 3.1.2. Strategy Goals vs. Purpose and Mission Statements

To get a better grip about the degree to which the strategy goals and the authorities' mission statements align, the respondents were asked to describe the purpose and mission of their agency. As expected, the described purpose and mission statements shared similar features with the strategy goals. The focus on customers, both on public and private sector customers and citizens, was present in the statements as well. Data accessibility, availability, and quality were also mentioned in several responses. Few respondents mentioned that their organization strives to be an initiator or a driving force for digital development or transformation in their respective countries.

The described statements tended to be, however, more concentrated on underlining the public interest or common good perspective of land administration than the strategic goals. "The institute is not for itself, but to serve others", answered one respondent. The mission statements emphasized, for example, the role these authorities have in facilitating economic growth and in ensuring societal stability. The authorities clearly position themselves as geospatial data producers and see that their purpose is to produce data that allows the creation of services, and thereby, to help to facilitate innovation and value creation in society. In one response, the purpose of authority was stripped down to the very core of land administration: "To register land and give a clear picture to the people of what property is owned by whom". Overall, the described statements showed how the authorities strive to be a supporting pillar for society.

### 3.1.3. Temporal Changes in Strategy Goals

We also asked the respondents to name which strategic themes have become more common during the past ten years, and on the other hand, which themes have lost ground during the same period. Somewhat unsurprisingly, similar themes that emerge as the current strategy goal themes were also brought up as the ones that have become more important lately. The responses to this question imply that digital transformation, and shift to electronic services, in particular, has prompted changes in strategic focal points. One respondent explained that during the past decade, a shift from the delivery of data and products to access of data has taken place. In another response, temporal changes in strategy interests were described followingly: Back in 2012 the focus was on the implementation of the obligatory tasks and development of information systems, and in 2017 the focus had shifted to transferring services into an electronic environment and to improving customer services. Now, in 2021, the focal points of the strategy are still in register management, improvement of information systems, development of electronic services, and improvement of customer service. However, the improvements are more related to innovation than formal compliance. More emphasis is also given to issues such as the efficiency of register keeping and open data.

Terms such as cooperation, users, use of data, sharing information, value chains, ecosystems, networks, and smart built environment occurred in many answers. This reinforces the view that cadaster and land registry data is increasingly seen as part of a wider network, and instead of focusing purely on their own processes, the authorities are aiming to build stronger networks and ecosystems to create better services to citizens. Furthermore, a couple of respondents noted that the dimensions of cadastral data have been expanding as well. Public law restrictions and utility mapping were mentioned as examples of new types of data recorded in cadastral systems. Moreover, 3D cadaster, and particularly 3D cadaster that provides data for web services, was used as an example of expanding dimensions of cadastral information. The streamlining of processes and digitization of legal processes was also brought up as a topic that has gained importance in recent years. Finally, some respondents mentioned that sustainability issues, such as climate change and social sustainability, have lately emerged as strategic focal points in their organizations.

The responses included fewer references to themes that have lost importance in strategies during the past decade. However, the answers clearly point out that traditional land surveying, digital archives, and map production are disappearing from the agenda. One respondent noted that internal process efficiency as such is no longer a point of interest in the strategy. Interestingly some respondents mentioned that the focus on data quality is diminishing, while some others stressed that the importance of data quality has been increasing lately.

### 3.2. Drivers of Strategy Work

This study also explores what drives strategy work at national mapping, cadastral, and land registry authorities. Eight different drivers were listed in the questionnaire, and

the respondents were asked to select which of them drive the strategy work at their agency. The respondents could select multiple options. The given options were determined based on the literature review conducted as the first step of the study. In particular, studies on strategy work at public agencies, e.g., [10,11], guided the selection and formulation of the given options. Figure 2 summarizes responses to this question. The respondents were also asked to elaborate in a follow-up question which drivers they consider as the most important drivers for their respective agency's strategy work and how these drivers affect the strategy work.



**Figure 2.** Drivers of strategy work in descending order.

Two options were selected by 65 percent of the respondents: Responding to changing customer needs and policy changes by the government. Three options, namely Changes in budget or other available resources, need to renew practices due to changes in the business environment or responsibilities of the organization and preparing for future changes in the business environment were all selected by 59 percent of the respondents. We note that in this stydy, the terms business environment and operational environment are treated as synonyms to describe the action space, i.e., the combination of socio-cultural, political, ecological, and economic factors, inside which an authority operates. The remaining options were picked less frequently. Twenty-four percent of the respondents said that the orders or will of the top management drive the strategy work at their agency. New research information or recommendations by international organizations was considered as a driver of strategy work by 18 percent of the respondents. The option that was considered as the least influential driver was direct orders of politicians or the government. Eighteen percent of the respondents thought some other drivers affect the strategy work at their agency. This implies that the given options cover the actual drivers of strategy work relatively well.

The responses to the follow-up question imply that there is no consensus about the most important driver of strategy work of these authorities. The importance of understanding and preparing for changes in the business environment was stressed often, as was the need to renew practices and business models due to such changes. Preparing for future changes in the business environment was seen, for example, as "essential for the efficiency and direction of the agency". One respondent mentioned that "New technologies challenge our operating model", hinting that the potential impacts of new technologies are pondered on a deeper level. Another respondent stressed that it is important to scan, in particular, the changing information technology (IT) landscape since register keeping ultimately functions through IT systems.

Furthermore, responding to changing customer needs was mentioned in several responses as the most important driver of strategy work. For example, it was said that

"there is a constant need to develop operations to meet the needs of customers and partners". In another response, the need to ensure effective and reliable services to citizens was seen as a driver for strategy work. In general, the responses to this question show that the authorities reflect their development and strategy work as something that is performed to serve "society's needs". The availability of funding and budget changes was also brought up by some respondents, which was expected considering that most of these authorities rely at least partly on government funding.

## 4. Discussion

National mapping, cadastral, and land registry authorities are public agencies responsible for producing, upkeeping, and the delivery of cadastral information. We recognize clear patterns in what type of goals these authorities pursue through their strategies. The focus is on technology (digitalization, in particular), data properties, serving customers and society, and on organizational development. When the findings are reflected in light of the ideals of land administration systems, such as those described by Enemark et al. [3], we can see that practice and theory align to a great extent. Enemark et al. [3] stated that a good, neutral LAS has four qualities. The authorities seem to be corresponding widely to the first three of these demands through their strategies. The identified strategy interests clearly demonstrate an objective to "serve the needs of governments, businesses, and the public" (quality 1). The current focus seems to be on creating "better services" or "relevant services", indicating that the authorities are increasingly (re)considering what are the user's needs in the era of e-government and digitalizing societies and trying to respond to them. Similar observations have been made before, for instance, by Krigsholm et al. [34] and Todorovski and Lemmen [35]. In their described purpose statements, the authorities also heavily emphasize this quality and the aim to serve society by enabling and advancing innovation and value creation. In this regard, the agencies demonstrate strong horizontal and downward accountability [12].

The second quality of a good LAS, "utilize the latest technologies", is explicitly visible in the strategies. The strong emphasis on technological megatrends as the main driving forces for mature cadastral systems has been noted previously as well [7]. The findings of this study attest to the impression that land administration professionals emphasize the technical aspect of land administrative tasks when envisioning and sketching future directions. The authorities do not seem to accentuate certain technologies or technological solutions in their strategies but rather formulate general objectives related particularly to digitalization. It should be noted, however, that the authorities are not a homogenous group in this regard. Some show ambitions to be a frontrunner in the digital transformation of government services in their respective country. Some other authorities, in contrast, are, according to our findings, still in the stage of setting up spatial data infrastructures and indicate no intention of becoming active leaders of transformation. This division fits a categorization developed by Pollitt and Bouckaert [36], who compared NPM reforms across countries and distinguished between maintaining countries, modernizing countries, marketizing countries, and minimizing countries. We find evidence, particularly of maintaining countries that lean toward preserving the status quo by taking incremental steps to current structures and practices and of modernizing countries that acknowledge the need for fundamental changes in organizing the administrative system.

The findings show that the third quality of a good LAS, "accounts for rights, restrictions, responsibilities, and risk related to land", is also integrated into strategies of national mapping, cadastral, and land registry authorities. The authorities brought up goals such as increasing the coverage of cadaster and enhancing the quality of data and services. However, the authorities seem to share a rather static view on what type of RRRs and risks should be accounted for in cadasters and land registries. Only a few respondents brought up the expanding dimensions of cadaster and land registry information and how this expansion is visible in their strategies. In the academic literature, the prospects of increasing vertical exploitation of real property to land administration and cadastral systems have

been studied extensively, see, e.g., [37,38]. Yet, a persistent gap has existed between the technical abilities to produce multi-dimensional geospatial (cadastral) information and the delivery of such information by the national mapping, cadastral, and land registry authorities. Ho et al. [39] have noted that budgetary constraints of public agencies are a major factor constraining 3D geoinformation innovation. Since conversion from two-dimensional to multi-dimensional information would present a paradigm shift for the agencies, other costs than just investments in technical architecture, such as educating personnel, need to be considered as well, and such investments have thus far not been economically feasible [39]. According to our findings, the authorities do not strongly stress the impact of budget constraints on their operations and strategy contents, but they do see, however, changes in budget or other available resources as an important driver of strategy work. One interpretation is that even though the NPM-based doctrine of the economy in the use of scarce public resources, e.g., [40], is not heavily present in our data, the availability of resources constrains the selection of strategy goals, i.e., the goals are set close to status quo by default due to limited resources.

The fourth quality, "delivers broad information about sustainable development", is the one with the weakest connection to the identified strategic focal points. Though few respondents mentioned climate change and sustainable development as strategy goals, a great majority did not stress sustainability themes or a goal to deliver information about sustainable development in their answers. This is a somewhat surprising finding considering that political ambitions of curbing global average temperatures have increased, and all levels of government are expected to frame, catalyze, and operationalize successful contributions to climate change mitigation and adaptation, e.g., [41]. In addition, it is increasingly acknowledged that land tenure security, one of the basic functions of LAS [1,3], underpins many of the UN Sustainable Development Goals (SDGs) [42]. It should be noted though, that the authorities might have considered this quality as something that is built into other strategic goals, such as serving the needs of society and hence did not stress sustainability themes separately here. The authorities might also state their actions that are aimed to advance sustainable development through other documents, processes, or projects than strategy. Our approach did not allow for this type of further examination of the reasons behind this observation.

We also note that the concept of sustainable development is constantly evolving and often poorly understood [43]. The lack of conceptual coherence makes it challenging for both practitioners and researchers to define the role land administration could and/or should play in supporting sustainable development. Our findings hint that a more coherent discourse on sustainable development is needed amongst practitioners to illuminate the contribution of national mapping, cadastral, and land registry authorities toward sustainable development. For instance, as producers of (increasingly) reliable, accurate and up-to-date information on property boundaries, RRRs, and the different uses of land, the authorities could contribute to the creation of indicators that monitor progress towards SDGs and particularly goals, such as "Sustainable Cities and Communities" (SDG 11) and "Life on Land" (SDG 15). Furthermore, studies in the field of land administration have already noted some time ago that emerging land (market)-related interests and commodities, such as carbon credits, could be managed through or in relation to LAS [44,45]. Wallace and Williamson [44] also argued that a change in LAS design to this direction is likely to face many barriers, from software systems limitations to a lack of political will to carry out such large-scale reforms to existing systems. Our findings, in part, exemplify that such barriers exist, as we observe virtually no initiatives towards a LAS that would support the achievement of sustainability objectives more efficiently than the current systems do.

The findings related to the drivers of strategy work are consistent with the public sector strategy literature. Particularly, we can detect associations to basic features of public agencies [10,11] and the interpretative repertoires of Höglund and Svärdsten [17], as the authorities replied that the strategy work is driven most often by policy changes by the government, as well as by changing customer needs. In open-ended questions, the

respondents emphasized the importance of understanding and preparing for changes in the business environment. This implies that the authorities recognize that their operational environment is becoming increasingly complex and uncertain. However, paradoxically, under one-fifth of the authorities reportedly connect their strategy work and strategic focal points to new research information or recommendations by international organizations in the field. This is interesting, considering that for science and technology-related fields, such as the field of land administration, futurists have considered academic and scientific journals as one of the best sources to detect weak signals and thereby to anticipate future changes in business and operational environments [46].

Since in the questions related to drivers of strategy work, the respondents were asked to provide answers based on a pre-determined list of categories, it is important to note that the respondents' differing interpretations of the given options might fuddle the findings. For instance, the options Policy changes by the government and Direct orders of politicians or the government are intended to describe differing situations—in the first one, an authority is assumed to have substantial autonomy over the strategy work even though policy changes by the government affect the strategic focal points, while the latter option describes a case where there is much less—if any—autonomy over the strategy work. It is possible, however, that the respondents have interpreted the options and the related nuances differently. Actually, it is realistic to assume that the words, categories, and concepts do not carry the same meaning for all respondents [31]. In this study, we have attempted to minimize the variation in interpretations by carefully designing the range of categories and the category descriptions and by testing the questionnaire with experts before data collection but acknowledge that the use of closed questions and pre-determined categories in a questionnaire inevitably affects the validity of the findings.

We note that there are some other limitations to the findings of this study as well. First, we need to acknowledge the limitations related to the sample size and representativeness of the sample. This study did not intend to research a representative sample of national mapping, cadastral, and land registry authorities. The data collection was restricted to authorities operating in European countries and further narrowed down to a group of authorities to which we had contact information and who were known to be engaged in international knowledge exchange and cooperation. With the chosen approach of questionnaire implementation, we were able reach a relatively high response rate (64%). We note, however, that there might be some bias to the findings. Respondents from similar country contexts, namely from small, northern European countries, are heavily presented in the sample. This might create a too strong perception, particularly of the convergence of the strategy goals of the authorities. It is also possible that authorities with significant attention to strategy work were more likely to answer the questionnaire. In preliminary questions, some authorities indicated that they do not conduct formal strategy work regularly since their purpose is to follow the strategy and rules of the government. This shows that the authorities do not form a homogenous group from the perspective of administrative autonomy, either.

Furthermore, our analysis was restricted to questionnaire responses. Even a carefully designed and implemented questionnaire has limits regarding the depth of coverage, see, e.g., [31]. Therefore, complementary methods and data sources are called for a more detailed look into the authorities' strategy contents and current strategic focal points. Our initial plan was to collect the official strategy documents of the questionnaire sample, to gain a deeper understanding of the strategic focal points and to validate the questionnaire findings, and we even requested them from the recipients. However, only seven authorities delivered such a document, and hence the formal analysis was restricted to the questionnaire responses. The received strategy documents were scrutinized, and they show that the questionnaire responses match, to a great extent, the contents of the official documents. However, since we were not able to access over half of the authorities' official strategy documents, the generalizability of this observation should be considered carefully. In addition, a review of the seven official documents showed that these documents are often kept short

and concise and that substantial variation exists content-wise. Some authorities present, for instance, goal-related measures or indicators and the set targets in the documents, while others rely on a more visual presentation with less information available about the strategy implementation. Hence, collecting comparable, in-depth information about the strategy goals and strategy drivers would require a (semi-)structured and tailored data collection method, such as interviews.

## 5. Conclusions

Land administration and cadastral systems are constantly evolving. National mapping, cadastral, and land registry authorities, as public agencies responsible for carrying out land administrative tasks in many countries, have a significant role in shaping the development of land administration and cadastral systems. Our study provides an overview of the strategy goals and strategy drivers of a group of European national mapping, cadastral, and land registry authorities. We find that the authorities often pursue goals related to (1) the digitalization and digital services, (2) quality, quantity, accessibility, and security of data and services, (3) customers and needs of the society, and (4) organizational development. The strongest drivers of strategy work are changing customer needs and policy changes by the government. These findings are likely to generalize at least partly to all countries operating a mature cadastral system.

The digital transformation of societies, and public services, in particular, has affected the authorities' strategic focal points profoundly in recent years: Increasing attention is given to issues, such as access to data and the security of data and services, as well as to cooperation and creation of value chains or ecosystems to public data production and services to provide better services to citizens. The impacts of digitalization have extended to legal processes in some countries, and this kind of development is likely to accelerate in the future. Our study also points out that other pressures, such as climate change, urbanization, and more intense exploitation of land, are, for the most part, neglected in the authorities' strategies. For cadastral systems, responding to these pressures would require more transformative or even paradigmatic changes than to, for example, technological developments or social movements, such as open data and increasing accessibility to public data.

Comprehensive explorations of the strategy goals and strategy drivers of national mapping, cadastral, and land registry authorities have been missing thus far. Hence our study provides a starting point for discussions about the role of these authorities' strategies and strategic focal points. We argue that this kind of discussions are urgently needed. As our findings show, the authorities are able to formulate goals and directions beyond the status quo, but simultaneously we observe that many of the authorities lack a comprehensive vision about their own development. Furthermore, it is relevant to ask whether an updated version of a shared vision for cadastral system development is needed. Publications, such as Cadastre 2014 [47] and Cadastre 2014 and beyond [24], have been influential for the whole land administration sector, but in a rapidly changing world, they no longer address many of the issues and pressures the authorities are facing today.

Our seminal contribution also helps to detect several potential future research avenues. The authorities seem to acknowledge the rapid changes taking place in the operational environment but appear to be lacking tools and methods to identify relevant changes and their potential implications for land administrative tasks. Therefore, more research on how to promote and implement anticipatory governance of national mapping, cadastral, and land registry authorities is needed. Second, as the anticipated shift to a LAS that widely supports the delivery of information about sustainable development [3,44] has not manifested, studies addressing the barriers to this would be a welcome contribution to the land administration literature. Finally, it would be highly interesting to explore how much, and through which channels, steering from the government actually guides the formulation of strategies at national mapping, cadastral, and land registry authorities. The authorities are navigating in a pluralistic context where the interests of multiple stakeholders need to

be met under budgetary constraints. Conceptualizing this reality would help to understand the strategy work of these authorities on a deeper level.

## Appendix A

**Table A1.** The participating organizations and their responsibilities as listed by EuroGeographics (https://eurogeographics.org/, last accessed on 22 December 2021).

| Country | Agency | Mapping | Cadaster | Land Registry |
|---|---|---|---|---|
| | | **Responsibilities** | | |
| Austria | Federal Office of Metrology and Surveying (BEV) | x | x | |
| Bulgaria | Geodesy, Cartography and Cadastre Agency | x | x | x |
| Croatia | State Geodetic Administration | x | x | |
| Czech Republic | Czech Office for Surveying, Mapping and Cadastre | x | x | x |
| Denmark | The Danish Agency for Data Supply and Efficiency | x | | |
| Denmark | The Danish Geodata Agency | x | x | |
| Finland | National Land Survey of Finland | x | x | x |
| Germany | Landesamt für Geoinformation und Landesvermessung Niedersachsen (LGLN) | x | x | |
| Iceland | The National Land Survey of Iceland | x | | |
| Lithuania | State Enterprise Centre of Registers | x | x | x |
| Malta | Malta Land Registry | | | x |
| The Netherlands | Cadastre, Land Registry and Mapping Agency (Kadaster) | x | x | x |
| Poland | Head Office of Geodesy and Cartography | x | x | |
| Portugal | Directorate General for Territory | x | x | |
| Romania | National Agency for Cadastre and Land Registration of Romania | x | x | x |
| Sweden | The Swedish mapping, cadastral and land registration agency (Lantmäteriet) | x | x | x |
| Switzerland | Federal Office of Topography (Swisstopo) | x | x | x |
| Ukraine | The State Service of Ukraine for Geodesy, Cartography and Cadastre | x | x | x |

## References

1. Williamson, I.; Enemark, S.; Wallace, J.; Rajabifard, A. *Land Administration for Sustainable Development*, 1st ed.; ESRI Press Academic: Redlands, CA, USA, 2010; ISBN 9781589480414.
2. Van der Molen, P. The dynamic aspect of land administration: An often-forgotten component in system design. *Comput. Environ. Urban Syst.* **2002**, *26*, 361–381. [CrossRef]
3. Enemark, S.; Williamson, I.; Wallace, J. Building modern land administration systems in developed economies. *J. Spat. Sci.* **2005**, *50*, 51–68. [CrossRef]
4. Enemark, S. Understanding the land management paradigm. In Proceedings of the Innovative technology for Land Administration, a Symposium Held by FIG commission 7, University of Wisconsin, Madison, WI, USA, 24–25 June 2005; International Federation of Surveyors: Copenhagen, Denmark, 2006; pp. 17–27.
5. Steudler, D.; Rajabifard, A.; Williamson, I.P. Evaluation of land administration systems. *Land Use Policy* **2004**, *21*, 371–380. [CrossRef]
6. Ting, L.; Williamson, I.P. Cadastral Trends: A Synthesis. *Aust. Surv.* **1999**, *44*, 46–54. [CrossRef]
7. Krigsholm, P.; Zavialova, S.; Riekkinen, K.; Ståhle, P.; Viitanen, K. Understanding the future of the Finnish cadastral system—A Delphi study. *Land Use Policy* **2017**, *68*, 133–140. [CrossRef]
8. Bennett, R.; Rajabifard, A.; Kalantari, M.; Wallace, J.; Williamson, I. Cadastral futures: Building a new vision for the nature and role of cadastres. In Proceedings of the FIG Congress 2010, Facing the Challenges–Building the Capacity, Sydney, Australia, 11–16 April 2010.
9. Krigsholm, P.; Riekkinen, K.; Ståhle, P. Pathways for a future cadastral system: A socio-technical approach. *Land Use Policy* **2020**, *94*, 104504. [CrossRef]
10. Pollitt, C.; Talbot, C.; Caulfield, J.; Smullen, A. *Agencies. How Governments Do Things through Semi-Autonomous Organisations*; Palgrave Macmillan: Basingstoke, UK, 2004.
11. Johanson, J.-E. Strategy formation in public agencies. *Public Adm.* **2009**, *87*, 872–891. [CrossRef]
12. Colin, S. Accountability in the Regulatory State. *J. Law Soc.* **2000**, *27*, 38–61.
13. Hansen, J.R.; Ferlie, E. Applying Strategic Management Theories in Public Sector Organizations: Developing a typology. *Public Manag. Rev.* **2014**, *18*, 1–19. [CrossRef]
14. Andrews, R.; Van de Walle, S. New Public Management and Citizens' Perceptions of Local Service Efficiency, Responsiveness, Equity and Effectiveness. *Public Manag. Rev.* **2013**, *15*, 762–783. [CrossRef]
15. Rainey, H.G. *Understanding and Managing Public Organizations*, 4th ed.; Jossey-Bass: San Francisco, CA, USA, 2009.
16. Jarzabkowski, P.; Fenton, E. Strategizing and Organizing in Pluralistic Contexts. *Long Range Plan.* **2006**, *39*, 631–648. [CrossRef]
17. Höglund, L.; Svärdsten, F. Strategy work in the public sector—A balancing act of competing discourses. *Scand. J. Manag.* **2018**, *34*, 225–232. [CrossRef]
18. Osborne, S.P. The New Public Governance? *Public Manag. Rev.* **2006**, *8*, 377–387. [CrossRef]
19. Torfing, J.; Triantafillou, P. What's in a Name? Grasping New Public Governance as a Political-Administrative System. *Int. Rev. Public Adm.* **2013**, *18*, 9–25. [CrossRef]
20. Ronda-Pupo, G.A.; Guerras-MartIn, L. Dynamics of the evolution of the strategy concept 1962–2008: A co-word analysis. *Strat. Manag. J.* **2011**, *33*, 162–188. [CrossRef]
21. Hambrick, D.C.; Fredrickson, J.W. Are you sure you have a strategy? *Acad. Manag. Exec.* **2001**, *15*, 48–59. [CrossRef]
22. Weiser, A.; Bickel, M.W.; Kümmerer, K.; Lang, D.J. Towards a more sustainable metal use–Lessons learned from national strategy documents. *Resour. Policy* **2020**, *68*, 101770. [CrossRef]
23. European Land Registry Association. Land Registries & Cadastres in Europe. Land Registries & Cadastres. Available online: https://www.elra.eu/facts-sheets/land-registries-cadastres-in-europe/2-land-registry-and-the-cadaster/ (accessed on 22 December 2021).
24. De Vries, W.T.; Laarakker, P.M.; Wouters, H.J. Living apart together: A comparative evaluation of mergers of cadastral agencies and public land registers in Europe. *Transform. Gov. People Process Policy* **2015**, *9*, 545–562. [CrossRef]
25. Riekkinen, K.; Toivonen, S.; Krigsholm, P.; Hiironen, J.; Kolis, K. Future themes in the operational environment of the Finnish cadastral system. *Land Use Policy* **2016**, *57*, 702–708. [CrossRef]
26. FIG. *Cadastre 2014 and Beyond*; e-Publication; Steudler, D., Ed.; FIG: Copenhagen, Denmark, 2014; 73p, Available online: https://fig.net/resources/publications/figpub/pub61/Figpub61.pdf (accessed on 22 December 2021).
27. LINZ. Land Information of New Zealand. In *Cadastre 2034–A 10–20-Year Strategy for Developing the Cadastral System: Knowing the 'Where' of Land-Related Rights*; e-Publication; Land Information of New Zealand: Wellington, New Zealand, 2014. Available online: https://www.linz.govt.nz/land/surveying/survey-system/cadastre-2034 (accessed on 22 December 2021).
28. United Nations General Assembly. *Transforming Our World: The 2030 Agenda for Sustainable Development*; United Nations General Assembly: New York, NY, USA, 2015.
29. Dunne, C. The place of the literature review in grounded theory research. *Int. J. Soc. Res. Methodol.* **2011**, *14*, 111–124. [CrossRef]
30. Boell, S.K.; Cecez-Kecmanovic, D. A Hermeneutic Approach for Conducting Literature Reviews and Literature Searches. *Commun. Assoc. Inf. Syst.* **2014**, *34*, 12. [CrossRef]
31. Schira, M.M.; Spehar, B. Differential effect of contrast polarity reversals in closed squares and open L-junctions. *Front. Psychol.* **2011**, *2*, 47. [CrossRef]

32. Holton, J.A. From Grounded Theory to Grounded Theorizing in Qualitative Research. In *The SAGE Handbook of Qualitative Business and Management Research Methods: History and Traditions*; Sage Publishing: Thousand Oaks, CA, USA, 2018.

33. Weber, R. *Basic Content Analysis*, 2nd ed.; Sage Publishing: Thousand Oaks, CA, USA, 1990.

34. Krigsholm, P.; Riekkinen, K.; Ståhle, P. The Changing Uses of Cadastral Information: A User-Driven Case Study. *Land* **2018**, *7*, 83. [CrossRef]

35. Todorovski, D.; Lemmen, C. Analysis of User Requirements: The First Step towards Strategic Integration of Surveying and Cadastral Services. In Proceedings of the FIG Working Week 2007, Hong Kong SAR, China, 13–17 May 2007; International Federation of Surveyors (FIG): Copenhagen, Denmark, 2007. Available online: http://www.fig.net/pub/fig2007/papers/ts_7g/ts07g_01_todorovski_lemmen_1202.pdf (accessed on 22 December 2021).

36. Pollitt, C.; Bouckaert, G. *Public Management Reform—A Comparative Analysis*, 2nd ed.; Oxford University Press: Oxford, UK, 2004.

37. Van Oosterom, P. Research and development in 3D cadastres. *Comput. Environ. Urban Syst.* **2013**, *40*, 1–6. [CrossRef]

38. Stoter, J.; Ploeger, H.; van Oosterom, P. 3D cadastre in the Netherlands: Developments and international applicability. *Comput. Environ. Urban Syst.* **2013**, *40*, 56–67. [CrossRef]

39. Ho, S.; Crompvoets, J.; Stoter, J. 3D Geo-Information Innovation in Europe's Public Mapping Agencies: A Public Value Perspective. *Land* **2018**, *7*, 61. [CrossRef]

40. Verhoest, K.; Verschuere, B.; Peters, B.G.; Bouckaert, G. Controlling autonomous public agencies as an indicator of New Public Management. *Manag. Int.* **2004**, *9*, 25–35.

41. Amundsen, H.; Hovelsrud, G.K.; Aall, C.; Karlsson, M.; Westskog, H. Local governments as drivers for societal transformation: Towards the 1.5 °C ambition. *Curr. Opin. Environ. Sustain.* **2018**, *31*, 23–29. [CrossRef]

42. Unger, E.-M.; Bennett, R.M.; Lemmen, C.; Zevenbergen, J. LADM for sustainable development: An exploratory study on the application of domain-specific data models to support the SDGs. *Land Use Policy* **2021**, *108*, 105499. [CrossRef]

43. Mensah, J. Sustainable development: Meaning, history, principles, pillars, and implications for human action: Literature review. *Cogent Soc. Sci.* **2019**, *5*, 1653531. [CrossRef]

44. Wallace, J.; Williamson, I. Developing cadastres to service complex property markets. *Comput. Environ. Urban Syst.* **2006**, *30*, 614–626. [CrossRef]

45. Bennett, R.; Wallace, J.; Williamson, I. Organising land information for sustainable land administration. *Land Use Policy* **2008**, *25*, 126–138. [CrossRef]

46. Hiltunen, E. Good sources of weak signals: A global study of where futurists look for weak signals. *J. Futures Stud.* **2008**, *12*, 21–44.

47. FIG. *Cadastre 2014—A Vision for a Future Cadastral System*; e-Publication; Kaufmann, J., Steudler, D., Eds.; 1998; 38p., Available online: https://www.fig.net/resources/publications/figpub/cadastre2014/translation/c2014-english.pdf (accessed on 22 December 2021).