

## Article

# Perspectives on Comprehensive Sustainability-Orientation in Municipalities: Structuring Existing Approaches

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**Abstract:** Municipalities play an important role in fostering sustainable development at the local level. Yet, they still face significant challenges in comprehensively integrating sustainability aspects into administrative action. In order to overcome real or perceived barriers to implementing sustainability into administrative practices comprehensively, this article presents a structured set of 19 fields of sustainability-orientation in local administrations derived from a literature review, considering international scientific and German practical perspectives. Our findings indicate that the resulting fields of sustainability-orientation differ in their potential to foster change towards sustainability in a complex administrative system. Furthermore, there is evidence that the reviewed scientific documents in particular insufficiently illustrate comprehensive approaches for ingraining sustainability-orientation in local administrations. Based on the findings, we outline implications for further research in order to better meet the challenges of enhancing sustainable practice in local administrations.

**Keywords:** sustainable municipalities; sustainability-oriented organizational development; system intervention, sustainability integration, local sustainable development

## 1. Introduction

With the adaption of the Sustainable Development Goals (SDGs) as part of the 2030 Agenda for Sustainable Development in 2015 [1], the SDGs are potentially expected to be integrated into strategies at the national, regional and local levels. Local communities play an undisputed important role for implementing sustainable development [2,3]. From a theoretical perspective there is a rich body of literature, which provides vital knowledge in order to foster local sustainability transition. Examples include frameworks, e.g., transition management [4–6] and strategic niche management [6,7], research approaches, e.g., laboratories and experiments [8,9] and concepts, e.g., governance [10–12] and resilience [13–15]. With the aim of tracking current progress, the United Nations Department of Economic and Social Affairs has launched a call for submissions of contributions to the implementation of the 2030 Agenda and the SDGs [16]. However, besides other relevant actors who operate at this level—such as civil society actors, businesses in the local economy, and non-governmental organizations—municipalities play an essential role in fostering sustainable development. The latter are key institutions responsible for providing public services and, therefore, have substantial effects on the quality of life and the environment in localities, both directly and indirectly.

This is illustrated by the complex and manifold spectrum of tasks enacted by local administrations. Article 28 of the German constitution, for instance, defines the core task of local administrations as follows: to manage the concerns of the public community in terms of services for

the public. Local administrations prepare and implement political decisions, manage public property and infrastructure, are responsible for educational and cultural services as well as healthcare, execute laws at different administrative levels, and provide places to undertake official matters [17]. Related to this portfolio, local administrations enact multiple roles since they are part of the state, as well as the economic and the societal system [18] and, as a consequence, they operate in an area of tension between politically driven public purposes, legal regulation and control, and city specific requirements [19]. Agenda 2030 challenges municipalities to integrate the concept of sustainability into their complex spectrum of tasks, e.g., considering inter- and intra-generational equity, as well as environmental integrity [20]. In order to meet this requirement, local administrations have to integrate sustainability-orientation throughout their entire organization comprehensively. In the following sections we clarify the terms sustainability-orientation in local administrations

Departing from a systems perspective, in this article we understand local administrations as constituted by individuals and groups, aims, structures and processes, as interfaces to external actors and organizations—as well as the existing interrelations and interactions among these elements. This understanding emerges from the following theoretical considerations. First, an understanding that ‘organizations are systems of coordinated actions between individuals and groups whose preferences, information, interests, or knowledge differ’ [21] (p. 2). Secondly, administrations are understood as special types of organizations, that have particular features that must also be considered: (1) their constitution is influenced by bureaucratic forms of organization; and (2) they have a legitimizing orientation on common welfare. Furthermore, administrations need to cope with (3) externally dominated aims, (4) distinct relations to politics and other administrative units, and (5) other external relations for regulating various societal domains [19]. These features illustrate that administrations are strongly affected by relations among internal and external structures and actions.

Additionally, the integration of the normative guiding concept of sustainable development causes a shift in the perspective on welfare because, for example, aspects related to integrity and equity are taken into consideration. This reorientation necessitates organizational adaption in local administrations, which is associated with a paradigm shift and should entail all levels of organization, involve all parties concerned and facilitate learning and solution-oriented processes [22–24]. Sustainability-orientation means that the concept of sustainability is reflected in the entirety of administrative practice, namely the organizational and task-related perspective [22,25]. Furthermore, according to Senge [26] systems thinking is essential for organizational learning and development. Understanding local administrations as dynamic systems with interacting units, requires dealing with the entire system and its complexity, as well as understanding its behavior in order to integrate sustainability into municipalities. In regards to more effectively managing complex systems, Donella Meadows [27] proposed a hierarchy of 12 intervention points, which differ in their potential to accomplish transformational change in a system towards sustainability (Figure 3). This concept might be helpful with regard to integrating sustainability-orientation into local administrations.

Earlier efforts to integrate sustainability aspects into administrative activity have been made. As a result of the Rio conference and the European Conference on Sustainable Cities in Aalborg in the 90s, processes to implement the Local Agenda 21 were initiated. These processes involved practical projects and activities, as well as innovative ways for citizens’ to participate, and have mainly affected the external dimension of communities [28], but often lacked long-term successes [29]. Furthermore, in local administrations a variety of sustainability instruments, often adapted from the private sector, have been applied [25,30]. These attempts have, however, been criticized for not being tailored enough to the requirements of the public sector [31–33]. Few comprehensive approaches exist for integrating sustainability into the organization of administration, which mainly lean on management tools and concepts [30,34–36], and, moreover, embrace organizational culture, governance and the relation between administration and politics [17]. Still, there remains a lack of translation of sustainability visions, goals, and strategies into local action [37,38], as well as a lack of effective attempts to comprehensively integrate sustainability aspects into administrative organization in German municipalities [30]. Thus, the implementation of sustainability-orientation in local

governmental institutions is understood as a precondition for successfully governing sustainable development [39].

The purpose of this article is to provide a structured overview of the status quo in the fields of integrated sustainability-orientation in local administrations, as represented in the literature. Therefore, this article aims to answer the following research questions:

1. Which fields of sustainability-oriented local administrations are represented in the literature on sustainable municipalities?
2. How can the identified fields of sustainability-oriented local administrations be structured?
3. Which differences and similarities exist with regard to the identified fields of sustainability-orientation between the documents representing scientific and practical perspectives?
4. What implications can be inferred from the results for research and practical developments on sustainability-oriented local administrations?

In order to identify fields of sustainability-oriented local administrations, we systematically reviewed literature focused on the perspectives reported in international scientific contributions and in practical contributions for the case of Germany. In order to structure the resulting fields, we assigned them to components derived from theoretical concepts originating in systems thinking. To uncover differences and similarities between the perspectives, we applied descriptive statistics. Finally, we synthesized the results. In the following section, we describe the applied procedure and methods of our research, before presenting the results. In the discussion we highlight and debate core results and conclude with recommendations for further research and practical development.

## 2. Materials and Methods

To address the research questions, we conducted a structured literature review in which we incorporated 19 documents representing four perspectives on sustainable municipalities from science and practice (Table 1). The scientific perspective was covered by (1) scientific articles (SA). Practical perspectives were represented by (2) European city commitments (ECC), (3) German national reports (GNR) and (4) reports and guidelines resulting from research and development projects in Germany (RDP).

To identify and select relevant *scientific* articles, we used the following search criteria: first, documents focused on local administrations in communities in industrialized countries; second, texts focused on aims, tasks, demands etc. in order to support a sustainability-oriented organization of local administrations. Articles only focusing on specific sustainability topics such as transport, health, energy, etc., or specific sustainability instruments like indicators were excluded. Third, the articles represent the authors' research and were not, for instance, a summarizing, introductory text to a special issue of a journal. Fourth, the text was available on the Internet in German or English. We used Scopus to conduct our search and applied a search string that contained keywords according to the search intention and the aforementioned criteria (for details see the Appendix A). As a result, we identified 741 articles (considering the years 1995 until 2016). By first checking the title and secondly searching the abstract, we filtered the relevant articles to identify those with study-related content.

The documents relating to the *practical* perspectives represent different administrative levels, authorships and purposes. Their focus is all on German communities and documents at the EU-level also beyond. Even though they might imply different understandings of sustainability, they aim to support local sustainable development. The documents of the groups ECC and GNR directly address the political-administrative level of communities, while documents of the group ECC are optional commitments on sustainable community development and build on each other—they are part of the European Sustainable Cities and Towns Campaign. Documents belonging to the GNR group contain one document authored by the federal government [40] that is part of the German Sustainability Strategy, and a publication by Grabow et al. [41] that resulted out of the major network 'Sustainable City', initiated by the Council for Sustainable Development. It aims to develop contributions to implement the National Sustainability Strategy. The documents of the RDP group address the authorities of German municipalities, as well as interested practitioners. These documents contain

application-oriented guidelines on local sustainable development with different foci and base on experiences in German municipalities.

**Table 1.** Overview of the documents analyzed in the literature review considering four different document groups.

Perspective	Document group	Author / editor	Title	Year	Scope of regional reference	Reference
Scientific	Scientific articles (SA) N = 13	a) R. Steurer	From Government Strategies to Strategic Public Management: An Exploratory Outlook on the Pursuit of Cross-Sectoral Policy Integration	2007	Europe	[42]
		b) G. Enticott, R.M. Walker	Sustainability, Performance and Organizational Strategy: An Empirical Analysis of Public Organizations	2008	England	[43]
		c) I.M. Garcia-Sanchez, J.-M. Prado-Lorenzo	Determinant Factors in the Degree of Implementation of Local Agenda 21 in the European Union	2008	Europe	[44]
		d) A. Caragliu, del B. Chiara, P. Nijkamp	Smart Cities in Europe	2009	Europe	[45]
		e) D.J. Fiorino	Sustainability as a Conceptual Focus for Public Administration	2010	International	[46]
		f) G.A. Horváth	Administrative Systems and Reforms across the European Union - towards Sustainability?	2011	Europe	[47]
		g) Y. Glemarec, J.A. Puppim de Oliveira	The Role of the Visible Hand of Public Institutions in Creating a Sustainable Future	2012	International	[48]
		h) A. Merrit, T. Stubbs	Complementing the Local and Global: Promoting Sustainability Action through Linked Local-Level and Formal Sustainability Funding Mechanisms	2012	South Africa, United Kingdom	[49]
		i) C.V. Hawkins, R.M. Krause, R.C. Feiock, C. Curley	Making Meaningful Commitments: Accounting for Variation in Cities	2015	United States of America	[50]
Practical	European city commitments (ECC) N = 4	j) European Sustainable Cities	Charter of European Cities & Towns Towards Sustainability	1994	Europe	[51]
		k) European Sustainable Cities	Lissabonner Aktionsplan	1996	Europe	[52]
		l) European Sustainable Cities	Aalborg+ 10 - Inspiring Futures	2004	Europe	[53]
		m) European Sustainable Cities	The Dunkerque 2010 Local Sustainability Declaration	2010	Europe	[54]
	German national reports (GNR) N = 2	n) B. Grabow, K.-D. Beißwenger, S. Bock, L. Melcher, S. Schneider	Städte für ein nachhaltiges Deutschland. Gemeinsam mit Bund und Ländern für eine zukunftsfähige Entwicklung (Cities for a Sustainable Germany. Together with Federal Government and Federal States for a Future-oriented Development)	2011	Germany	[41]

Research and development projects (RDP) N = 4	o)	Presse- und Informationsamt der Bundesregierung (ed.)	Nationale Nachhaltigkeitsstrategie. Fortschrittsbericht 2012: Kapitel I. Nachhaltigkeit auf kommunaler Ebene - Beitrag der Bundesvereinigung der kommunalen Spitzenverbände (National Sustainability Strategy. Progress Report 2012: Chapter I. Sustainability on the Local Level - a Contribution of the Local Authority Associations)	2012	Germany	[40]
	p)	S. Klatt, B. Meyer, T. Petri	Auf dem Weg zur Stadt 2030 - Leitbilder, Szenarien und Konzepte (Towards City 2030 - Guiding Principles, Scenarios and Concepts)	2004	Germany	[55]
	q)	N.A. Philipp, S. Kuhn, D. Kron	Handbuch Projekt21. Einstieg in ein zyklisches Nachhaltigkeitsmanagement (Handbook Project21. Introduction into a Cyclic Sustainability Management)	2007	Germany	[31]
	r)	H. Büttner, D. Kneipp	Gemeinsam Fahrt aufnehmen! Kommunale Politik- und Nachhaltigkeitsprozesse integrieren (Commonly Gain Momentum! Integrating Politic and Sustainability Processes in Municipalities)	2010	Germany	[56]
	s)	K. Nolting, E. Göll	"Rio + 20 vor Ort" Kommunen auf dem Weg zur Nachhaltigkeit ("Rio + 20 on Site" Municipalities towards sustainability)	2012	Germany	[57]

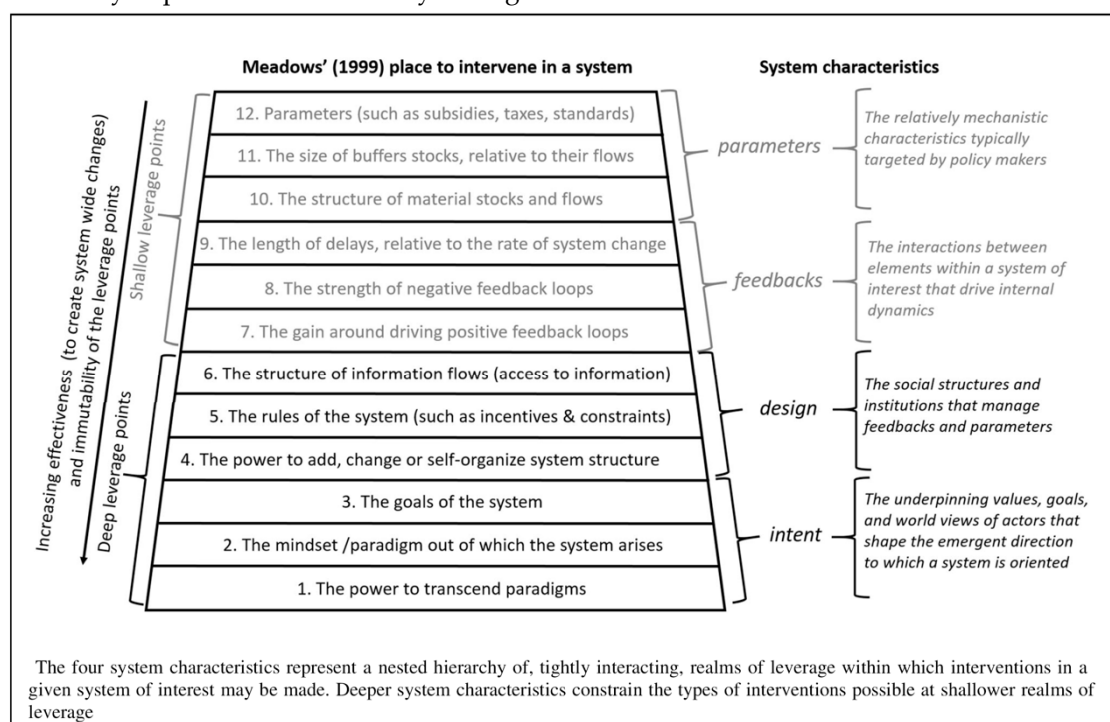
For each document, we conducted a qualitative content analysis adapted from Mayring [58]. First, we extracted the phrases that concern fields of sustainability-orientation. We included all descriptions that refer to goals, responsibilities, challenges, and the requirements of sustainability-oriented organizational development in local administrations, considering the scope of action of administrations. Next, we applied a deductive approach using the 14 fields of sustainability action for local administrations [17] as categories, and assigned the phrases to the categories. The fields are part of an approach to developing municipality-specific management, and represent an attempt to categorize integrated sustainability orientation of municipalities in German-speaking regions. Extracted phrases that contained various content were assigned to several categories: as for instance with the phrase 'We will initiate a local, participatory process to identify specific targets and time frames' [53] (p. 1), that contains aspects of participation and sustainability aims. Furthermore, for phrases that were deemed not to fit into the pre-determined categories, we developed additional inductive categories. Finally, we rechecked and adjusted the classification of the entire set of phrases and the newly developed categories.

When the dataset constituted by the categories was considered sufficiently developed, we undertook a descriptive and explorative statistical analysis, including total quantities and frequencies per document, as well as average frequencies and standard deviation per document group. Quartiles and medians per document and per category were also used in the analysis.

With the intention of deriving a sufficient set of fields of sustainability-orientation in local administrations, the deductive set of Plawitzki et al. [17] served as a foundation and was supplemented by inductive categories. We did not include the three categories 'long-term perspective and interdependencies', 'processes, structures and resources of administration' and 'quality and efficiency of administration' in the set, because the category 'long-term perspective and interdependencies' is very closely related to 'establishing transparency of conflicting aims'. Thus, both categories were merged into one field of sustainability-orientation. The categories 'processes, structures and resources of administration' and 'quality and efficiency of administration' are of a very general manner and indirectly covered within most of the categories. Thus, we distinguish between the terms category and field of sustainability-orientation in local administrations depending on the

level of our analysis as follows: when using the term category we refer to the set we conducted a statistical analysis with. The term field of sustainability-orientation refers to the reduced set we derived and we used in the following steps.

In order to structure the set of fields of sustainability-oriented local administrations in relation to sustainability transformations, we used the four system characteristics of Abson et al. [59], which are based on the leverage points of systems proposed by Meadows [27] (Figure 1). By drawing on the expertise of three scientists in a consensus-oriented group discussion, we assigned the fields to these characteristics, where possible. As we understand local administrations as systems in which sustainability aspects have to be integrated, the four system characteristics serve as a suitable concept to distinguish the fields of sustainability-orientation, with regard to their potential to induce change and to leverage the fields to efficiently integrate sustainability in local administrations. Furthermore, by using the system characteristics as a conceptual frame, we consider potential root causes of the insufficiency of previous sustainability management in local administrations.



**Figure 1.** From 12 leverage points to four system characteristics [59].

### 3. Results

In the 19 documents, we identified a total of 292 phrases of sustainability-orientation in local administrations, in which the nine documents representing the scientific perspective contained 65 phrases, while the 10 documents representing the practical perspective contained 227. We organized the assigned phrases into 22 categories which, including the 14 categories of Plawitzki et al. [17] and eight additional categories we derived (Table 2). The documents representing the scientific perspective contained fewer phrases, covering fewer categories on average (average amount of tasks: 7 and categories: 5) than the documents representing the practical perspective (23/11).

Out of the 19 fields of sustainability-orientation, we assigned 15 fields to the four system characteristics (Table 3). To *parameter*, we assigned the fields ‘signing international commitments and application of norms’ and ‘dealing with public finances’; to *feedback* the fields ‘considering long-term perspective, interdependencies and conflicting aims’ and ‘relation between local politics and administration’; to *design*, ‘preparation of a local sustainability strategy’, ‘defining responsibilities for the coordination of local sustainability activities’, ‘application of suitable sustainability instruments’, ‘supporting sectorial crossing orientation’, ‘implementation of the management cycle’, ‘implementing integrated sustainability communication’, and ‘supporting innovations’; and to *intent*,

‘development and consolidation of local sustainability understanding’, ‘support through leadership’, ‘educating competencies, knowledge and skills and strengthening individual motivation’, and ‘sustainability-oriented culture’. The four fields that describe the interface to external actors, institutions and organizations, could not be assigned within the conceptual framework and, thus, we derived a separate area entitled *interface*.

The highest number of phrases were identified in Grabow et al. [41], representing the practical perspective with 71 phrases covering 20 categories. In contrast, the fewest phrases were identified in Enticott and Walker [43], representing the scientific perspective with two assignments in two categories.

**Table 2.** List of derived deductive and inductive categories, as well as amount, average relative frequency of assignments of the documents per group and in total, and standard deviation, respectively.

Categories		Amount of assigned phrases / average frequency / standard deviation of frequency														
		SA (N = 9)			ECC (N = 4)			GNR (N = 2)			RDP (N = 4)			Total		
Deductive (Plawitzki et al. 2015)	1 Development and consolidation of local sustainability understanding	1	3.7	10.5	5	12.3	8.4	5	7.0	1.3	8	7.5	5.5	19	6.7	9.2
	2 Development of a local sustainability strategy	3	4.4	9.2	2	3.7	3.9	9	13.3	3.4	4	5.0	5.8	18	5.3	7.7
	3 Supporting sectorial crossing orientation	4	5.0	8.1	4	7.6	4.4	5	10.4	6.2	3	2.8	2.8	16	5.6	6.8
	4 Defining responsibilities for the coordination of local sustainability activities	3	4.1	7.7	1	1.4	2.4	1	0.7	0.7	2	1.4	2.5	7	2.6	5.7
	5 Support through leadership	1	1.6	4.5	1	1.4	2.4	5	7.0	1.3	1	0.7	1.2	8	1.9	3.8
	6 Establishing transparency of conflicting aims	0	0.0	0.0	0	0.0	0.0	3	5.6	2.8	1	1.2	2.1	4	0.8	2.1
	7 Application of suitable sustainability instruments	8	13.4	13.3	3	5.3	5.3	10	10.5	2.2	3	3.3	2.1	24	9.3	10.5
	8 Implementing integrated sustainability communication	0	0.0	0.0	1	1.4	2.4	3	2.1	2.1	4	4.3	3.5	8	1.4	2.6
	9 Signing international commitments and application of norms	1	1.1	3.1	3	5.1	5.1	3	2.1	2.1	0	0.0	0.0	7	1.8	3.7
	10 Implementing participation and cooperation	9	11.6	9.6	10	21.2	5.2	9	13.3	3.4	25	27.1	9.2	53	17.0	10.5
	11 Active involvement of state-owned enterprises	0	0.0	0.0	1	2.5	4.3	2	1.4	1.4	0	0.0	0.0	3	0.7	2.3
	12 Relation between local politics and administration	4	3.2	6.2	2	3.7	3.9	2	4.9	3.4	8	7.1	7.1	16	4.3	6.0
	13 Care of intercommunal exchange and cooperation	5	5.8	10.0	3	6.2	3.9	7	8.4	0.1	7	8.5	7.1	22	6.7	7.9
	14 Strengthening individual motivation and sustainability-oriented culture	1	1.2	3.5	0	0.0	0.0	1	0.7	0.7	5	4.7	3.1	7	1.7	3.2
Inductive	15 Educating competencies, knowledge and skills	5	6.9	11.1	6	12.6	4.4	4	2.8	2.8	0	0.0	0.0	15	6.2	9.0
	16 Supporting innovations	1	1.9	5.2	2	5.0	8.7	1	0.7	0.7	3	3.8	4.0	7	2.8	5.9
	17 Considering long-term perspectives and interdependencies in decision-making	2	1.3	3.7	1	1.4	2.4	2	1.4	1.4	4	4.3	5.9	9	2.0	4.1
	18 Implementation of the management cycle	4	10.2	15.5	3	7.3	4.2	3	2.1	2.1	10	10.7	10.8	20	8.8	12.2
	19 Dealing with public finances	2	3.7	10.5	0	0.0	0.0	4	2.8	2.8	1	0.7	1.2	7	2.2	7.5
	20 Further development of processes, structures and resources	5	7.3	8.5	0	0.0	0.0	3	2.1	2.1	3	3.1	3.9	11	4.3	6.8
	21 Improving quality and efficiency	4	10.7	18.6	0	0.0	0.0	0	0.0	0.0	1	1.2	2.1	5	5.3	13.8
	22 Constitution of relations to higher administrative levels	2	3.0	5.8	1	2.3	3.9	1	0.7	0.7	2	2.6	2.6	6	2.5	4.6
		65			49			83			95			292		



To the category ‘implementing participation and cooperation’, we assigned most phrases (average frequency 17%/standard deviation 10.5) identified in six out of nine documents representing the scientific perspective and, in all documents, representing the practical perspective. We also frequently assigned phrases to the following categories: ‘application of suitable sustainability instruments’ (9.3%/10.5); ‘implementation of the management cycle’ (8.8%/12.2); and ‘care of inter-communal exchange and cooperation’ (6.7%/7.9). For an overview, see figure 2 (Figure 2).

Few assignments were made to the categories ‘active involvement of state-owned enterprises’ (1.0%) identified in European Sustainable Cities [54] and Grabow et al. [41]; ‘establishing transparency of conflicting aims’ (1.4%), identified in Bundesregierung [40], Grabow et al. [41] and Philipp, Kuhn, and Kron [31]; and ‘quality and efficiency of administration’ (1.7%), identified in Philipp, Kuhn, and Kron [31], Glemarec and Oliviera [48], Fiorino [46], and Enticott and Walker [43].

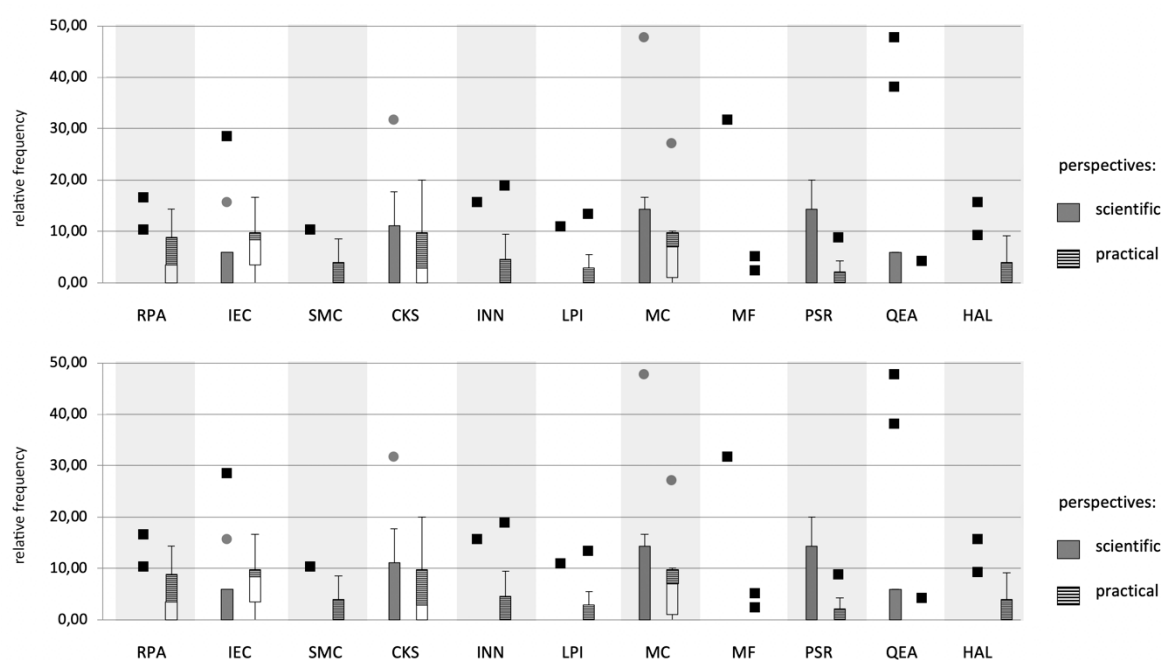
Our results indicate that with the exception of the three documents European Sustainable Cities [52], Grabow et al. [41] and Büttner and Kneipp [56], the identified phrases in the documents could only be assigned to less than half of the categories (Figure 3, median = 0 or no boxplot). Furthermore, we observed a clear focus in three of the four documents in the RDP group. By focus we mean boxplots with extreme outliers (Figure 3). In Klatt et al. [55] and in Nolting and Göll [57] the focus lies with the category ‘implementing participation and cooperation’ (Klatt et al.: 38% of the assignments, Nolting and Göll: 33%). In Philipp, Kuhn, and Kron [31], the focus resides on the category ‘implementation of the management cycle’ (29%).

Detailed information on the results of the statistical analysis for each document are given in the table in Appendix B.

Table 3. Structured set of fields of sustainability-oriented local administrations.

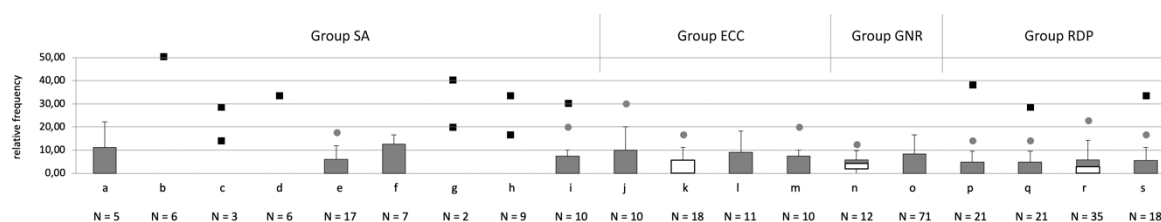
		Fields on sustainability-orientation in local administrations	Description (1, 4-8, 10-13, 15-19 and parts of 3 adapted to Plawitzki et al. 2015)
System characteristics (Abson et al. 2017)	Parameter	1 Signing international commitments and application of norms	Signing border-crossing commitments and compliance with norms to support local sustainable development
		2 Dealing with public finances	Dealing with public finances in order to support a sustainable local development
	Feedback	3 Considering long-term perspective, interdependencies and conflicting aims	Considering long-term perspectives and interdependencies as well as transparency of conflicting aims on sustainability topics in order to support political decision-makers with comprehensive information as basis for decision-making
		4 Relation between local politics and administration	Ideal interrelation between local authorities and politicians to successfully implement measures of sustainability management and practice
	Design	5 Preparation of a local sustainability strategy	Bundling of sustainability actions of the local administration in a sustainability strategy that contains future-oriented guidelines, strategic aims and tangible measures as well as practical instructions
		6 Defining responsibilities for the coordination of local sustainability activities	Staff and institutional commitment of responsibilities for the coordination of sustainability activities of the local administration, scope of action depends on the placement in the hierarchical, administrative system
		7 Application of suitable sustainability instruments	Efficient and strategic application of instruments of the broad spectrum of sustainability instruments
		8 Supporting sectoral crossing orientation	Integration of sustainability aspects in organizational structures and processes of all hierarchical levels and functional departments in the administration
		9 Implementation of the management cycle	Implementing a management cycle including analysis, planning, implementation and evaluation
		10 Implementing integrated sustainability communication	Implementing a comprehensive sustainability communication that contains a strategic process of dialogue in the local administration and with external stakeholders about manifold topics and using divers channels
		11 Supporting innovations	Supporting innovations by creating constraints, respectively and/or implementing initiatives and projects by the local administration itself

Additional area	Intent	12	Development and consolidation of local sustainability understanding	Specifying the understanding of sustainability and focusing on particular topics as well as their regularly evaluation, elaborating a common level of awareness on the term sustainability and sustainability understanding of the public administrators
		13	Support through leadership	Using the potential of leadership for the integration of sustainability-orientation in administrative routines
		14	Educating competencies, knowledge and skills	Implementing measures of professional training for public administrators to educating competencies, supporting skills and acquiring knowledge, which are relevant for fostering sustainable development
		15	Strengthening individual motivation and sustainability-oriented culture	Positive impacts on the implementation of sustainability management by motivated staff and a sustainability-oriented administrative culture
	Interface	16	Implementing participation and cooperation	Implementing processes of participation and cooperation to sufficiently inform internal and external actor groups and to engage them in decision-making and operative processes of local sustainable development
		17	Active involvement of state-owned enterprises	Using the potential of state-owned enterprises for implementing sustainable development by actively involving them
		18	Intercommunal exchange and cooperation	Intercommunal networking for the exchange of experiences, knowledge and information and for potentially initiating cooperation
		19	Constitution of relations to higher administrative levels	Constitution of relations to higher administrative levels (region, federal state, nation, European level)



**Figure 2.** Lower and upper quartile, median as well as mild and extreme outliers of relative frequency of the identified phrases in the documents per category distinguished between scientific and practical perspectives (categories: DCSU = ‘development and consolidation of local sustainability understanding’, DSS = ‘development of a local sustainability strategy’, SCO = ‘supporting sectorial crossing orientation’, RSA = ‘defining responsibilities for the coordination of local sustainability activities’, SLS = ‘support through leadership’, TCA = ‘establishing transparency of conflicting aims’, ASI = ‘application of suitable sustainability instruments’, ISC = ‘implementing integrated sustainability communication’, ICAN = ‘signing international commitments and application of norms’, IPC = ‘implementing participation and cooperation’, ISE = ‘active involvement of state-owned enterprises’, RPA = ‘relation between local politics and administration’, IEC = ‘care of intercommunal exchange and cooperation’, SMC = ‘strengthening individual motivation and sustainability oriented culture’, CKS = ‘educating competencies, knowledge and skills’, INN = ‘supporting innovations’, LPI = ‘considering long-term perspectives and interdependencies in decision-making’, MC =

‘implementation of the management cycle’, MF = ‘dealing with public finances’, PSR = ‘further development of processes, structures and resources’, QEA = ‘improving quality and efficiency’, HAL = ‘constitution of relations to higher administrative levels’).



**Figure 3.** Lower and upper quartile, median as well as mild and extreme outliers of relative frequency of the identified phrases in the categories per document (documents: a) Steurer (2007) [42], b) Enticott and Walker (2008) [43], c) Garcia-Sanchez and Prado-Lorenzo (2008) [44], d) Caragliu et al. (2009) [45], e) Fiorino (2010) [46], f) Horváth (2011) [47], g) Glemarec and Oliveira (2012) [48], h) Merritt and Stubbs (2012) [49], i) Hawkins et al. (2015) [50], j) European Sustainable Cities (1994) [51], k) European Sustainable Cities (1996) [52], l) European Sustainable Cities (2004) [53], m) European Sustainable Cities (2010) [54], n) Grabow et al. (2011) [41], o) Bundesregierung (2012) [40], p) Klatt et al. (2004) [55], q) Philipp, Kuhn, and Kron (2007) [31], r) Büttner and Kneipp (2010) [56], s) Nolting and Göll (2012) [57]).

## 4. Discussion

From the literature review, which considers scientific and practical perspectives, we identified a diverse set of 292 phrases of sustainability-oriented local administrations covering 22 categories, from which we derived a set of 19 fields of sustainability-orientation in local administrations. In the following, we first elaborate upon the fields of sustainability-orientation with most and fewest assignments. Then, we discuss the suggested structure of the developed set based on the system characteristics of Abson et al. [59]. Next, we focus on the differences between the scientific and practical perspectives and illustrate examples of how they represent fields of sustainability-oriented local administrations. Finally, we propose some implications for scientific research and practical developments.

### 4.1. Relevance of Exclusive Fields of Sustainability-Orientation

There seems to be broad agreement about the relevance of the field ‘implementing participation and cooperation’, which contains most phrases identified in 16 of the 19 reviewed documents (17%, Table 2). They concern engaging citizens and stakeholders, strengthening local democracy or institutionalizing participatory processes. Citizens and stakeholders have to be involved in planning, supplying, financing, and assessment of public offerings, and they should share the responsibility for implementation, results and effectiveness [41]. The local administrations provide financial and personnel resources, as they lead the participation processes and direct moderation and mediation tasks [52] by applying instruments like, for instance, forum meetings and public hearings [44]. The scientific literature offers plenty of further contributions on forms of participation and collaboration, e.g., in the context of the Local Agenda 21 [60], good governance [11,61], sustainable cities [10,62], etc.

In order to analyze, assess and monitor policies and policy implications, ‘the application of suitable sustainability instruments’ was often mentioned in the reviewed documents and, therefore, appears relevant. Beside instruments of environmental planning and data collection, economic, regulation and communication instruments, as well as many others [51] repeatedly emphasized the application of indicators [31,41,46,47,52]. To illustrate local sustainable development with regard to the goals of the 2030 Agenda in Germany, a catalogue of SDG indicators for municipalities was recently developed in a collaboration of the Bertelsmann Stiftung with six other partners [63].

The field ‘implementation of the management cycle’ is often mentioned by Philipp, Kuhn, and Kron [31], wherein the implementation of a cyclical sustainability management process is described. Therefore, the field need not be further specified at this point.

The ‘care of inter-communal exchange and cooperation’, also often mentioned in the reviewed documents, should be enacted as a continuous dialogue between local, regional and national levels [57]. The cooperation and networking aims to, e.g., convince other municipalities to commit to sustainability [57] and to develop learning processes between municipalities [55]. Hawkins’ et al. [50] investigations indicated that municipalities are more likely to devote resources for sustainability when they are part of inter-communal networks.

Other fields of sustainability-oriented local administrations were less frequently represented in the reviewed documents. These were the fields ‘active involvement of state-owned enterprises’ (0.7%) and the category ‘establishing transparency of conflicting aims’ (0.8%).

State-owned enterprises are only explicitly brought up in Grabow et al. [41] (Table 2). Others mention local business [54] without distinguishing between state-owned and private companies. In Germany, state-owned enterprises are very heterogeneous, support local administrations in fulfilling their public services and, therefore, have the potential to directly contribute to local sustainable development. Examples of state-owned companies include electric supply companies, housing societies and transportation companies [64]. Besides having elected municipal officers as members in supervisory committees of state-owned enterprises, local authorities can closely cooperate by developing shared sustainability aims or integrating actors of the enterprises in sustainability processes [17].

The issue of conflicting aims is picked up in three documents [31,40,41]. Therein, the authors suggest that competing aims have to be made visible, and Grabow et al. [41] argue that political guidelines have to provide answers on how to deal with conflicting aims, which are core challenges in pursuing sustainable development [65]. The documents neither offer a description of the conflicts nor a distinction between different kinds of conflicts, nor do they also contain detailed approaches on how to deal with this problem. We merged the category ‘establishing transparency of conflicting aims’ with the category ‘considering long-term perspectives and interdependencies in decision-making’, which is closely related to the handling of conflicting aims because both deal with systemic concerns. Using a systems perspective allows us to identify interrelations and interdependencies between the different components, describe the system’s status quo and characterize the structures and dynamics, which further allows us to identify hindering or stabilizing feedback loops and potential leverage points of a system [66].

#### 4.2. Making a Difference Between the Fields of Sustainability-Orientation

Table 3 shows that it was generally possible to structure the identified fields of sustainability-oriented local administrations into the four system characteristics—*parameter*, *feedback*, *design*, and *intent* as developed by Abson et al. [59], as well as into the area *interface*. Due the fact that each field of sustainability-orientation is wide-ranging in itself and they partially overlap, the assignment has to be understood as an orientation. Taking the hierarchy into account, the fields ‘signing international commitments and application of norms’ and ‘dealing with public finances’ assigned to *parameter*, have less potential to contribute to fundamental sustainability-oriented transformation in local administrations than the fields ‘development and consolidation of local sustainability understanding’, ‘support through leadership’, ‘educating competencies, knowledge and skills’ and ‘strengthening individual motivation and sustainability-oriented culture’, assigned to the system characteristic *intent*. This means minor changes in the fields assigned to *intent* may have great effects on sustainability-orientation in local administrations. Yet, the purpose of this assignment is to contribute to a deeper understanding of the possible systemic functions of the fields of sustainability-orientation rather than a judgement. Insights on these functions and the interrelations between the fields of sustainability-orientation might help to foster advancements of measures and their targeted and strategic utilization.

Thus, fields assigned to the system characteristics *parameter*, *feedback* or *design* might, for instance, be a prerequisite to address deeper leverage points. This can be illustrated with an example for the field ‘signing international commitments and application of norms’, assigned to the system characteristic *parameter*: There exist plenty of international sustainability commitments for

municipalities. Indeed, a brochure of the German Federal Environment Agency introduces 35 of them [67]. The Aalborg Commitments were signed by more than 700 and the Basque Declaration by more than 500 European municipalities [68]. Both resulted from the series of European Conferences on Sustainable Cities and Towns. It might reasonably be assumed that not all of these participating municipalities are comprehensively sustainability-oriented. Nevertheless, signing the commitments provides a suitable condition to address sustainability aspects in the long term.

Furthermore, fields assigned to the system characteristic *intent* are not necessarily fields in which minor changes are easily enacted. For that reason, interrelations between the fields have to be considered. Positive interrelations to the fields assigned to the system characteristic *intent*, can meaningfully be used in order to effect system wide changes towards sustainability-orientation. For instance, the ‘application of suitable sustainability instruments’ could be included in educational programs, or the ‘preparation of a local sustainability strategy’ can contribute to generating a common local sustainability understanding. The aforementioned fields are two of seven assigned to the system characteristic *design*. For most of them, there exist numerous measures and application experiences [17], which can be purposefully deployed.

A look at the reviewed literature, serves to specify the fields assigned to the system characteristic *intent*. The field ‘development and consolidation of local sustainability understanding’ mainly seeks to concretize sustainable development in municipality-specific guiding principles or visions [41,51,56]. In the field ‘educating competencies, knowledge and skills’, Fiorino provides examples for areas of knowledge and competencies, such as: ‘appreciation of the relationships among economic and environmental policies, ... experience in framing and discussing technical issues, with citizens, an ability to analyze the environmental consequences of economic decisions’; and ‘skill in devising and using various environmental, social, and economic indicators as tools of the administrator’s trade’ [46] (p.84). The education of public administrators aims to promote skills in working strategically and spanning boundaries [42], as well as to support personal initiative [41]. The field ‘strengthening individual motivation and sustainability-oriented culture’ considers, for instance, the willingness to learn from each other, the common search for solutions, an understanding of different procedures and constraints, and the maintenance of a culture of recognition [41,56].

The field ‘support through leadership’ maintains that the head of administration is responsible for the sustainability-orientation in local administrations, that its task is to structure and organize this concern and to ensure decision-making takes equal account of sustainability criteria [41]. A practical example illustrates how municipalities who receive strong support from leadership, tend to be more advanced with regard to sustainability-orientation, like for instance in the German cities Freiburg im Breisgau and Ludwigsburg. In both cities, the established unit of sustainability management closely works together with the mayor [69,70]. This example should not be perceived as conclusive evidence, but rather provides a slight indication of the different relevance of the fields of sustainability-orientation in relation to their intervention potentials.

#### 4.3. Practice as Example for Science

None of the reviewed documents fully covers the broad spectrum of identified fields of sustainability-oriented local administrations. Indeed, the scientific articles in particular lack comprehensive approaches (Figure 3). In some of the articles’ concepts, measures or implications are discussed that should be considered in order to achieve a sustainability-orientation in local administrations [42,46,48] and others base their findings on the implementation status in municipalities [43–45,50]. The phrases identified in Fiorino [46] and Steurer [42] cover most fields within this document group. Fiorino argues that sustainability should guide the conceptual orientation of public administrations. Steurer focuses on cross-sectorial integration of policies, such as strategies on sustainable development in public administrations. Others discuss the effects of reforms [47] and specific funding mechanisms [49] on sustainability action in municipalities, or examined crucial factors for the implementation of Local Agenda 21 [44], reasons for sustainability commitments in municipalities [50], and the relations between sustainability management and performance in public organizations [43]. Glemarec and Oliveira [29] discuss the role of public

institutions in fostering sustainable development, while Caragliu et al. [45] examine the concept of smart cities. Recent contributions propose to consider multi-level governance approaches [12,71,72], emphasize public and business participation for solving sustainability problems [73], as well as other specific aspects. Even though the articles contribute to a deeper understanding of the general sustainability-orientation of public administrations, different concepts and supporting and hindering factors of sustainable municipalities, none provide a comprehensive exploration of the organizational development of municipalities and their potential courses of action to foster sustainability-oriented local administrations.

By contrast, documents, containing numerous practical examples, cover a broad spectrum of fields of sustainability-orientation [31,41,56,57]. For instance, Grabow et al. [41] representing extensive opportunity measures on sustainability-oriented municipalities (Figure 3). The document represents the knowledge and experiences of 20 sustainability committed mayors of German cities, and aims to provide recommendations for policy and decision-making on sustainable urban development, based on promising experiences in German cities. Furthermore, it calls for improving context conditions and regulations in cooperation with federal and national authorities. Therefore, the expert knowledge represented in the document is of great value for research on and development of sustainability-oriented local administrations.

#### 4.4. Implications for Science and Practice

The results of the literature review have highlighted a broad spectrum of fields of sustainability-oriented local administrations as potential realms to foster sustainable-oriented administrative practices. We attempted to substantiate and supplement this by providing the as yet only attempt to list fields of sustainability action for municipalities [17] for German-speaking countries. Based on the results of the literature review, we suggest the addition of five fields of sustainability-orientation. As the initial set has not previously been categorized, we structured the set by making use of the four system characteristics according to Abson et al. [59] (Table 3) and based on the hierarchy of 12 leverage points proposed by Meadows [27].

Research is needed for generating further insights concerning their relevance and interconnectedness in order to effectively intervene in the practices of local administrations to foster sustainability. On the other hand, we were unable to assigned identified fields that refer to the interface between administration and other actors or organizations, to the four system characteristics. These fields describe relations from the system of local administrations to other systems, e.g., citizens, state-owned enterprises, other communities or higher administrative levels. The concept of the four system characteristics focuses on inner-systemic relations. Yet, the *interface* category considers inter-systemic relations. To what extent fields within the *interface* area also have the potential to offer powerful sustainability-interventions, needs further investigation. Additionally, the potential contribution of state-owned enterprises to local sustainable development seems largely unexplored.

Besides considering the concept of the four system characteristics, we discussed the potential of system thinking to foster sustainability in communities in general. Even though there might be barriers to integrating system thinking within political and administrative practice because of, inter alia, the vertical oriented organizational structures of administrations [74], system thinking harbors great potential for helping to manage sustainability challenges in municipalities. According to Willke [75], system thinking can support the management of organizations. Organizational science employs system thinking primarily to develop methods and instruments for change management in the private sector [76,77]. In the science of sustainable urban development, a procedure called sustainable solution spaces was proposed, which is also based on system thinking and aims to develop a consistent set of sustainability goals for urban development [78]. Therefore, the procedure is potentially relevant for developing sustainability strategies and serves as an example for how to employ system thinking for sustainability-orientation in local administrations. To enact this potential, it is essential (1) to work out the benefit for administrations when applying system thinking; and (2) to enhance existing approaches and shape them in a way that is practically applicable in the day-to-day practice of municipalities. Developments have to tie into experiences made with the existing

methodological concepts we described above, and demonstrate awareness of the logic and specific context of municipalities.

The results of the literature review illustrate a difference between scientific and practical documents in how they engage with the comprehensive set of fields of sustainability-orientation in local administrations. Therefore, further research is needed to involve the more experiential knowledge of local administrators, mayors and other experienced practitioners, to complement and enrich the scientific discourse related to sustainability-oriented local administrations. Transdisciplinary sustainability research provides methods and procedures to facilitate this mode of knowledge production [79–81].

Furthermore, the reviewed documents present measures and activities, which are intended or already implemented. As we did not explicitly include this distinction in our analysis deeper insights regarding this would be relevant for making meaningful conclusions for practice. Further investigations on the potential function of intended measures in the administrative system and their implementation is needed.

Finally, the set of fields of sustainability-orientation in local administrations is not to be understood as a completed collection. The search criteria we applied limit the extend of search results as we focused on documents with an—as far as possible—comprehensive approach of sustainability-oriented organizational development in local administrations. Paying attention to publications with a specific scope could provide more in-depth insights in the fields of sustainability-orientation, for instance, in the field on leadership [22,82]. Also, in our study we did not include publications on a broader institutional context such as local governments, e.g., [10,15] and publications we could not include because of technical restrictions, e.g., [83].

## 5. Conclusions

The implementation of sustainability in local administrations continues to face major challenges. Although several approaches to how municipalities can support local sustainable development exist, sustainability aspects are not yet systematically integrated into administrative practice.

In our research we aimed to derive a comprehensive set of fields of sustainability-orientation in local administrations from the literature. In considering the scientific perspective and the practical perspective in Germany, which both integrate intended as well as already implemented activities and measures, our results led to a spectrum of 19 fields of sustainability-oriented local administrations. To structure these fields, we made use of the four types of system characteristics proposed by Abson et al. [26]. We assigned 15 fields to the system characteristics *parameter*, *feedback*, *design* and *intent*. To structure the four remaining fields, we developed the area *interface* (Table 3). The fields assigned to the four system characteristics may differ in their potential to intervene in a system's development towards sustainability.

Furthermore, we identified a lack of comprehensive approaches on sustainability-orientation in local administrations, particularly in the scientific literature. Most of the reviewed documents also failed to represent the categories 'establishing transparency of conflicting aims' and 'active involvement of state-owned enterprises' (Table 2)—which may harbor significant potential to foster sustainability in municipalities.

For future research, we recommend studies: (1) to gain detailed insights into the relevance and interconnectedness of the identified fields of sustainability-orientation, in order to effectively intervene in local administrations to foster sustainability; and (2) to better understand the role of fields in the area of *interface* to induce powerful sustainability-interventions in local administrations. We also propose the need to integrate the experiential knowledge of experienced practitioners more deeply into research-based knowledge generation. For the purpose of applying system thinking approaches in administrative practices, we suggest working out the benefit of those approaches and adapting them to be suitable for practical applications under the consideration of the specific logic and context of municipalities.

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## Appendix A

The literature search was conducted in the Scopus database. The access to some documents was constrained, and therefore three articles could not be included into the analysis of this review.

Search string that revealed 734 articles in April, 2017:

TITLE-ABS-KEY ( "public administration" OR "local administration" OR "local municipality" AND sustain\* ) AND DOCTYPE ( ar OR re ) AND PUBYEAR > 1994

## Appendix B

**Table A1.** Amount of assigned phrases and average frequency of each document of the literature review.

Categories		Amount of assigned phrases / average frequency											
		Scientific articles (N = 9)											
		Garcia-Sanchez & Prado-Lorenzo 2008											
		Steurer 2007	Enticott & Walker 2008	Prado-Lorenzo 2008	Caragliu et al. 2009	Fiorino 2010	Horváth 2011						
Deductive (Plawitzki et al. 2015)	1 Development and consolidation of local sustainability understanding	0	0	0	0	0	0	1	33.3	0	0	0	0
	2 Development of a local sustainability strategy	1	11.1	0	0	2	28.6	0	0	0	0	0	0
	3 Supporting sectorial crossing orientation	2	22.2	0	0	0	0	0	0	1	5.9	1	16.7
	4 Defining responsibilities for the coordination of local sustainability activities	0	0	0	0	0	0	0	0	0	0	1	16.7
	5 Support through leadership	0	0	0	0	1	14.3	0	0	0	0	0	0
	6 Establishing transparency of conflicting aims	0	0	0	0	0	0	0	0	0	0	0	0
	7 Application of suitable sustainability instruments	0	0	0	0	0	0	1	33.3	3	17.7	1	16.7
	8 Implementing integrated sustainability communication	0	0	0	0	0	0	0	0	0	0	0	0
	9 Signing international commitments and application of norms	0	0	0	0	0	0	0	0	0	0	0	0
	10 Implementing participation and cooperation	1	11.1	0	0	2	28.6	0	0	3	17.7	0	0
	11 Active involvement of state-owned enterprises	0	0	0	0	0	0	0	0	0	0	0	0
	12 Relation between local politics and administration	1	11.1	0	0	0	0	0	0	3	17.7	0	0
	13 Care of intercommunal exchange and cooperation	0	0	0	0	0	0	0	0	1	5.9	1	16.7
	14 Strengthening individual motivation and sustainability-oriented culture	1	11.1	0	0	0	0	0	0	0	0	0	0
Inductive	15 Educating competencies, knowledge and skills	1	11.1	0	0	0	0	1	33.3	3	17.7	0	0
	16 Supporting innovations	0	0	0	0	0	0	0	0	0	0	0	0
	17 Considering long-term perspectives and interdependencies in decision-making	0	0	0	0	0	0	0	0	2	11.8	0	0



18	Implementation of the management cycle	1	11.1	1	50	1	14.3	0	0	0	0	1	16.7
19	Dealing with public finances	0	0	0	0	0	0	0	0	0	0	0	0
20	Further development of processes, structures and resources	1	11.1	0	0	1	14.3	0	0	0	0	0	0
21	Improving quality and efficiency	0	0	1	50	0	0	0	0	1	5.9	0	0
22	Constitution of relations to higher administrative levels	0	0	0	0	0	0	0	0	0	0	1	16.7
		9		2		7		3		17		6	

Categories		Amount of assigned phrases / <i>average frequency</i>															
		European city commitments (N = 4)															
		Glemarec & Oliveira 2012		Merritt & Stubbs 2012		Hawkins et al. 2015		ESC 1994		ESC 1996		ESC 2004		ESC 2010			
Deductive (Plawitzki et al. 2015)	1	Development and consolidation of local sustainability understanding		0	0	0	0	0	0	2	20	0	0	1	9.1	2	20
	2	Development of a local sustainability strategy		0	0	0	0	0	0	0	0	1	5.6	1	9.1	0	0
	3	Supporting sectorial crossing orientation		0	0	0	0	0	0	1	10	2	11.1	1	9.1	0	0
	4	Defining responsibilities for the coordination of local sustainability activities		0	0	0	0	2	20	0	0	1	5.6	0	0	0	0
	5	Support through leadership		0	0	0	0	0	0	0	0	1	5.6	0	0	0	0
	6	Establishing transparency of conflicting aims		0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7	Application of suitable sustainability instruments		1	20	2	33.3	0	0	1	10	2	11.1	0	0	0	0
	8	Implementing integrated sustainability communication		0	0	0	0	0	0	0	0	1	5.6	0	0	0	0
	9	Signing international commitments and application of norms		0	0	0	0	1	10	0	0	2	11.1	1	9.1	0	0
	10	Implementing participation and cooperation		1	20	1	16.7	1	10	3	30	3	16.7	2	18.2	2	20
	11	Active involvement of state-owned enterprises		0	0	0	0	0	0	0	0	0	0	0	0	1	10
	12	Relation between local politics and administration		0	0	0	0	0	0	0	0	1	5.6	1	9.1	0	0
	13	Care of intercommunal exchange and cooperation		0	0	0	0	3	30	1	10	1	5.6	1	9.1	0	0
	14	Strengthening individual motivation and sustainability-oriented culture		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Inductive	15	Educating competencies, knowledge and skills		0	0	0	0	0	0	1	10	2	11.1	1	9.1	2	20
	16	Supporting innovations		0	0	1	16.7	0	0	0	0	0	0	0	0	2	20
	17	Considering long-term perspectives and interdependencies in decision-making		0	0	0	0	0	0	0	0	1	5.6	0	0	0	0
	18	Implementation of the management cycle		0	0	0	0	0	0	1	10	0	0	1	9.1	1	10
	19	Dealing with public finances		0	0	2	33.3	0	0	0	0	0	0	0	0	0	0
	20	Further development of processes, structures and resources		1	20	0	0	2	20	0	0	0	0	0	0	0	0
	21	Improving quality and efficiency		2	40	0	0	0	0	0	0	0	0	0	0	0	0
	22	Constitution of relations to higher administrative levels		0	0	0	0	1	10	0	0	0	0	1	9.1	0	0
		5		6		10		10		18		11		10			

Categories		Amount of assigned phrases / average frequency													
		German national reports (N = 2)						Research and development projects (N = 4)							

		Grabow et al. 2011		Bundes-regierung 2012		Klatt et al. 2004		Philipp et al. 2007		Büttner & Kneipp 2010		Nolting & Göll 2012			
Deductive (Plawitzki et al. 2015)	1	Development and consolidation of local sustainability understanding		4	5.6	1	8.3	1	4.8	0	0	5	14.3	2	11.1
	2	Development of a local sustainability strategy		7	9.9	2	16.7	0	0	3	14.3	0	0	1	5.6
	3	Supporting sectorial crossing orientation		3	4.2	2	16.7	0	0	0	0	2	5.7	1	5.6
	4	Defining responsibilities for the coordination of local sustainability activities		1	1.4	0	0	0	0	0	0	2	5.7	0	0
	5	Support through leadership		4	5.6	1	8.3	0	0	0	0	1	2.9	0	0
	6	Establishing transparency of conflicting aims		2	2.8	1	8.3	0	0	1	4.8	0	0	0	0
	7	Application of suitable sustainability instruments		9	12.7	1	8.3	0	0	1	4.8	1	2.9	1	5.6
	8	Implementing integrated sustainability communication		3	4.2	0	0	1	4.8	2	9.5	1	2.9	0	0
	9	Signing international commitments and application of norms		3	4.2	0	0	0	0	0	0	0	0	0	0
	10	Implementing participation and cooperation		7	9.9	2	16.7	8	38.1	3	14.3	8	22.9	6	33.3
	11	Active involvement of state-owned enterprises		2	2.8	0	0	0	0	0	0	0	0	0	0
	12	Relation between local politics and administration		1	1.4	1	8.3	0	0	3	14.3	5	14.3	0	0
	13	Care of intercommunal exchange and cooperation		6	8.6	1	8.3	3	14.3	0	0	1	2.9	3	16.7
	14	Strengthening individual motivation and sustainability-oriented culture		1	1.4	0	0	0	0	1	4.8	3	8.6	1	5.6
Inductive	15	Educating competencies, knowledge and skills		4	5.6	0	0	0	0	0	0	0	0	0	0
	16	Supporting innovations		1	1.4	0	0	2	9.5	0	0	0	0	1	5.6
	17	Considering long-term perspectives and interdependencies in decision-making		2	2.8	0	0	3	14.3	0	0	1	2.9	0	0
	18	Implementation of the management cycle		3	4.2	0	0	0	0	6	28.6	3	8.6	1	5.6
	19	Dealing with public finances		4	5.6	0	0	0	0	0	0	1	2.9	0	0
	20	Further development of processes, structures and resources		3	4.2	0	0	2	9.5	0	0	1	2.9	0	0
	21	Improving quality and efficiency		0	0	0	0	0	0	1	4.8	0	0	0	0
	22	Constitution of relations to higher administrative levels		1	1.4	0	0	1	4.8	0	0	0	0	1	5.6
		71		12		21		21		35		18			

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