

Article

Sustainable Development—A Poorly Communicated Concept by Mass Media. Another Challenge for SDGs?

Svatava Janoušková ^{1,2}, Tomáš Hák ^{1,3,*} , Vlastimil Nečas ⁴  and Bedřich Moldan ¹

¹ Charles University Environment Center, Charles University, 11636 Prague, Czech Republic; svatava.janouskova@czp.cuni.cz (S.J.); bedrich.moldan@czp.cuni.cz (B.M.)

² Faculty of Science, Charles University, 11636 Prague, Czech Republic

³ Faculty of Humanities, Charles University, 11636 Prague, Czech Republic

⁴ Faculty of Social Sciences, Charles University, 11636 Prague, Czech Republic; vlastimil.necas@fsv.cuni.cz

* Correspondence: tomas.hak@czp.cuni.cz

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Abstract: Thirty years after “Our Common Future” by the Brundtland Commission in 1987, sustainable development remains the only internationally and consensually recognized global development concept. The last major United Nations event—the Rio+20 Conference in 2012—endorsed it by proposing the Sustainable Development Goals (SDGs) and their more specific targets and indicators (adopted in 2015). We claim that educators, politicians, and civil society organizations have failed to a large extent in making the sustainable development concept broadly appealing. Among the missing enabling factors are a good narrative (making an extremely complex sustainable development concept comprehensible to all, thereby raising public support), social norms (reflecting commonly held sustainability principles and goals), and sustainability indicators (providing clear information for steering policies as well as for daily decisions). In this paper we focus on the role of mass media (English-written printed newspapers) as an important information channel and agenda-setter, and analyze their modes of sustainability communication. We look into how these media communicate selected key sustainability themes, and how they make connections to the overarching concept of sustainable development. We hypothesize that the media predominantly informs people and sets the agenda by communicating themes of current interest (e.g., gender inequalities), but misses the opportunity of framing them in the broader, overarching concept of sustainable development. This may be a significant sustainability faux (error)—great political intentions need efficient implementation tools, not just political resolutions. To this end, we need well-narrated and framed sustainability themes communicated through mass media to activate the social norms that potentially support societally beneficial conduct. By undertaking an extensive mass media analysis, this paper offers rare empirical evidence on sustainability communication by the global mass media during the last ten years, and identifies the main caveats and challenges for sustainability proponents. As sustainability communication does not yet have its own theoretical framework, SDGs seem to offer a suitable mechanism for this.

Keywords: sustainable development; sustainability communication; media analysis; SDGs; knowledge on sustainable development

1. Introduction

It is generally conceived that the idea of sustainable development, by and large, was put forward by the today famous Our Common Future [1]. We may understand it as a response to two grave challenges posed by events in 1972. First, the necessity to preserve the integrity of our “Only One

Earth” of the Stockholm Conference and how to set about achieving this [2]. Second, “The Limits to Growth” [3] which put forth the convincing argument concerning the incompatibility of indefinite economic growth while retaining the integrity of natural resources, an unpolluted environment and a healthy living world. The answer to both questions was found: sustainable development that entails “changing course” [4] in most current economic and overall societal development in a profound way. The essence of the message is that it must be undertaken comprehensively. The development of human civilization is an extremely broad issue and no partial solution can be effective.

The problem is that while this idea is evidently right, it is at the same time not very helpful for identifying concrete workable solutions. Those lie in individual practical actions focused on well-defined tasks as are now laid out in the 169 targets of the 17 Sustainable Development Goals (SDGs) accepted at the global UN summit in 2015 [5]. However, it remains absolutely clear that the only way these can work is for them to be both concrete and part of the broad sustainable development concept. The goals and targets are not isolated, being constituents of a holistically understood conception. Such a conception serves as an essential condition for identifying an effective solution that may be compared to the function of a capstone that finishes a vault. Individual stones may be beautiful in themselves but without the final capstone the whole construction has little sense.

A recent article published in Science Magazine, “Composites from renewable and sustainable resources: Challenges and innovations” [6] provides an example of such a comprehensive approach. The article presents a rich set of solutions concerning production, use, etc., of composite materials, but it is always stressed that a solution lies within the sustainability paradigm. Indeed, the term sustainable development, sustainability, and similar are quoted 35 times in the manuscript. It remains clear that a holistic perspective prevails while there are also other similar but narrower terms used as appropriate: renewable, environmentally friendly etc. The authors take great pains to be clear on this issue: “Measuring the sustainability . . . is a complex task affected by factors such as nature of feedstock, energy input during production, durability, health impacts, and afterlife recycling or disposal”. In other words, careful linking and relating a capstone (sustainable development) to all relevant partial solutions and measures allows both complexity and comprehensibility of the whole story on renewable resources.

Many very interesting and important messages are missing in this dimension, and without this sustainability context they lose credibility with many stakeholders. Therefore, even after thirty years of sustainable development summits, action plans, and reports, decision-makers and proponents of sustainable development have failed to make the concept appealing to a wide spectrum of potential stakeholders [7,8]. Therefore, insufficiently and very slowly “changing course” have not resulted in the necessary improvements in many aspects of environmental, social, and economic sustainability [9].

In this study, we investigate how the news media worldwide (printed newspapers) communicate sustainability issues. Since this topic has not been extensively presented in scientific literature, we devoted one section to the theoretical assumptions and foundations of effective communication of sustainable development. We further analyzed real news media and their specific performance over the last ten years in terms of publishing sustainability issues. Although a few studies on the role of media in sustainability communication have emerged recently, they mostly either analyze the content (how a selected theme—e.g., climate change—is communicated) [10,11] or explore certain aspects of a communication theory (e.g., news attention cycle) [12]. This study endeavors to provide a better insight into how media (un)use communication potential of the holistic concept of sustainable development. We looked into the numbers of global newspaper articles covering defined sustainability themes alone and those explicitly linking them to the overarching sustainability concept. The article presents data, data sources, and all methodological steps of our analytical approach. Finally, we discuss the main findings and conclusions.

2. Communicating Sustainable Development

Communication is a key factor for developing knowledge and participation. Sustainability communication ideally reflects the increasingly cross-cutting nature of sustainability issues, and captures changes on a small (local level) to large (planetary) scale, now and in the future, with short- or long-term effects.

Before exploring the issue of sustainable development communication it is important to first clarify two concepts—sustainable development and sustainability. While sustainable development has been known, defined, and redefined for 37 years (first appearing in the World Charter for Nature [13], then fully addressed in *Our Common Future*, further elaborated in Agenda 21 of the Earth Summit in 1992 [14] and finally endorsed by the Sustainable Development Goals commitment by most countries in 2012 (formally in 2015)) [5], the term sustainability appeared even earlier [15]. In many popular books as well as in scientific and policy texts both terms have been used interchangeably (e.g., sustainability indicators refer to indicators of sustainable development, often used term sustainability science means in fact sustainable development-focused science that explores the fundamental character of interactions between nature and society, etc.) [16]. In other cases, sustainability is thought of as a long-term goal while sustainable development refers to the many processes and pathways to achieve it [17]. All these approaches, regardless of whether they are time bound, process- or output-oriented, apply Brundtland's definition, implicitly or explicitly. Unlike these uses, sustainability has also often been used in quite different meanings, e.g., to depict resource sustainability, i.e., the industry's capacity to ensure a continued supply of needed resources; similarly sustainability of pension systems or sustainability of fiscal policy refer to the ability of governments to secure long-term functioning of these systems. Although this is important, conceptual and terminological definitions are not the focus of this article, and we refer potential interested readers to plentiful relevant sources [18–20]. If not explicitly stated otherwise, in this text both terms—sustainable development and sustainability—are used interchangeably to describe an ethically motivated normative concept referring to a form of development and human lifestyle that does not endanger our future and does not limit the opportunities of future generations.

It is intuitively clear and also theoretically and empirically evidenced that effective communication is a critical success factor for reaching sustainability objectives [20–22]. Sustainable development is not science but it employs a myriad of inputs from many scientific disciplines, each with its own theoretical principles and knowledge [23]. Scientific information—assumptions, causal relationships, results, uncertainties etc.—concerning sustainable development must be communicated to the public due to the growing political commitment to giving citizens more of a voice in the decisions that affect their lives. However, the majority of people—outside formal educational settings—do not experience any form of direct public engagement. Instead, most citizens hear about scientific issues from various online and offline media [24]. Their exposure to science and scientists, in other words, is not direct, but indirect through mass or online media. Media's role as a conduit between science and lay audiences is important for citizens as mass media makes the unknown known [25]. Stakeholders—practitioners and lay people with their specific attitudes and behaviors—who are users of scientific results need to understand them. They need to get them in the form of trustworthy, socially-robust, and usable knowledge [16].

A range of authors have stressed the role of mass media in informing and mobilizing the general public as well as shaping public opinion [26,27]. Generally, broadsheet newspapers, rather than other types of media such as newscast or popular magazines, are assumed to have a strong agenda-setting effect on public agenda [28–30] and influence the agenda of other media [31,32]. Within the agenda-setting literature, it has long been acknowledged that “the press may not be successful much of the time in telling people what to think, but it is stunningly successful in telling its readers what to think about” [33]. Moreover, the ability of media to shape the public agenda goes beyond the salience of topics: “Agenda setting is about more than issue or object salience. The news not only tells us what to think about; it also tells us how to think about it. Both the selection of topics for the news

agenda and the selection of frames for stories about those topics are powerful agenda setting roles and awesome ethical responsibilities" [28].

3. Building Sustainability Agendas—Story Telling, Framing

In general, the general public does not seem to care too much about sustainability—one reason may be the extreme complexity of SD and vagueness of the concept, which makes it incomprehensible to the target audience [34]. This lack of clarity is far away from the imperative of today's news—dramatic, exciting and sensational. People are concerned with sustainability issues such as long-term income (prosperity), air and water quality and biodiversity (environment), health (social aspects) or honesty of politicians (democracy). However, most people do not fully appreciate the links between topics, necessary trade-offs, potential risks, and impacts of their behavior [35]. Yet, the sustainability discourse remains fragmented, with a diverse set of challenges receiving vastly different levels of attention [36].

If sustainable development is too elusive and complex a concept, while particular themes—although catchy and comprehensible—do not provide the bigger picture, then a special strategy for sustainability communication must be employed. However, nothing radically new needed—communication theory points to a role of narratives and explains how media institutions appropriate story-telling when communicating information and news. In a nutshell: humans use narratives to weave together fragmented observations to construct meanings and realities (the importance of narratives is illustrated in one of the species names used to define our human species—human narrans; = story-telling beings). For mass media, translating various issues into meaningful stories involves many qualified decisions on how to portray issues in the most vivid and affecting manner possible [37]. Media theory suggests that developing an interesting narrative or even framing isolated pieces of information through a sustainability concept, and its presentation in media—either textually or visually—could significantly impact how audiences process the information. The mechanism behind media framing is known as applicability effect: i.e., a message has a significantly stronger effect if it resonates with (or is applicable to) the audience's underlying cognitive schemas than if it does not [25]. Experiments prove the effects and importance of the strategic message framing for improving the effectiveness of mediated communication of even neglected sustainability topics [38].

A note for terminological clarity: there have been various conceptual frameworks for sustainability reporting based on themes (e.g., transportation, health), political actions (e.g., SDGs), causality phenomenon (Driving force–Pressure–State–Impact–Response; DPSIR), accounting principle (water or ecosystem accounts), etc. Through a clearly structured organization of relevant information often in the form of indicators, such frameworks enable concise communication and help expose how the information provided is related to various processes and how specific policy or management actions can address sustainability problems [39]. Applying frameworks to analyze and structure information helps to move from data to information and subsequently to the structured knowledge needed to elucidate sustainability issues and to design effective responses. In our research, we do not apply causal or other types of conceptual frameworks—we take the benefits of information framing and base it loosely on the definition of a frame as a "central organizing idea ... for making sense of relevant events, suggesting what is at issue." [40]. Thus, we apply the framing and narrating concepts to explore if journalists elaborate and convey sustainability-related themes individually, separately without links and relationships to the overarching sustainability concept or where they publish sustainability-related issues within the overall sustainability context (in other words, if they develop and use—at least to some extent—sustainability narratives to frame current issues of public interest). We don't explore the contents and/or mechanisms of news making. We focus our interest on quantified evidence of (non)framing as a starting point for further research. Our approach to explore this question is described in detail in the following methodological section.

4. Data and Methods

Based on sustainability education and awareness, strategies for sustainability communication, and the media concept of narratives and frames, we assume a beneficial effect of exposing people to relevant information in a holistic manner with explicitly stated causal, spatial, temporal, etc., relationships among facts (processes, subjects and phenomena) in a sustainability context. This contextual presentation of information relevant for sustainable development delivered by informal channels (mass media—newspapers) and frequently (on a daily basis) may substantially improve public understanding of even the complex and vague sustainability concept.

Our quantitative approach is based on the assumption that a volume of media coverage generally indicates the relative salience that is awarded to an issue over time in a given context [12,41]. We developed a protocol within our study for the data mining process and analysis, searching for a single specific theme related to sustainability (e.g., renewable energy) with the conceptual overarching idea (sustainable development). We first conducted a computer search in full-text articles containing specific theme-keywords related to the sustainable development concept. Then, we searched the same keywords together with the terms denoting the sustainability concept. Thus, we investigated whether and how much various sustainability themes reported in global newspapers are linked to the overarching concept of sustainable development. The testing parameters were the frequency of occurrence of the selected keywords representing main themes (discussed below) of the sustainability concept individually (stand-alone), and in relation with the four specific terms denoting sustainability in some sense: sustainability, sustainable development, Sustainable Development Goals and Millennium Development Goals.

4.1. Selection of Terms for the Media Analysis

A crucial step affecting the validity of the media analysis was selection of the sustainability themes. They were selected/extracted from the SDGs that currently represent a broad international consensus on the key global problems and objectives to achieve a more sustainable path of development by 2030. The selection of themes was made by an expert panel of five people (three authors of this article plus two other experts) working in the field of sustainability assessment for more than ten years. Based on the analysis of each goal, each expert selected one theme denoted by one term (a word or a collocation) that best/most closely characterized it. For example, for SDG 3 (ensure healthy lives and promote well-being for all at all ages) the theme “healthy lives” was identified as the best representative of the entire Goal. The sets of terms for the themes by all experts were compared and conformities and discrepancies among them were identified. The experts concurred in 11 out of 17 themes (Goals 1, 2, 3, 4, 5, 8, 9, 11, 12, 13, and 17; Table 1. In two goals (Goals 7 and 10) there were only terminological discrepancies rather than conceptual or factual ones (modern energy vs. clean energy vs. renewable energy; inequality within countries vs. inequality among countries). For these two ambiguous cases the media analysis provided a clue—the term(s) with the highest occurrence proceeded into a further analysis (Table 2). In four goals (Goals 6, 14, 15, and 16) experts failed to reach a consensus. They provided several alternative terms for each goal and even during subsequent discussion a unanimous solution was not found. The reason was that the goals’ formulations embraced several equally important aspects of the given theme; all closely linked but nevertheless different in principle (e.g., biodiversity loss vs. land degradation vs. ecosystem conservation for SDG 15 devoted to terrestrial ecosystems; or water availability vs. sanitation availability for SDG 6 devoted to water and sanitation). In these cases, all the selected themes/terms were used in the media analysis (Table 3). The same solution was used for the goals with multiple/alternative themes where experts encountered some terminological discrepancies such as e.g., water availability vs. water accessibility for both water and sanitation themes. Since the factual meaning was similar, the media analysis provided a final clue again (the terms with the highest occurrence were employed in further analysis; Table 4).

Table 1. An expert panel's consensus on both the theme and its keyword.

SDG 1	End Poverty in All Its Forms Everywhere	
SD theme	Extreme poverty	Theme agreed on by all experts
Keyword	Extreme poverty	Keyword agreed on by all experts
Final keyword	Extreme poverty	

Table 2. An expert panel's consensus on the theme, not the keyword.

SDG 7	Ensure Access to Affordable, Reliable, Sustainable and Modern Energy	
SD theme	New clean types of energy	Theme agreed on by all experts
Keywords first selection	Modern energy vs. Renewable energy vs. Clean energy	Keyword not agreed on by all experts
		Media analysis of all three keywords identifies the most commonly used term
Final keyword	Renewable energy	

Table 3. Expert panel's disagreement concerning the theme but consensus on its keyword.

SDG 15	Sustainably Manage Forests, Combat Desertification, Halt and Reverse Land Degradation, Halt Biodiversity Loss	
SD theme	Land degradation vs. Ecosystem conservation vs. Biodiversity loss	One theme not agreed on by all experts
	Land degradation, Ecosystem conservation, Biodiversity loss	All three themes assessed as equally important by all experts—all themes chosen for the media analysis
Keywords		Key words agreed on by all experts
Final keywords	Land degradation, Ecosystem conservation, Biodiversity loss	

Table 4. Expert panel's disagreement on both the theme and its keyword.

SDG 6	Ensure Availability and Sustainable Management of Water and Sanitation for All	
SD theme	Sustainable management of water vs. Sustainable management sanitation	One theme not agreed on by all experts
		Both themes assessed as equally important by experts—all chosen for media analysis
Keywords	Water availability vs. water accessibility; Sanitation availability vs. sanitation accessibility	Keywords not agreed on by all experts
		Media analysis of all four keywords identifies the mostly used terms
Final keywords	Water availability; Sanitation availability	

At the selection phase, experts sought to avoid the term “sustainable” in the theme terms search due to the potential effect on results of the media analysis in cases of joint occurrences of the theme plus “sustainable development” term. The only exemption is Goal 8 devoted to sustainable economic growth for which no more relevant term than “sustainable economic growth” was identified. The overview of all selected sustainability themes in the global mass media is shown in Figure 1.

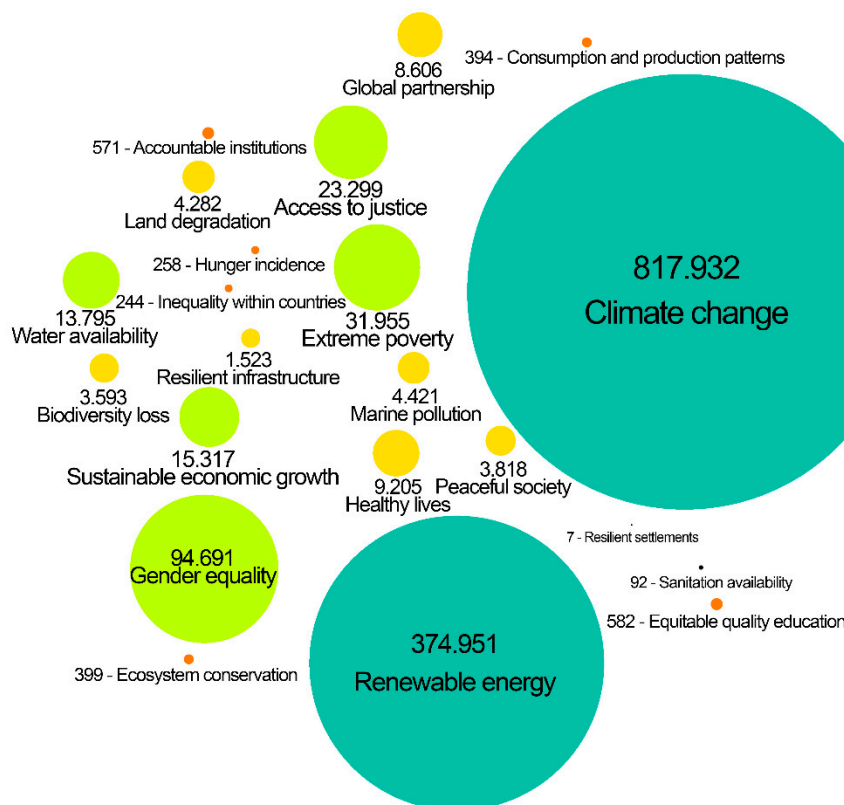


Figure 1. An overview of all selected sustainability themes with their total occurrence magnitudes (the circles’ size proportionally denotes the magnitude, colors denote clusters of themes based on the order of magnitude).

The counterpart to the above 22 selected sustainability themes for the media analysis, which provided a contextual frame, was sustainable development. The “sustainable development” concept has remained unchanged for almost forty years (since its launch in 1983) although many definitions attempting to more clearly define it, and related concepts have emerged. The experts unanimously proposed an additional three fitting terms appearing in mass media as well as in scientific literature depicting the same concept: “sustainability” (see the above discussion), “Sustainable Development Goals” (recently considered an agreed measurable/operational definition of sustainable development) and “Millennium Development Goals” (predecessors of the SDGs packing social, economic, and environmental concerns into several understandable goals and thus mobilizing and marking the human trajectory towards sustainability). For more details on this issue we refer to the selected sources over past 20 years: [19,42–45].

4.2. News Media Selected for Analysis

The aim of the quantitative analysis was to explore the absolute number and relative share of articles using sustainability terminology in English language newspapers. The sample of media for the content analysis consisted of the newspapers with global reach published in a 10-year time period from 2009 to 2018. A number of previous studies have focused on print media, because of its strong agenda-setting effect on public opinion as well as on the news agenda of other media [10–12,46–48].

Data were collected using the Factiva news repository and search tools giving access to thousands of sources from about 160 countries (news sources include newspapers such as The Wall Street Journal, Dow Jones Newswires, The New York Times, The Sydney Morning Herald, South China Morning Post, The Times of India etc.). At the time of the search, the sample of newspapers contained a total of 9553 titles including major global, national, and regional newspapers [49]. Other types of print media (e.g., popular magazines, trade journals) were not included in the sample.

4.3. Data Mining Method

We applied a basic text mining technique [11,50] using the Factiva database full-text search tools [51]. The search procedures were as follows: (1) for each sustainability theme and each sustainability concept (search strings used for concepts: Sustainability—*“sustainability”*; Sustainable—(*“sustainable development” not “sustainable development goals”*) or (*atleast2 “sustainable development” and atleast1 “sustainable development goals”*)); Sustainable development goals—*“sustainable development goals”*; Millennium development goals—*“millennium development goals”*), a specific search algorithm was developed allowing for the inclusion of possible variations in spelling, conjunction or misspelling of the term. All articles that contained at least one mention of the respective theme, or a combination of theme and concept (using Boolean operator AND, for example *“sustainable development goals” AND “extreme poverty”*), were counted. (2) Under the ‘source category’ option we selected ‘all newspapers’, excluding identical duplicate articles. (3) The search date range was restricted from 1 January 2009 to 31 December 2018. Search results were converted to frequency tables, displaying the total number of articles in the review period.

5. Results

The media analysis revealed that the five most published themes were “Climate change” (SDG 13) followed by “Renewable energy” (SDG 7), “Gender equality” (SDG 5), “Extreme Poverty” (SDG 1), and “Access to Justice” (SDG 16). Climate change appeared in total 817,000 times in all newspapers during the last ten years. It had 45,000 combined appearances together with the “sustainability” term; 29,000 appearances with the “sustainable development” term; 8000 appearances with the “Sustainable Development Goals” term; and 4000 appearances with the “Millennium Development Goals”. Climate change was thus linked to a sustainability concept 86,000 times whereas it was presented as a stand-alone concept nine times more often (731,000 occurrences).

However, the themes were only slightly linked to the sustainability concept: for example only 11% of the articles containing the flagship sustainability theme “Climate Change” were somewhat related to sustainability. Another frequently published theme “Renewable energy” was so framed only in 9% of published articles. “Extreme poverty” showed the highest share of articles linking the theme and sustainability concepts in this group—28% (see Table A1 in Appendix A). However, these proportions may be in fact smaller provided that one article may comprise two or more concepts (the article is then counted accordingly, twice or more, in the media analysis and sum of all sustainability concepts related to the themes is bigger and therefore the share is also bigger accordingly).

Other interesting findings revealed by the media analysis were five themes most closely related to sustainability: both “Consumption and production patterns” (SDG 12) and “Equitable quality education” (SDG 4) in 100% of appearances, “Resilient infrastructure” (SDG 9) (53 percent), “Land degradation” (SDG 15) (45%) and “Accountable institutions” (SDG 16) (44%). However, the total number of articles with these themes published during the same ten-year period was very small. For example the “Consumption and production patterns” theme appeared only in 394 articles, i.e., only in eleven articles all over the world per year. Within these five best-framed themes the “Land degradation” was published most extensively—in 4282 articles. It is still, however, eight times less than the volume of articles addressing “Extreme poverty”, the best-framed theme among the top five most published themes.

The media paid only marginal attention to the theme “Resilient settlements” (SDG 11)—only 7 articles were devoted to this during last ten years. Another neglected theme was, surprisingly, “Sanitation availability” (SDG 6) with less than a hundred articles. The weakest sustainability concept framing was found in two themes of SDG 16—“Peaceful society” and “Access to justice” which together comprised only 5 percent. In other words, only every 20th article dealing with access to justice connected this theme to sustainable development to some degree.

As evidenced by the media analysis results, nine out of 22 themes (40%) had less than a 15% share of articles where the themes are linked to sustainability. Five more themes (out of a total of 22, i.e., 22%) were within the range of 16–30% linked to sustainability, four themes at about 33% (one third), two themes with the range of 46–60%, and only two themes had a sustainability connection of higher than 90% (see Figure 2). These figures can be read as the untapped potential of global mass media for effective communication of various sustainability issues holistically and in a relevant context. Despite the fact that readers are exposed to large quantities of newspaper articles covering issues relevant to sustainability (about 1.5 million articles during the past ten years), a large portion of them are narrowly focused only on a specific sustainability theme.

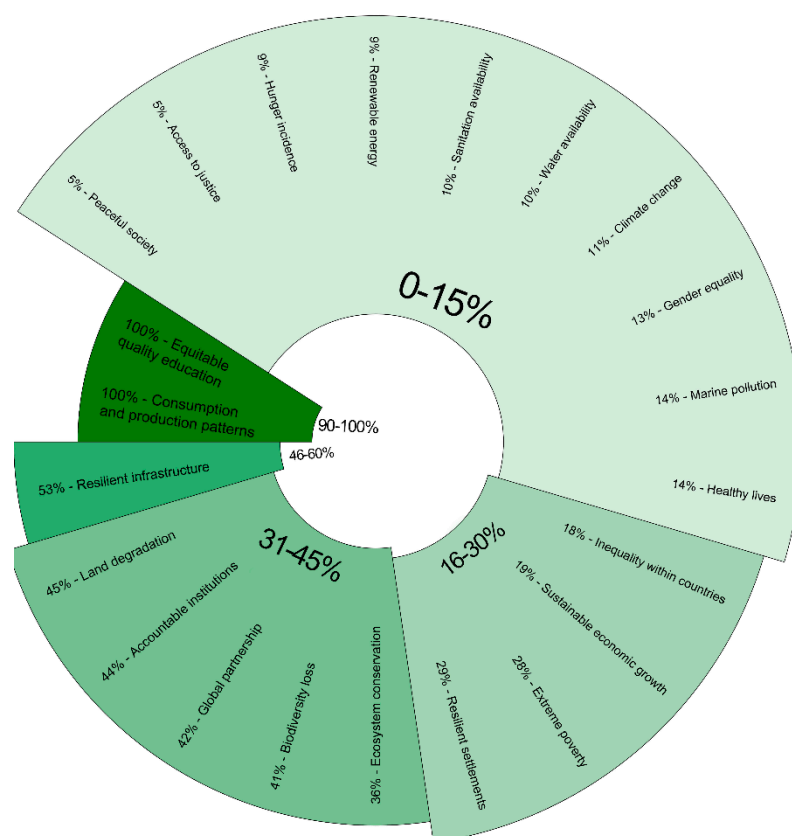


Figure 2. An overview of all selected sustainability themes clustered in five groups based on the proportion of articles linking its sustainability theme with one of the four selected sustainability concepts.

6. Discussion and Conclusions

In the course of a lifetime, people accumulate knowledge from a combination of school, media, family members and friends, and a wide range of other professional and personal experiences. However, even children get more environmental information from the media (83%) than any other source. For most adults, the media is the only steady source of environmental information [24].

We assume a similar situation concerning knowledge on sustainable development, i.e., that most adults use mass media as a prime source of information. However, unlike approaches towards environmental, financial or sexual literacy, sustainability communication still does not have its own theoretical framework to introduce the complex relationship between humans and their environment into social discourse; nor how to help develop a critical awareness of the problems and relating them to social values and norms. Scientists and educators thus have an instrumental role in providing reliable information and assisting media with developing suitable narratives.

This challenge is of enormous magnitude. Sustainability is inherently a multi- and cross-disciplinary concept. Therefore, both thematic specialists as well as universal sustainability scientists are needed for the task. Moreover, these experts must be willing and capable of popularization of the sustainability concept. To make the whole issue even more complicated, the same prerequisites apply to journalists—combining expertise in a particular theme (water, poverty, economic growth, etc.) with a broad overview and proficiency in generalizing, and last but not least being great story-tellers.

Our research was not designed to answer the following question, but we may speculate on the role of another important proponent of sustainability besides science—policy and decision makers. Sustainability is a concept aiming at action leading to positive change and many of these actions are to be initiated or implemented from that level. The Fourth Estate (press) is historically a societal power, whose influence is not officially recognized as such, but just the name indicates the importance of the press in relation to legislative, executive, and judiciary powers. The key purpose of mass media is to act as a watchdog systemically questioning and reporting all matters of governance, public matters as well as commercial ones. This is fully legitimate since political practices show that while decision- and policy-makers are increasingly charmed by participatory and bottom-up approaches, they nonetheless continue to believe that top-down planning, mainly based on the use of media, remains a more effective way to ‘deliver’ social change [52,53]. However, besides this, politicians are also important stakeholders and proponents of sustainable development since they have many effective instruments for promoting and implementing sustainability at various levels (economic incentives, regulation, innovation support, etc.). Therefore, politicians should be involved in sustainability communication to add governance, legislation, finance, and other aspects to the implementation of sustainable development.

Nevertheless, even if scientists and politicians get involved in sustainability communication, identifying how to channel the powerful influence of the media to achieve not just public awareness but literacy remains a key challenge. According to Reference [24], the media is poorly positioned to offer in-depth education. This means it provides a steady, even ubiquitous, flow of awareness-building information but it seldom educates on complex matters.

Our research provides evidence that readers are exposed to relatively large quantities of newspaper articles covering issues relevant to sustainability (in total about 1.5 million. articles during past ten years). However, the various sustainability themes attracted journalists very unevenly (this is confirmed also by other research, e.g., in Reference [54], the authors found that media coverage of climate change was up to eight times higher compared to biodiversity in English speaking countries). The media paid just marginal attention to the theme “Resilient settlements” (SDG 11)—only seven articles covering this theme in the last ten years. Another neglected theme was, surprisingly, “Sanitation availability”, (SDG 6) with less than a hundred articles. Among the thematic lagers, “Hunger incidence” (SDG 2) and “Inequalities within countries” (SDG 10) also experienced very little attention (about 250 articles). There is no easy explanation for this—at first sight, keywords for these neglected themes sound familiar and urgent: (i) urbanization is the theme of this decade—half of the world’s population has lived in urban settlements since 2011 and the UN major event on this issue (Habitat III) took place in 2016; (ii)

4.5 billion people worldwide lacked a safely managed sanitation service in 2015 and nearly a billion people still practiced open defecation; Bill Gates has recently funded research into toilets that don't require a sewer system; (iii) according to FAO, the number of hungry people in the world was over 800 million in 2016 and the global prevalence of undernourishment is rising—a well-known statistics; and (iv) significant disparities, e.g., in health among more and less privileged social groups within even high-income countries have appeared that worries both sociologists and politicians. There may be a multi-factorial *raison d'être* for avoidance of these themes by the media that we may hypothesize about: denial of the problems by politicians in some countries (hunger, sanitation); new or unusual keyword assigned for the theme (resilient settlements), low visibility of the problem (inequalities); little urgency (hunger is not starvation or famine), perceived local-scale effects mostly in low-income countries (sanitation) or just an overall lack of attractiveness of the theme for the front-page headlines.

On the other hand, the media analysis revealed a few quite highly published themes such as “Climate change” (SDG 13), “Renewable energy” (SDG 7), and to some extent “Gender equality” (SDG 5). We might speculate on the reasons for that—climate change may get into spotlight due to its link to weather forecasts with a long tradition on TV and in newspapers, renewable energy due to everyday concerns of ordinary people about the price of heating, car fuels, electricity bills etc.—but the key result of our research is that even the highly published themes are inadequately (i.e., weakly) linked to the overarching sustainability concept. Without this context, people do not have a clear picture of how driving big cars and/or intensive logging are related to climate change or even to health problems, loss of culture or hunger. Furthermore, the particular themes do not only lack broader context and meaning but also important arguments derived from sustainability principles such as long-term thinking, intergenerational justice, global perspective, etc.

Improving the contextual communication of numerous sustainability-related themes (with causal, spatial, temporal, sectoral and other relationships to grasp sustainable development in its complexity) is an extremely difficult task: outreach activities are generally considered as time-consuming among scientists and insufficiently rewarded in terms of career advancement; politicians prefer narrow “silo” thinking and short-term agendas (within their mandate) not based on scientific facts. Scientists, politicians, and journalists are three key, interconnected players involved in producing and communicating reliable information on the state and outlook of society and the planet. Since 2015, they have had a powerful tool to accomplish this task—the Sustainable Development Goals intended to “transform the world”. Yearly SDG reports—both at thematic [55] and global [9] levels—supply any interested person with plenty of data, information, case studies and recommendations. They also explore linkages within particular SDGs and the interlinkages between a SDG and other SDGs' targets and indicators. Similarly to the emerging media discourse, the political discourse also needs to work on framing particular themes and integrating them into various fields of public policy and ultimately into the sustainability concept.

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Appendix A

Table A1. An overview of the media analysis results.

SDG (Goal)	Sustainability-Related Theme	Sustainability Concept	Occurrence (Numbers)	Share of “Framed” Articles
G1	Extreme poverty	Sustainability	1623	27%
		Sustainable development	2274	
		Sustainable Development Goals	1963	
		Millennium Development Goals	3087	
		Sum of the 4 sustainability concepts	8497	
		Total occurrence (individual occurrence + 4 sustainability concepts)	31,995	
G2	Hunger incidence	Sustainability	9	9%
		Sustainable development	1	
		Sustainable Development Goals	2	
		Millennium Development Goals	12	
		Sum of the 4 sustainability concepts	24	
		Total occurrence (individual occurrence + 4 sustainability concepts)	258	
G3	Healthy lives	Sustainability	187	14%
		Sustainable development	425	
		Sustainable Development Goals	490	
		Millennium Development Goals	182	
		Sum of the 4 sustainability concepts	1284	
		Total occurrence (individual occurrence + 4 sustainability concepts)	9250	
G4	Equitable quality education	Sustainability	52	125% *
		Sustainable development	296	
		Sustainable Development Goals	274	
		Millennium Development Goals	103	
		Sum of the 4 sustainability concepts	725	
		Total occurrence (individual occurrence + 4 sustainability concepts)	582	

Table A1. Cont.

SDG (Goal)	Sustainability-Related Theme	Sustainability Concept	Occurrence (Numbers)	Share of “Framed” Articles
G5	Gender equality	Sustainability	2636	13%
		Sustainable development	4176	
		Sustainable Development Goals	3297	
		Millennium Development Goals	2568	
		Sum of the 4 sustainability concepts	12,668	
		Total occurrence (individual occurrence + 4 sustainability concepts)	94,691	
G6	Water availability	Sustainability	790	10%
		Sustainable development	446	
		Sustainable Development Goals	109	
		Millennium Development Goals	71	
		Sum of the 4 sustainability concepts	1416	
		Total occurrence (individual occurrence + 4 sustainability concepts)	13,795	
	Sanitation availability	Sustainability	5	10%
		Sustainable development	1	
		Sustainable Development Goals	2	
		Millennium Development Goals	1	
		Sum of the 4 sustainability concepts	9	
		Total occurrence (individual occurrence + 4 sustainability concepts)	92	
G7	Renewable energy	Sustainability	22,051	9%
		Sustainable development	10,257	
		Sustainable Development Goals	1731	
		Millennium Development Goals	600	
		Sum of the 4 sustainability concepts	34,639	
		Total occurrence (individual occurrence + 4 sustainability concepts)	374,951	

Table A1. Cont.

SDG (Goal)	Sustainability-Related Theme	Sustainability Concept	Occurrence (Numbers)	Share of “Framed” Articles
G8	Sustainable economic growth	Sustainability	1074	19%
		Sustainable development	1164	
		Sustainable Development Goals	495	
		Millennium Development Goals	235	
		Sum of the 4 sustainability concepts	2968	
		Total occurrence (individual occurrence + 4 sustainability concepts)	15,317	
G9	Resilient infrastructure	Sustainability	175	53%
		Sustainable development	287	
		Sustainable Development Goals	276	
		Millennium Development Goals	68	
		Sum of the 4 sustainability concepts	806	
		Total occurrence (individual occurrence + 4 sustainability concepts)	1523	
G10	Inequality within countries	Sustainability	10	18%
		Sustainable development	11	
		Sustainable Development Goals	13	
		Millennium Development Goals	9	
		Sum of the 4 sustainability concepts	43	
		Total occurrence (individual occurrence + 4 sustainability concepts)	244	
G11	Resilient settlements	Sustainability	1	29%
		Sustainable development	1	
		Sustainable Development Goals	0	
		Millennium Development Goals	0	
		Sum of the 4 sustainability concepts	2	
		Total occurrence (individual occurrence + 4 sustainability concepts)	7	

Table A1. Cont.

SDG (Goal)	Sustainability-Related Theme	Sustainability Concept	Occurrence (Numbers)	Share of “Framed” Articles
G12	Consumption and production patterns	Sustainability	145	157% *
		Sustainable development	235	
		Sustainable Development Goals	163	
		Millennium Development Goals	77	
		Sum of the 4 sustainability concepts	620	
		Total occurrence (individual occurrence + 4 sustainability concepts)	394	
G13	Climate Change	Sustainability	45,238	11%
		Sustainable development	29,189	
		Sustainable Development Goals	8161	
		Millennium Development Goals	4066	
		Sum of the 4 sustainability concepts	86,654	
		Total occurrence (individual occurrence + 4 sustainability concepts)	817,932	
G14	Ocean protection	Sustainability	132	9%
		Sustainable development	47	
		Sustainable Development Goals	15	
		Millennium Development Goals	5	
		Sum of the 4 sustainability concepts	199	
		Total occurrence (individual occurrence + 4 sustainability concepts)	2221	

Table A1. Cont.

SDG (Goal)	Sustainability-Related Theme	Sustainability Concept	Occurrence (Numbers)	Share of “Framed” Articles
G15	Biodiversity loss	Sustainability	521	41%
		Sustainable development	574	
		Sustainable Development Goals	246	
		Millennium Development Goals	122	
		Sum of the 4 sustainability concepts	1463	
		Total occurrence (individual occurrence + 4 sustainability concepts)	3593	
	Land degradation	Sustainability	510	45%
		Sustainable development	1090	
		Sustainable Development Goals	261	
		Millennium Development Goals	86	
		Sum of the 4 sustainability concepts	1947	
		Total occurrence (individual occurrence + 4 sustainability concepts)	4282	
	Ecosystem conservation	Sustainability	65	36%
		Sustainable development	61	
		Sustainable Development Goals	10	
		Millennium Development Goals	6	
		Sum of the 4 sustainability concepts	142	
		Total occurrence (individual occurrence + 4 sustainability concepts)	399	

Table A1. Cont.

SDG (Goal)	Sustainability-Related Theme	Sustainability Concept	Occurrence (Numbers)	Share of “Framed” Articles
G16	Peaceful society	Sustainability	42	5%
		Sustainable development	79	
		Sustainable Development Goals	60	
		Millennium Development Goals	19	
		Sum of the 4 sustainability concepts	200	
		Total occurrence (individual occurrence + 4 sustainability concepts)	3818	
	Access to justice	Sustainability	249	5%
		Sustainable development	458	
		Sustainable Development Goals	297	
		Millennium Development Goals	165	
		Sum of the 4 sustainability concepts	1169	
		Total occurrence (individual occurrence + 4 sustainability concepts)	23,299	
	Accountable institutions	Sustainability	35	44%
		Sustainable development	106	
		Sustainable Development Goals	59	
		Millennium Development Goals	50	
		Sum of the 4 sustainability concepts	250	
		Total occurrence (individual occurrence + 4 sustainability concepts)	571	
G17	Global partnership	Sustainability	898	42%
		Sustainable development	1015	
		Sustainable Development Goals	683	
		Millennium Development Goals	1001	
		Sum of the 4 sustainability concepts	3597	
		Total occurrence (individual occurrence + 4 sustainability concepts)	8606	

* The higher percentage—over 100—may be caused by double counting (see p. 9 for explanation).

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