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The relative representation of ecosystem services and disservices in South African newspaper media

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ABSTRACT

Newspapers are key information sources and may influence both public opinion and policy. Previous studies have analysed the portrayal of ecosystem disservices in newspapers, but none have assessed the relative coverage between disservices and services, or how it might have changed over time. We report on the relative frequency and depiction of ecosystem services and disservices in South African, English newspapers over a 15-year period. We used a SABINET search complemented by key-informant interviews with environmental journalists. For each article we recorded if it covered ecosystem services or disservices, the type of service or disservice, and article tone and length. Overall, 2,201 articles were found, of which 25% were on services and 75% on disservices. The number of articles per year declined over the 15-year period for services, but not disservices. The most common services were energy and craft materials, food production, recreation and culture, and disservices were human health, heat waves and floods. Articles on ecosystem services were 25–40% longer than those on disservices. Article lengths on both declined over the 15 years. The greater reporting of ecosystem disservices over services is likely to influence public opinion and environmental decision-making accordingly.

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1. Introduction

It is now well appreciated that ecosystems provide humans with a wide variety of direct and indirect services and benefits that underpin human health, livelihoods and well-being (Costanza et al. 2014; Dobbs et al. 2014; Diaz et al. 2015). These benefits are generated in different mixes and quantities in both natural and human-modified ecosystems, but the magnitude or quality of the benefits may be compromised through human actions or mismanagement. Consequently, there are ever-increasing efforts to map and quantify ecosystem services (ES) provision and flows at various scales so they can be better conserved and managed (e.g. Lang and Song 2019; Varin et al. 2019), and to better inform trade-off decisions (Darvill and Lindo 2016; Turkelboom et al. 2018).

Though ecosystems provide humans with a range of ES, they are also capable of producing ecosystem disservices (Lyytimäki 2014; Von Döhren and Haase 2015), defined by Shackleton et al. (2016) as the ‘ecosystem generated functions, processes and attributes that result in perceived or actual negative impacts on human well-being’. Ecosystem disservices (EDS) may include pathogens, allergens, pests, physical environmental obstacles that hinder human movement, and phenomena that decrease aesthetic value or harm human well-being and safety (Lyytimäki 2014). Typically they operate in one or more of three ways (Shackleton et al. 2016): (i)

direct negative effects on a person, such as an insect or snake bite, (ii) causing a reduced flow of an ES, which subsequently constrains the benefit flows required by a particular person or community, and (iii) the loss or reduction of a supporting or regulating service, such as the loss of primary production following a wildfire.

Relative to the considerable volume of literature on ES, EDS have been overlooked within the ES paradigm (Lyytimäki et al. 2008; Ninan and Inoue 2013; Lele et al. 2013; Von Döhren and Haase 2015; Shackleton et al. 2016), and in many empirical works. For example, in Weslawski et al.’s (2006) assessment of the Baltic Sea marine ecosystems only benefits were considered (such as the mineralogical and biological resources provided, climate regulation functions, the value of recreational benefits and the control of erosion), with very little information on EDS, such as the hazards associated with rising sea levels, the damage caused by storms, floods, erosion and abrasion, the negative effects of algal blooms, eutrophication, pollution, parasites and how salt water leaching affects the fresh groundwater supply (Lyytimäki et al. 2008). However, Von Döhren and Haase (2015) and Shackleton et al. (2016) argue that EDS have been well represented in some academic literature, but were not referred to as such and were typically not assessed within ES or nature’s benefits paradigms or frameworks.

In contrast, EDS are often well covered in the public media, which may be dominated by ‘bad

news' (Lyytimäki 2014), even though coverage of environmental issues is generally increasing in newspapers (Holt and Barkemeyer 2012). Articles about EDS are regarded as more common in the public media than those on ES because the stories with the highest news value are those which involve the disruption of a community or human well-being (Leitch and Bohensky 2014; Lyytimäki 2014). Newspaper media are a platform for creating social constructs of an event, issue or personality by reflecting and shaping public opinion through what information is made available as well as the manner in which it is presented (Bogart 1989; Kepplinger et al. 1989; Holt and Barkemeyer 2012; Leitch and Bohensky 2014). Print and online newspapers are generally easily accessible information sources worldwide and are a medium through which individuals connect to the world (Bogart 1989; Boykoff 2009). Thus, media coverage can contribute to development of opinions and consequent policy responses. For example, Miller et al. (2018) reported a correlation between media coverage of invasive wild pigs in the USA and policy responses. It is thus important to gauge whether dominant discourses in the public media sufficiently reflect those in more expert or academic realms, and at times evidence-based 'reality'. If there is an asymmetry it may result in incomplete understandings of core concepts or issues amongst some of the readers and decision makers. That may result in constructions, in some situations or by some parties, that are far divorced from 'reality' (Van der Meer et al. 2019), and that may result in misinformed decisions, resource allocations or policies (Lyytimäki 2014; Eagle et al. 2018).

Although there is recognition of the importance of newspapers as information sources, only a few studies have examined the media's portrayal of the general ecosystem services (Leitch and Bohensky 2014), and not both ES or EDS and therefore the relative prevalence of the two has not been determined. According to Lyytimäki (2014) there is a need for ES and EDS to be taken into consideration together, because if one is ignored it may result in an imbalance in the content presented to the public, which in turn may then engender uninformed or biased opinions and actions. Additionally, ES and EDS in newspaper media have never been analysed relative to each other over an extended time-period (more than five years). Thus, the aim of this study was to assess the occurrence and representation of both ES and EDS in newspaper media across South Africa (at a national scale) over a 15-year period. Within this context we sought to determine the frequency and depiction of ES and EDS in the South African English newspaper media by answering the following questions; (1) is there a difference in the frequency and content regarding ES and EDS in the newspaper

media? (2) has the frequency or content changed over the last 15 years? and (3) how do environmental journalists view the coverage and narratives of ES and EDS over the past 15 years?

2. Study context

This study sourced data from various newspapers across South Africa. The population is approximately 56 million people (with an annual population growth rate of 1.0 %), 51% of which are female and 49% male (Statistics South Africa 2016). South Africans of African descent constitute the majority (80.7 %) of the population, followed by those of mixed African and European descent (8.7 %) and European descent (8.1%). Approximately 62% live in urban areas, and 38% in rural villages and farms. Unemployment and poverty are high, at approximately 27% and 40%, respectively. South Africa is a culturally diverse country with 11 official languages. For the purpose of this study, only newspapers published in English were used. Although only 9.6 % of the population speak English as a first language (Statistics South Africa 2016), English is generally understood across the country as it is recognised as the language of government, business and commerce (Gough 1996). The literacy rate (people aged 15 years and older capable of reading and writing) is 94.3% (Statistics South Africa 2016; Zuberi et al. 2016). The newspapers used in this study were national newspapers. Newspaper readership is dynamic and constantly changing, although a steady decline in circulation has been experienced for most national newspapers over the last decade, attributed to cheap tabloids and on-line media (Myburgh 2011; Manson 2017). Approximate circulation of SA newspapers as of the end of 2016 was 1.2 million copies for daily newspapers, 0.5 million copies for weekly newspapers and 1.5 million copies for weekend newspapers (Manson 2017).

3. Methods

3.1. Data collection

The online resource database 'SABINET' was searched to determine the number of articles reporting on ES and EDS occurring over a 15-year period (Jan 2002 to Dec 2016) in all national, weekly English South African newspapers, under the link 'SA Media'. Any publications that were not newspapers (that is, magazines and books) were excluded from the study. A 15-year period was chosen for a long-term perspective and to account for any variability in environmental conditions that may have possibly influenced what was reported in the newspapers at particular times (for example, droughts, floods or wildfires). Furthermore, it also covered the time-period across which the Millennium

Ecosystem Assessment (2005) has been active. However, after data collection the year 2002 was removed from the data array as the number of articles published on the SABINET database for this year was atypically low for both ES and EDS. This decision cut the time-period down to 14 years.

To quantify the frequency of ES and EDS in South African newspapers, a list of specific search terms correlating to ES and EDS were used (Tables 1 and 2) after a pilot run. The initial list was based on Costanza et al. (1997) for ES and Lyytimäki (2014) for EDS that aligned with the definition of Shackleton et al. (2016). The pilot run indicated that some services yielded high numbers of articles but most of which had no direct links to the environment; for example the ES 'waste treatment' resulted in a many articles about water treatment works or issues of mismanagement at landfill sites, whilst the ES 'gas regulation' returned numerous articles related to general and industrial chemistry rather than regulation of the composition of the atmosphere, and 'nutrient cycling' provided only one article on the role of ecosystems in nutrient cycling but dozens on human diets and

general industrial biochemistry. We also found it necessary to merge some of the Costanza et al. (1997) categories to limit the number of duplicate returns (e.g. water regulation and water supply; recreation and cultural; biological control and refugia). One ES or EDS had multiple search terms which were then separated by 'AND' or 'OR' in the search bar and were counted together as one ES or EDS. This process was repeated for the eight ES and the eight EDS identified, and it was done for each year individually falling within the search period. Threats to human health were included as an EDS in instances where the threat was posed by a disease or physical harm caused by another organism (Table 2).

To assess the content of articles the same search technique as before was used. However, only 50 randomly selected articles published in three different periods, at the start, middle and end of the 14-year analysis window (i.e. 2003, 2009 and 2016) were used, providing a total of 150 articles that were examined in detail. For each of the 150 articles, we recorded the following: (i) whether the article considered an ES or an EDS, (ii) the word count, (iii) a count of the search

Table 1. Ecosystem services and their functions (Costanza et al. 1997) and their search terms used for the study.

Ecosystem service	Ecosystem function	Search terms	Code
Water regulation and water supply	Control of water flows/processes and storage of water	Water regulation OR water supply AND provisioning OR storage OR flow OR reservoir OR aquifer OR watershed	WR + WS
Erosion control	Minimising loss of soil in an ecosystem	Erosion AND control OR stop OR prevent OR silt storage OR soil retention OR vegetation	EC
Pollination	Pollination of plants and flowers by biotic and abiotic vectors	Pollination OR seed dispersal AND mammal OR insect OR wind OR water OR flower OR plant	P
Biological control and refugia	Trophic-dynamic regulation of populations and habitat for populations during unfavourable conditions	Natural AND population AND migration OR biological control	BC + R
Food production	Primary production extractable as a food resource	Food OR subsistence AND production OR farming OR hunting OR nuts OR fishing OR game OR crops OR fruit OR gather	FP
Raw materials	Primary production extractable as raw materials	Human use OR natural resource OR timber OR fuel OR fodder OR raw material OR firewood OR energy OR medicine OR crafts	RM
Genetic resources	Source of unique biological materials and products	Genetic OR natural AND diversity OR resource OR medicine OR genes OR resistance OR plant pathogen OR crop pests NOT modified	GENR
Recreation and cultural services	Environments that provide recreational opportunities as well as non-commercial uses	Environment OR nature OR outdoors AND recreation OR activities OR aesthetic OR scenic OR cultural OR spiritual OR beauty OR ecotourism NOT government	REC + C

Table 2. Ecosystem disservices and their functions (Lyytimäki 2014) and their search terms used for the study.

Ecosystem function or property	Ecosystem disservice	Search terms	Code
Storm, strong wind	Storm damage, electricity blackouts, traffic/ transport delays, sandstorms	Storm damage AND death OR hail OR tornado OR wind OR strong wind	S
Floods	Flood damage, salinization of water, erosion and landslides	Flood AND damage OR landslide OR erosion OR salinization OR torrential rain OR heavy rain	F
Heat waves	Thunderstorms, forest fires, droughts	Drought NOT politics	HW
Nature related fear	Fear of wild animals (death/ damage), unpleasant experiences, children's fears	Animal AND attack OR scared OR bite OR death OR wild OR injure	NRF
Fears and risks to human health	Allergens, disease, hygiene/ health problems, contamination of water, antibiotic resistance, virus spread, new disease by exotic species	Human AND health AND threat OR allergen OR disease OR hygiene OR virus OR spread	HH
Unpleasant natural elements	Animal excrement, loud noises by birds, cats, dogs, algae affecting watercourses, ugly appearing species, unmanaged vegetation, weeds, pests, nuisance species, glare caused by direct sunshine	Nature OR environment AND ugly OR loud OR unmanaged OR weeds OR pest NOT school	UNE
Problems of overly large green areas	Getting lost, fear of darkness, crime, unpleasant activity	Green spaces OR parks OR green areas AND large OR lost OR crime OR fear OR danger	GS
Growth and ageing of vegetation	Falling branches/ trees hurt people or damage property, large trees affecting maintenance, root damage and tripping hazard, too much shade, excessive growth, invasive or alien species	Vegetation OR plant OR tree OR branch AND damage OR growth OR danger OR old OR fall OR alien species OR invasive OR injure OR maintenance	V

term words, (iv) the main ES or EDS being referred to, (v) the type (general news, feature story, commentary or criticism article or other), and (vi) whether the subject was represented positively, negatively or both. In terms of the article type, general news referred to articles covering recent events which are typically factual and fairly short (usually 300 to 600 words), feature articles are usually longer (up to 2,000 words) and tell more of a story, and finally, commentary/criticism articles reflect a personal opinion (either of the journalist or the newspaper) (Lynch and Peer 2002).

Five leading environmental journalists working for different newspapers were identified and approached for telephonic interviews, of which three agreed. The interviews were structured and conducted using open-ended topics and lasted up to two hours. Although a prompt sheet was used, the conversations were long, in-depth and interactive meaning that we could ask follow-up questions in response to the answers to the prompt topics. The prompt sheet covered five broad areas, namely: (i) has newspaper coverage of ES and EDS changed over the past 15 years and if so how and why? (ii) did they think that ES and EDS receive equal coverage in the media and why? (iii) are some ES or EDS given prominence over others and why? (iv) do readers react differently to articles about ES or EDS and why? and (v) who drives environmental reporting in newspapers, the public, journalists or editors?

3.2. Data analysis

A t-test was used to determine if there was a significant difference in the mean annual number of articles on ES

and EDS. For the content of the articles, chi-squared tests were used to assess change in composition over time, as well as the change between ES and EDS over time. Finally, a two-way Anova was used to determine if there was a significant difference between mean word counts (length) of articles on ES and EDS in general, as well as over the 14-year time-period. All statistical analyses were run using Statistica Version 12.

4. Results

There were 2,201 news articles reporting on ES or EDS during the period, with 559 articles on ES and 1,642 articles on EDS. Once 2002 was removed from the analysis, the number over the 14-year period was 2,154, with 533 articles on ES and 1,621 articles on EDS. There was a greater proportion (almost triple the number) of articles on EDS than there were on ES per year ($t = 6.37$; $p < 0.05$) (Figure 1).

Of the three key informants, B and C believed that the media coverage of ES and EDS had changed over the past 15 years, with the former saying EDS had become more prominent in the news, and the latter claiming that coverage of ES was low, but increasing in recent years. However, informant A stated 'I don't think that generally the coverage of ES anywhere has changed in as much as nobody covers it as a topic.' Informant A went on to add that the general public is 'more aware of when ecosystems stop working' and that this could be because ecosystem collapse 'is happening more often or it's just because the public is more receptive or accepting of that kind of reporting.'

The most mentioned ES in the articles were provisioning raw materials (35% of the articles), food production (26% of the articles) and recreation and culture

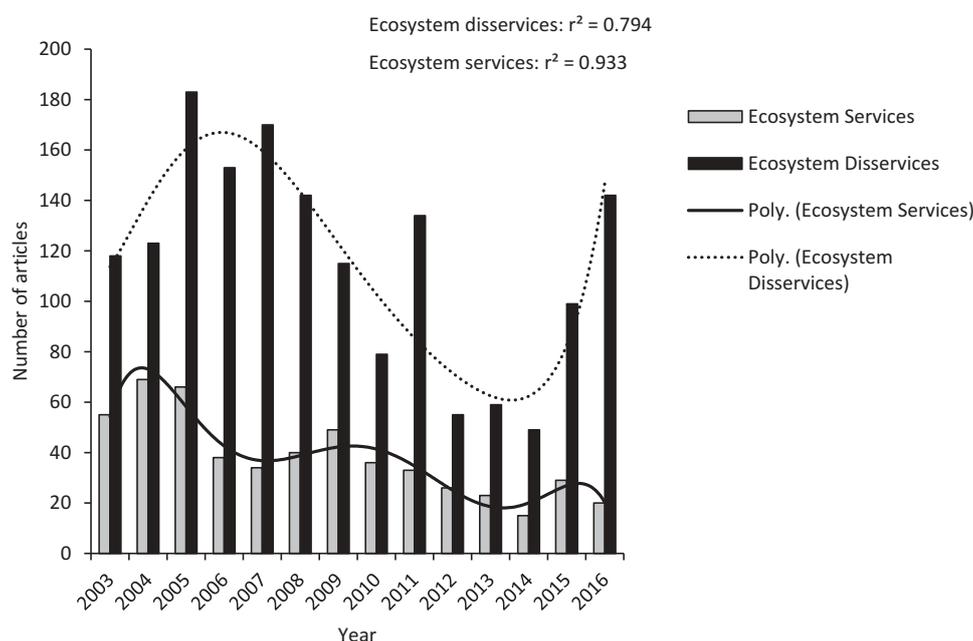


Figure 1. The number of articles in South African English weekly national newspapers on ecosystem services and ecosystem disservices per year between 2003 and 2016. (The lines are polynomial regressions of the number through time).

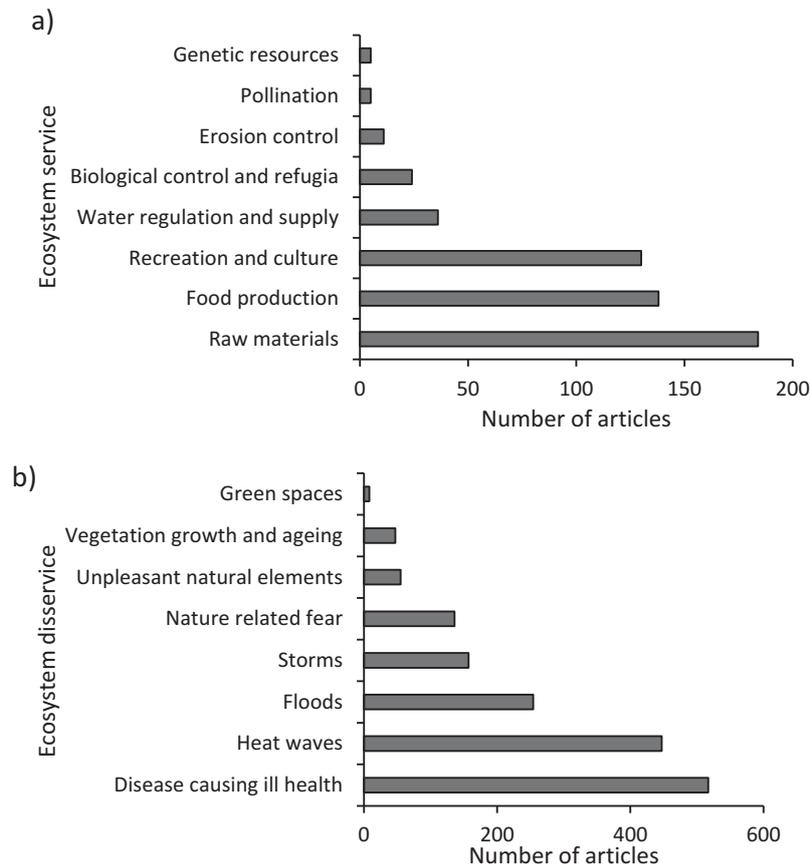


Figure 2. The number of articles in South African English weekly national newspapers on specific ecosystem services (a) and ecosystem disservices (b) between 2003 and 2016.

(24% of the articles) (Figure 2(a)). Articles on raw materials included stories about people collecting energy sources (such as firewood) and craft materials, and how they used these raw materials. Food production articles referred to the agricultural sector in South Africa and generally how it is changing (itself and the technology surrounding it) or the foods that it provides. Recreation and culture articles focused mostly on the tourism and ecotourism sector of South Africa and usually gave elaborate stories about different ecotourism and cultural sites and their significance and importance.

The most reported EDS were those relating to human health effects of pathogens (32% of the articles) and heat waves (28% of the articles) (Figure 2(b)). Articles on poor human health were largely on the issue of HIV/Aids in South Africa, as well as other smaller disease outbreaks like Ebola and swine flu. Heat wave articles involved, in particular, the bad droughts experienced in South Africa as well as the problems associated with these droughts and adaptation strategies of citizens.

All of the journalists said that EDS are given more coverage than ES; 'Yes, disservices' and 'I would think that disservices are given vastly more coverage' were the responses. Informant B went on to comment that a definitive quantity of how much disservices are favoured in the media cannot be given, but a possible

reason for this heightened coverage is that 'generally bad news sells more than good news' and 'the disservices would be particularly reported when there are extreme natural events, such as floods, droughts, storms and fires.' C also stated that 'it's difficult to quantify' but 'it's very disproportionate' and the environments 'role of providing a free resource is, I think, often eclipsed by the disservices.'

When asked how a more balanced coverage between ES and EDS could be achieved, all of the informants mentioned that to incorporate more ES would be difficult because 'they're just not as sexy as the bad news events.' Informant A elaborated, saying that 'once you have people's attention by saying this ecosystem has collapsed, you should then have a section saying; this is what the ecosystem used to do, this is what a healthy ecosystem needs. Once you have people's attention then you feed them what the good stuff is.' Alternatively, B said that to achieve a balance 'we've got to try to turn those services stories into more interesting stories.' Informant C had a completely different attitude towards how more of a balance can be achieved; 'Firstly, I think it's a question of demystifying and simplifying terms. When you talk about ES, it's a theoretical concept which has to be broken down into bits and explained in a way the general public can better understand, by way of concrete examples that are familiar to them. If you talk

at an abstract level about ES, you find people’s eyes glazing over because they don’t really know what you’re talking about.’

Articles on ES were typically 25–40% longer than those on EDS ($F = 11.54$; $p < 0.001$) and for both, the article length declined from 2003 to 2016 ($F = 4.65$; $p < 0.05$), although there was no significant interaction between the two factors (Figure 3). In general, 2003 was characterised by a greater proportion of feature and commentary articles and fewer general articles compared to the subsequent two periods ($\chi^2 = 11.38$; $p < 0.001$), which were not significantly different from one another (Figure 4). In terms of EDS, in particular, there was a significant increase in the number of

general and commentary articles and a decrease in other articles between 2003 and 2009 ($\chi^2 = 9.82$; $p < 0.05$).

There was a change in tone from mostly positive to generally negative between 2003 and the subsequent two periods ($\chi^2 = 58.90$; $p < 0.001$), which were identical to one another. This is attributed to there being a general increase in the number of EDS articles which, more often than not, are depicted in a negative light. In terms of the EDS articles between 2003 and 2009, there was a significant change in tone to more negative as well as an increase in the articles being depicted in both a positive and a negative light ($\chi^2 = 11.03$; $p < 0.05$). However, between 2009 and

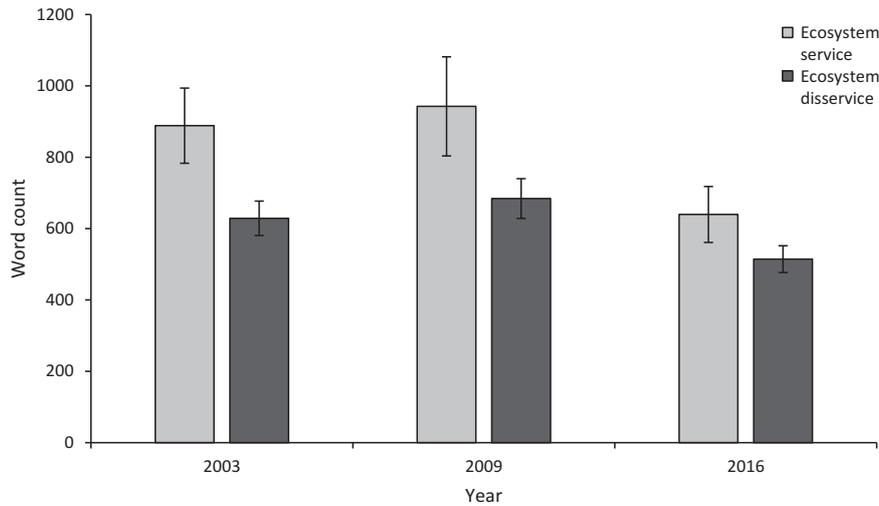


Figure 3. The average word count of articles on ecosystem services and ecosystem disservices for three years (\pm SD) .

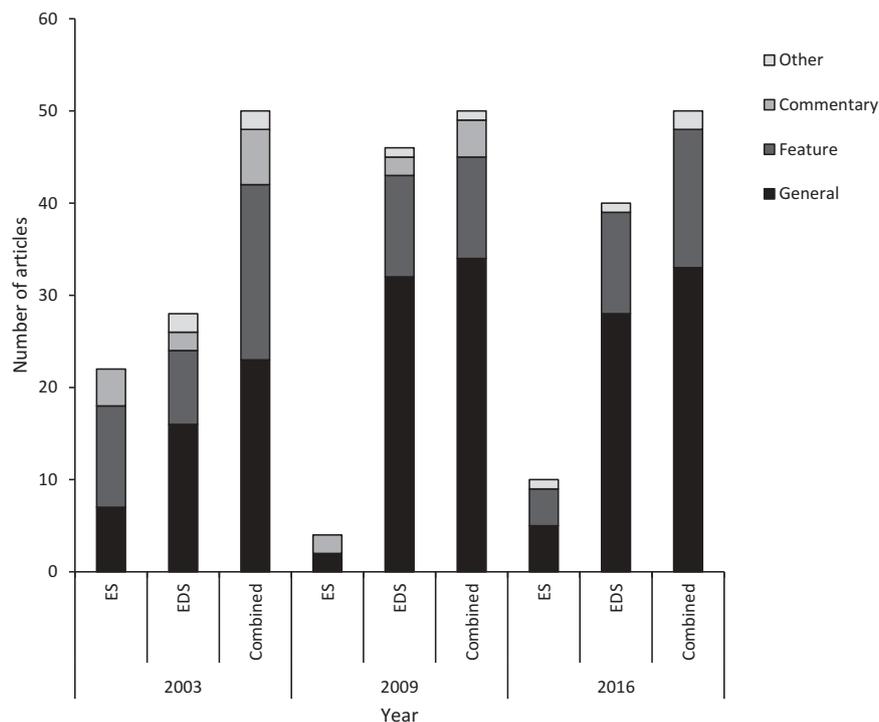


Figure 4. The style of articles on ecosystem services, ecosystem disservices and the two combined ($n = 50$ per year) for three years.

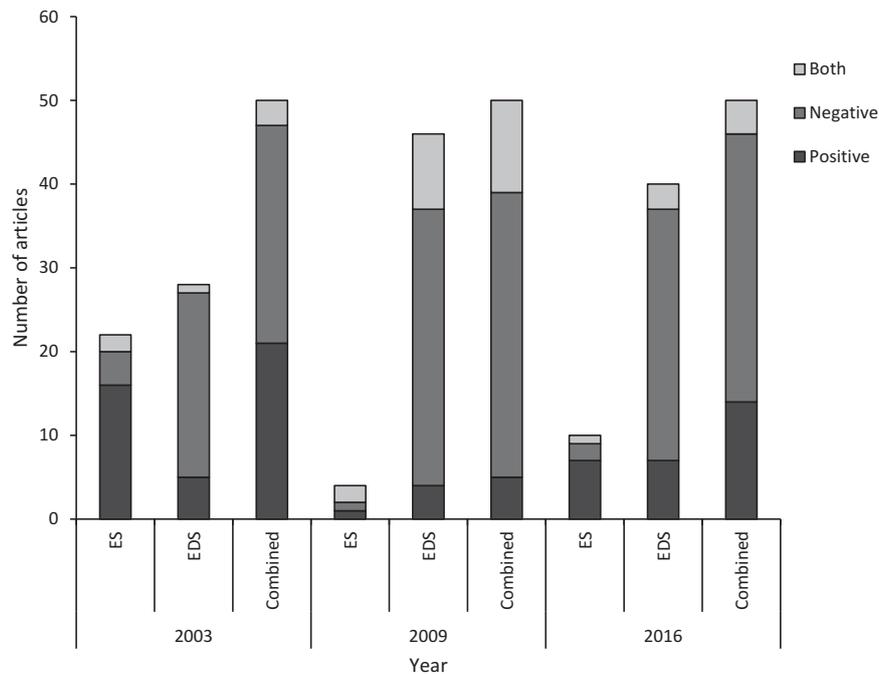


Figure 5. The tone of articles on ecosystem services, ecosystem disservices and the two combined ($n = 50$ per year) for three years.

2016, the tone of EDS articles shifted to more positive ($\chi^2 = 13.59$; $p < 0.05$) (Figure 5). ES were not tested as there were too few articles.

In terms of the public's reaction to articles on ES, informant A stated that many people are aware of the environment and the good it does for us, however, we only pay attention when the link is made for us, additionally; 'it's well received ... knowledge is interesting to people. So when you give people this information they're receptive to it.' Informant C stated that the public need to understand what is being spoken about, and it should be 'conveyed in a way that has meaning to them or have relevance in their daily lives.' Similarly, informant C believed that when disasters happen, it is a good opportunity to make the link between what went wrong and why; 'You don't want to frighten people to death but you also want to sort of make the link to the fact that disservices are the results of not putting in place mitigation and adaptation measures' and 'there is this opportunity for the media to highlight those more complex issues behind the scenes that don't surface until there's a crisis.' Journalists A and C said that the general public reaction to EDS is a feeling of being overwhelmed. Informant A stated that this feeling is followed by the depression and tiredness which is related to having 'had enough of reading about that kind of thing.' Whilst B said that the public reacts positively to EDS as they're interesting; 'It's a fine line between scaring people to death, scaring them off, and getting them interested and normally they are only interested in those kinds of dramatic stories.'

5. Discussion

There is clear agreement between the quantitative media analysis and the input given by the environmental journalists to the effect that EDS are covered more frequently than ES in the South African English language print media. This corroborates the widespread sense that newspapers tend to focus on 'bad news' because that is what sells (Arango-Kure et al. 2014). Indeed, the preponderance of negative reporting in newspapers is wildly recognised (Soroka and McAdams 2015; Van der Meer et al. 2019), but it is still debated whether this negativity is supply or demand driven (Arango-Kure et al. 2014; Van der Meer et al. 2019). The same adage seems to apply to environmental reporting as shown by our results and those of Leitch and Bohensky (2014) in Australia and Lyytimäki (2014) in Finland. According to Leitch and Bohensky (2014) the most newsworthy events about the environment are those of natural disasters, including the social and ecological disorder they cause. This echoes Friedman's (2004) assertion that in the past, a good environmental story was one that reported the misfortunes resulting from environmental disasters. Lyytimäki (2014) argued the same regarding responses to EDS as reported in the newspaper media in Finland. Overall, 2.9% of the news analysed mentioned EDS, which Lyytimäki (2014) considered as high. Lyytimäki (2014) stressed that looking at both ES and EDS in the media is important for environmental planning and management,

especially because the media can influence public opinions, actions and policy agendas (e.g. Miller et al. 2018).

Within the general acceptance that most newspapers globally offer more 'bad news' stories than good ones, local or national context could well influence both the nature of the EDS covered as well as the frequency, to some extent. The EDS with the highest occurrence in our sample were the health impacts of pathogens, and heat waves and associated droughts. Both of these are a great deal more common in South Africa than would be reflected in the media in the Global North countries that have better health care services as well as disaster prevention and mitigation mechanisms (South Africa has the greatest number of people in the world living with HIV (WHO (World Health Organisation) 2018)). The felt, negative effects of drought could also be higher because South Africa has a significant proportion of the population living in poverty and relying on land-based livelihoods to some degree; more so than Australia and Finland which provide the only comparative studies (Leitch and Bohensky 2014; Lyytimäki 2014). There are also interactions between these different types of EDS, such as between HIV/AIDS or poverty and heightened vulnerability to drought or loss of crops to pests (Shackleton and Shackleton 2012).

Although the newspaper media are generally dominated by negative news, which in our case relates to stories about EDS, in some instances it may have some positive outcomes. For example, Martin (2008) argues that exposure to negative news can motivate some readers to take action to mitigate or respond in some way to whatever the issue was, i.e. the negative news galvanises some people to take action, even more so when sensationalised to a degree (Otieno et al. 2014). This information-action response is what underlines the plethora of environmental education materials and programmes. Similarly, Leitch and Bohensky (2014) concluded that media coverage of environmental disasters in Australia is potentially an important catalyst for recovery from such disasters because as it creates awareness, and with increased awareness comes rising pressure for action. They concluded that such coverage can then be central in developing resilience in the face of environmental disasters (Leitch and Bohensky 2014). However, it is a delicate balance because too much negative news can result in some readers skipping articles or ceasing to read the source of such articles (Zerba 2011). This can be countered to some extent by human-interest stories from journalists who have actually experienced the EDS or been to the site, rather than simply reporting it on behalf of others (Cottle 2013).

One potential implication of the asymmetry in coverage of EDS and ES is that some readers may develop impressions that the environment or nature generally does more harm than good, or that the benefits that

are written about, may not be explicitly linked to or identified as an ES. For example, food production is a crucial environmental benefit, but many people do not immediately acknowledge that it relies on a number of ES, such as nutrient cycling and soil formation. The increasing separation of humans from the natural environment, often termed the extinction of experience (Miller 2005), is of increasing concern in an ever-urbanising world (Soga and Gaston 2016). A predominantly negative portrayal of the environment through a disproportionate focus on EDS may contribute to this, and deserves further examination.

Another potential repercussion is that the shorter articles that characterised EDS, have less scope for dwelling on the complexity of ecosystems and the interconnection between them and from there to human well-being. Our results showed that the articles on EDS were substantially shorter than those of ES. They were typically general articles, which are normally shorter than commentary or feature articles (Lynch and Peer 2002). Feature articles are not simply facts, but rather stories which explain what happened, along with why it is important and to whom (Deahl 2017). Van der Meer et al. (2019) found that negative news usually covers discrete events as opposed to thematic issues, as might be covered in a feature article. Van der Meer et al. (2019) also reported that the number of negative articles is increasing. We did not detect such a trend, but we did find a decreasing trend in the number of articles on ES, which suggests that proportionately EDS may be increasing. However, this was contrary to the views of the environmental journalists that we interviewed, as well as the sentiments of Friedman (2004) who argued that increasing scientific understanding of the complexity of the relationships between humans and nature have led to more media articles attempting to cover these complexities.

Longer articles not only offer the possibility for more informative pieces, they may also allow for greater balance within an article, i.e. include both EDS and ES in the same article, or the sometimes positive consequences of EDS. For example, Lawhon and Makina (2017) assessed local environmental discourses about water in a national South African newspaper over two decades and concluded that although the topic of water was presented as an ES, the articles also covered the negative aspects such as floods, poor quality jeopardising human health and poor delivery. The journalists we interviewed emphasised the need for balance, and that even if an article is predominantly negative, it should try to end off with a positive note or tone. This is what McIntyre and Gibson (2016) termed the 'silver-lining story', providing an example of a town that recovers after the devastating impacts of a tornado. Although most articles (67%) about ES in our study portrayed them in a positive frame and EDS in a negative one

(75%), there were many examples of articles covering both the positive and negative sides of ES or EDS within the same piece. For example, an article on ecotourism (as an ES) that also considers how ecotourism pressures may result in land degradation or cultural attrition.

Although longer articles offer more scope for depth and some balance where it might be useful, our results showed a general decline in the length of articles (as indicated by word counts) over the 15-year survey period, for both ES and EDS subjects. This is assumed to be a response to on-line media news (Ghersetti 2014) which is dominated by short articles (Myburgh 2011; Manson 2017). However, if longer articles are required to fully convey the importance and benefits of ES, then a trend to shorter articles could translate to fewer articles on ES with time in the print media. Alternately, novel ways of communicating these aspects of ES in shorter articles will be required.

6. Conclusion

Both the qualitative and the quantitative results show a greater number of articles about EDS than ES in South African, English newspaper media. EDS are more frequently reported in the way of general articles, whilst ES are reported on less and are more likely to be covered via feature articles. Thus, although ES are reported on significantly less than EDS, more of an effort is made for the reader to understand the goods and benefits that nature provides humans, as well as how and what needs to be done. In contrast, EDS articles are commonly general, short news stories that are meant to keep people up-to-date on a recent, usually disruptive event, such as a flood, drought, mudslide, pest or disease outbreak.

The unequal reporting of ES and EDS in the media may have implications considering the important role that the media play in not only peoples' values and choices, but also formal environmental management and planning and even policy. As Holt and Barkemeyer (2012) state, the media helps set the agenda of what the general public discusses, but not necessarily the content. Thus, it is important that articles, whether on ES or EDS, seek to be as informative as possible and examine the underlying dynamics and causes of the phenomena on which they are reporting. Doing so could improve public appreciation and understanding of how important ES, and the benefits they provide, are to human well-being and the effects of degrading or losing them, as well as the complexity in their management and the links between ES and EDS.

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