JOURNAL OF SECURITY AND SUSTAINABILITY ISSUES
ISSN 2029-7017 print/ISSN 2029-7025 online
2018 June Volume 7 Number 4
https://doi.org/10.9770/jssi.2018.7.4(6)

CLIMATE CHANGE INFORMATION ON INTERNET BY DIFFERENT BALTIC SEA REGION LANGUAGES: RISKS OF DISINFORMATION & MISINTERPRETATION[1]

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Received 28 February 2018; accepted June 11 2018

Abstract. The internet space is the most important and affluent source of climate change related information. Hoverer information content are not always satisfying and threat of fake news and disinformation are very realistic. The analysis included top10 search results of four phrases (*Climate change, Global warming, Adaptation to climate change* and *Climate change policy)* using *Google* search engine. The phrases were searched in 11 Baltic Sea Region (BSR) languages and in the Ukrainian and English languages. The results revealed that climate change disinformation and misinterpretation exists on the internet. Mostly it displayed in indirect forms such as old information, existence of junksites, advertisements, unequal share by main actors (government, mass media, etc.). Moreover, on Eastern BSR languages, internet search results of climate change information are less convenient comparing to western BSR languages. The usage of multi-language approach in *Wikipedia* pages could be one of the freshest and most reliable sources of information about climate change.

Keywords: climate change; risk; information; Internet; Baltic Sea Region

Reference to this paper should be made as follows: Kažys, J. 2018. Climate change information on internet by different Baltic Sea Region languages: risks of disinformation & misinterpretation, *Journal of Security and Sustainability Issues* 7(4): 685-695. https://doi.org/10.9770/jssi.2018.7.4(6)

JEL Classifications: Z13

1. Introduction

The internet start to play more and more important role in our lives. In 2016, 85 % of European households had access to the internet from home (Eurostat, 2016). Therefore, the internet is one of the best platforms to communicate about climate change (Anderson 2009). The integral role played by the media is not surprising, as it is still the main source of information and opinion for millions of readers and viewers through newspapers, magazines, television, radio and the internet (Boykoff and Rajan, 2007). However, mass media have been a key vehicle by which climate change contrarianism has travelled (Boykoff, 2013) and the mass media potential remains largely untapped (Shah, 2016). The same controversial situation forms in internet social media (Anderson, 2017; Šišulák, 2017; Limba, Šidlauskas, 2018). Moreover, the need for a society of science-literate citizens is becoming increasingly apparent (Nature Communications, 2017).

Latest Eurobarometer (2017) report revealed that 92% of EU citizens see climate change as a serious problem and 74% see it as a "very serious" problem. In Baltic Sea Region (BSR) climate change awareness increasing. However the levels of information perception are different in Baltic – Nordic countries (Budžytė and

[1] The research was performed within framework of Erasmus+ project "Risk and Security Governance Studies within Baltic – Nordic Academic Community of Practice" (No 2015-1-LT01-KA203-013467)

Balžekienė, 2018). Kažys (2016) found that the climate change information content in the internet holds higher quality in Western BSR countries than in Eastern ones.

More and more research on climate change communication in the internet space exist (Anderson, 2017; Greer ir Mensing, 2006; Jančevskaitė and Telešienė, 2013; Kažys, 2016, Leviston et al., 2014; van der Linden et al., 2014). The public's awareness of the scientific consensus on human-caused climate change is a prime example of the consequences of scientific misinformation (Nature Communications, 2017). On one hand, mass- and social- media raise the awareness; on other hand, they provide scepticism in the internet space (Anderson, 2017; Jančevskaitė and Telešienė, 2013). Moreover, climate change communication process is very difficult one, because a lot other factors, especially policy options, windows, and barriers, come into play (Moser & Dilling 2012; Stern, 2016). Studies by Metag et al. (2017), Roser-Renouf et al. (2015), Schäfer et al (2018) revealed that public perception of climate change information in different social groups are not the same and the communication should be directly orientated to group demands. An overview of existing research body on climate change risk discourses in Lithuanian media indicated huge demand of this information (Telešienė 2018).There are a lot emerging issues for future research and practice on climate change communication (Moser, 2010).

The aim of this research is identify possible sources of climate change misinformation and disinformation in the internet by BSR languages. The internet space could include direct (fake news, governmental denial, scepticism sites) websites and indirect (old information, junksites, advertisements, etc.) forms of misinformation about climate change. This research could be helpful indicating weaknesses of internet search engines and encourage new generation smart PageRank algorithms, which could prevent emerging of fake news on the top of search result pages. Moreover, the findings will widen scientific understatement and deepen knowledge of social communication in the internet space.

2. Methodology of the research

The same analysis methodology already have been used by Kažys (2016, 2017). Four phrases related to climate change topic – *Climate change, Global warming, Adaptation to climate change, Climate change policy* picked as the most representative ones to fulfil the picture of information in the internet. The phrases translated in 11 Baltic Sea Region (BSR) languages. Additionally, the Ukrainian and English languages selected for comparison (Fig. 1). The phrases translated using EuroVoc multilingual thesaurus (eurovoc.europa.eu) and Google Translator (translate.google.com).

Google search engine used for the search of the phrases in the internet. According to search engine market share in Europe (January 2018) *Google* occupied 91.66% of the market (StatCounter, 2018). Additionally *Yandex* search engine used for search in Russian (abr. RUS2). *Yandex* occupied 54.05% of the market (*Google* – 42.43%). Chitika (2013) found that the first page take 91.5% of *Google* traffic because of that only top10 results (the first page) of *Google* search used in further research.

Analysis based on the case study of January 18, 2018 *Google* search engine results. The analysis focused on four contextual parameters for 4 different phrase in top10 search sites:

- Information updating – the percentage of sites representing novelty of information deviated into 3 categories from 2016 and up to date, from 2013 to 2015, 2012 and older.
- Politics – the percentage of governmental (different levels of governance) sites.
- Media – the percentage of mass (target) media sites.
- Science – the percentage of sites that include scientifically based research information.

Table 1. The interpretation of of 4 phrases (Climate change, Global warming, Adaptation to climate change, Climate change policy) in different languages

Language versions		*Terms*
English	English (UK)	climate change, adaptation to climate change, climate change policy, global warming
Беларускую	Byelorussian (BY)	змена клімату, адаптацыя да змены клімату, палітыка ў галіне змены клімату, глабальнае пацяпленне
Dansk	Danish (DK)	Klimaændring, Tilpasning til klimaændringer, Klimapolitik, global opvarmning
Deutsch	German (DE)	Klimawandel, Anpassung an den Klimawandel, Klimaschutzpolitik, globale Erwärmung
Eesti	Estonian (EE)	kliimamuutus, kliimamuutustega kohanemine, kliimamuutuste poliitika, globaalne soojenemine
Latviešu	Latvian (LV)	klimata maiņa (klimata pārmaiņas), pielāgošanās klimata pārmaiņām, klimata pārmaiņu politika, globālā sasilšana
Lietuvių	Lithuanian (LT)	klimato kaita, prisitaikymas prie klimato kaitos, klimato kaitos politika, pasaulinis atšilimas
Norsk	Norwegian (NO)	Klimaendring, tilpasning til klimaendringer, klimapolitikk, global oppvarming
Polski	Polish (PL)	zmiany klimatu, dostosowanie do zmiany klimatu, polityka przeciwdziałania zmianie klimatu, globalne ocieplenie
Русский	Russian (RU)	изменение климата, адаптация к изменению климата, политика изменения климата, глобальное потепление
Suomi	Finish (FI)	Ilmastonmuutos, ilmastonmuutokseen sopeutuminen, ilmastonmuutospolitiikka, globaali lämpeneminen
Svenska	Swedish (SE)	Klimatförändring, klimatanpassning, klimatpolitik, global uppvärmning
Українська	Ukrainian (UA)	зміна клімату, адаптація до зміни клімату, політика зміни клімату, глобальне потепління

Source: EuroVoc multilingual thesaurus (eurovoc.europa.eu), Google Translator (translate.google.com)

The results divided to three different levels: high, intermediate and low by country. Additionally the information connectivity between 4 different phrase in top10 search sites analysed using 3 principles:

- Interconnectivity – the same site opens in different links for different phrase.
- Repetition – the same main site (not link) opens for the same phrase.
- Dubbing – exactly the same link opens for different phrase.

Further analysis of top10 search results included the identification of junksites (the sites which is including the information not directly related to the topic or contains disinformation patterns) and of accompanying information on *Google* search page (Advertisements, Info boxes, News boxes, Google Scholar and Goggle Images links). The number of advertisements and junksites per 10 sites calculated per country.

Kažys (2016) found that *Wikipedia* website is one of the main sources of information on climate change topics in BSR languages. Firstly, the sum of 4 Wikipedia pages (*Climate change, Global warming, Adaptation to climate change, Climate change*) length in kilobytes calculated using *Wikipedia Page information* tool. Additionally 3 *Wikipedia* pages (*Paris Agreement, Climate change denial, Global warming controversy*) added for the widening of the research. Finally, the number of countries per climate change topic and the number of topics per country were calculated.

3. Climate change information on internet by Baltic Sea Region languages

3.1 Contextual parameters of infromation

Previous research by Kažys (2016) revealed that in top10 search results most important features of climate change information are constant refreshment and sharing between different actors. Regular updated information will not lose efficiency and will satisfy public needs. Especially it is important for information, which appears in mass media sites. The intersection of mass media, science and policy is a particularly dynamic arena of communication, in which all sides have high stakes (Boykoff and Rajan, 2007). In addition, it is very

important to keep the equilibrium between these actors. One third of the sites should be governmental (from local, through national to international levels), another third should include media (from mass to specific) and the last third should be related to social networks (YouTube, Facebook, Twitter, Wikipedia) and NGOS. It is very important to highlight that scientifically based information should be dominant one in majority of sites. UNESCO believes that open access to scientific literature is as key for realizing the majority of the 2030 sustainable development goal and could be fatal element to conquer fake news (Nature Communications, 2017).

Google top10 search results showed that most of the sites (>50%) update the information permanently (Fig. 1a). However only four countries reach 75% mark. Some differences between Nordic and Easter Europe countries persist as it was discovered by Kažys (2016). Usually information on phrase Global Warming is the oldest one. Largest percentage of recently updated information appears on phrase Climate change policy. Mot permanent information updating made by mass media sources.

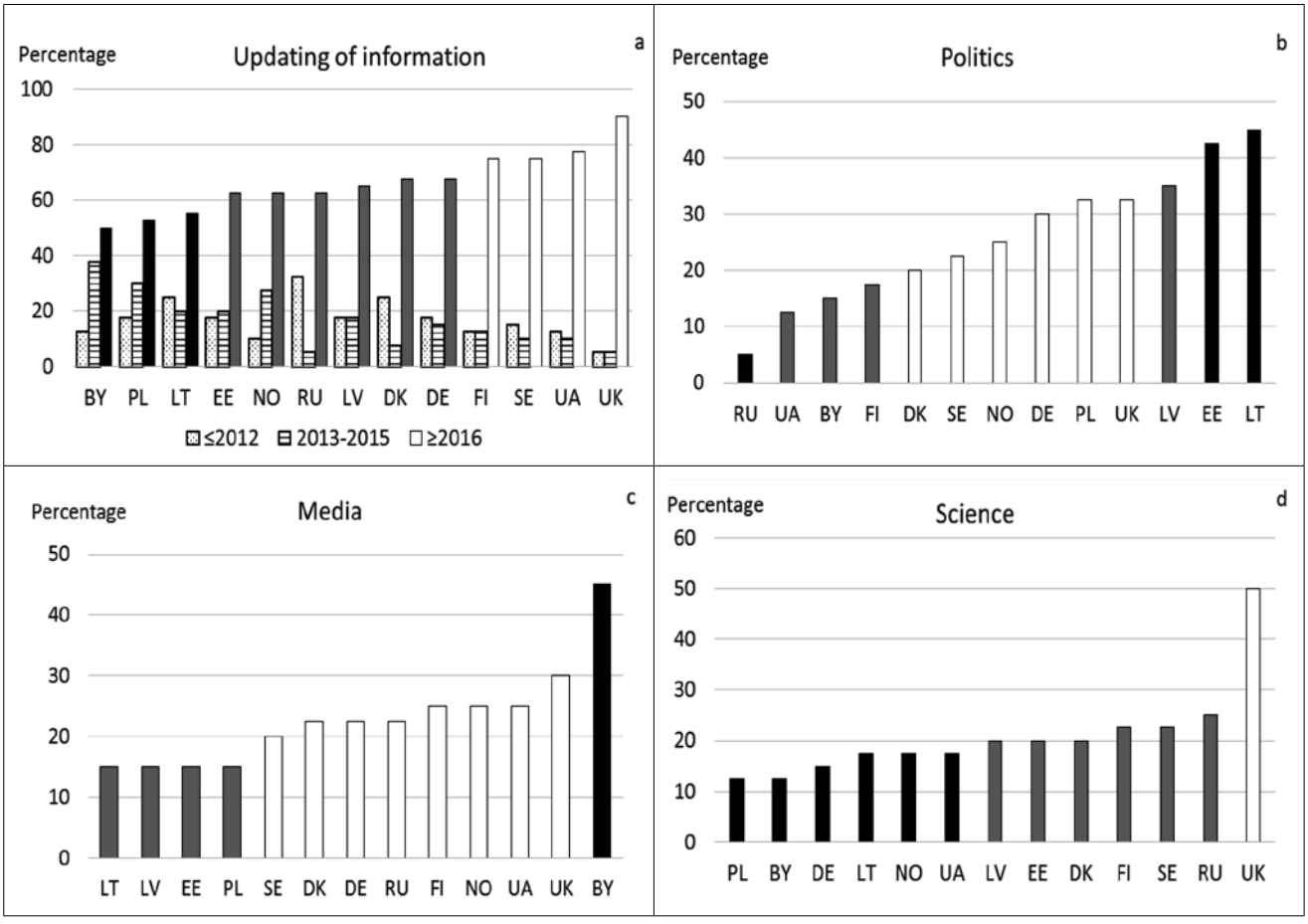

Fig. 1. Percentage of *information updating* (a), *political* (b), *media* (c) and *scientifically* (d) based sites in top10 Google search of 4 phrases (Climate change, Global warming, Adaptation to climate change, Climate change policy) by country (January 18, 2018). Levels: high (white), intermediate (grey) and low (black)

For keeping the equilibrium between different actors in the climate change topic governmental sites should cover from one fifth to one third of top10 sites. It is obvious that only 6 counties hold in these limits (Fig. 1b). Baltic States climate change topic is prescribed as political issue, with no personal responsibility in it. Balžekienė et al. (2008) and Budžytė and Balžekienė (2018) support the same findings. Opposite situation appears in Slavic countries, lack of political and governmental initiative solving climate change problems is a huge challenge in these countries. In Baltic States the recent rise of governmental sites activity related to releasing and supporting campaign of climate change strategies on national level. Another reason is lacking of one main site bringing information about climate change (many governmental providers), though most of the Western Europe countries have special sites of climate change information. Different EU initiatives could be a solution to keep the right balance and share reliable information in international and regional levels in every language.

A little bit better situations occurs analysing media sites (Fig. 1c). Again, most relevant distributions is between 20 and 33 percent of top10 results. Eight of thirteen countries fits the range. However, media penetration is a little bit lower in Baltic States due to lack of interest in climate change topic (Telešienė, 2009; Jančevskaitė and Telešienė, 2013) and week journalism traditions (Balčytienė, 2011). Very dangerous situation occurs for Byelorussian language sites, 45 percent of content is occupied by mass media sites. It means more sensation seeking and less scientifically or governmentally proofed information are available in the internet. Media are more interested in Climate change and Global Warming phrases than Adaptation and Policy topics.

Unfortunately, most of the sites in top10 search results hold very less scientific information (Fig. 1d). It is very much similar percentage throughout all the languages, English language is more an exception. The number one scientific language provides relevant and newest information about climate change on international level. However, it is no longer the truth talking about national and subnational levels. Moreover, Kažys (2016) showed that fluent knowledge of English still a bid for the future between eastern BSR countries. Most common to find scientific information is Wikipedia pages, special national government sites and EU climate change platforms.

All the phrases (Climate change, Global warming, Adaptation to climate change, Climate change) are topically related to climate change. The next step is to analyse interconnectivity, repetition and dubbing of internet sites between Google search top10 results.

Interconnectivity of sites are very much country individual (Fig. 2a). Every country have at least two interconnected sites. Mostly interconnectivity exists between two phrases. Only five countries have interconnectivity between all four phrases. Best examples of interconnectivity is Wikipedia, European Commission's Climate Action Initiative, national climate change platforms and mass media websites. In one hand interconnectivity is positive (e.g. Wikipedia, EU sites), because it opens the ways for wide range of reliable information reaching the internet users. On other hand, less reliable sites (e.g. mass media) block other sites to reach top10 positions. It is promising that Lithuania has the highest number of interconnected sites, though it could be related with very low activity of other sources (Kažys, 2017).

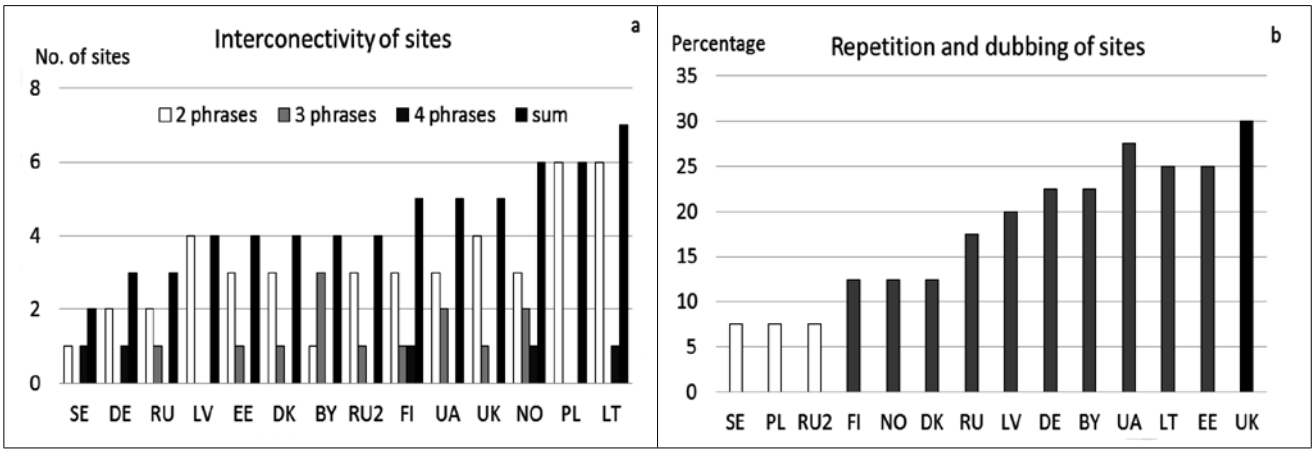

Fig. 2. Number of *interconected* (a) sites and percentage of *prepeated and dubled* (b) sites in top10 Google search of 4 phrases (Climate change, Global warming, Adaptation to climate change, Climate change policy) by country (January 18, 2018). Levels (b): high (black), intermediate (grey) and low (white). RU2 – *Yandex* search engine in Russian language

Again, repetition and dubbing of sites block other sites sometimes with more reliable information) to reach top10 positions. Surprisingly high percentage (18%) of these sites were found (Fig. 2b), e.g. various links of climate.nasa.gov appeared for seven times. Even though all phrases have the same topicality, the information should be presented separately. Mostly dubbing of information related to mass media sites and it outweigh the repeatability of sites. The repetition sites distributed equally between government and mass media. In Nordic countries the percentage of these sites are lower than in other countries. However, for these countries the origin of higher percentage are different. In German and English languages, high number of repetition and dubbing

of sites are caused by mass media, which is very important actor in internet information about climate change. Lack of sufficient and reliable information sources are the main reason of higher rates of these sites in Baltic States and Eastern Slavic countries.

3.2 Junksites and additional information

In this research, I found only two direct evidences of climate change denial. It is a Polish *Wikipedia* page (pl.wikipedia.org/wiki/Globalne_ocieplenie_-_wielkie_oszustwo) in which the documentary "The Great Global Warming Swindle" (2007) is presented. Another fake climate news came from *Yandex* search (RU2). The social blog site "The world of prognosis (www.mirprognozov.ru)" presents article called "Global warming – the lie of the century (Глобальное потепление — ложь века!)". However, the number of junksites in some extent exist in every language (Fig. 3a). Surprisingly high number of junksites found among *Yandex* search (RU2) results. *Yandex* search does not have information segmentation tools as *Google* (images, videos, advertisements, etc.) does. *Yandex.ru* extensions (news, images, video) obstruct the way for other sites entering the top search results. In case on Byelorussia, many sites of English advertisements for studies abroad appear (by.academic-courses.com, by.lawstudies.com, etc.) which not contain any particular information about climate change. The junksites could appear because of the linguistic reasons. In polish, entering the phrase "zmian*a* klimatu" instead of "zmian*y* klimatu" (climate change) in *Google* search the junksites occupied seven positions in top10, because of the famous concert club with the same name (zmianaklimatu.eu). Perfect scenario is to have no junksites at all. However, recent *Google PageRank* algorithm and SEO policy opens the ways for fake news appearing in top10 search results.

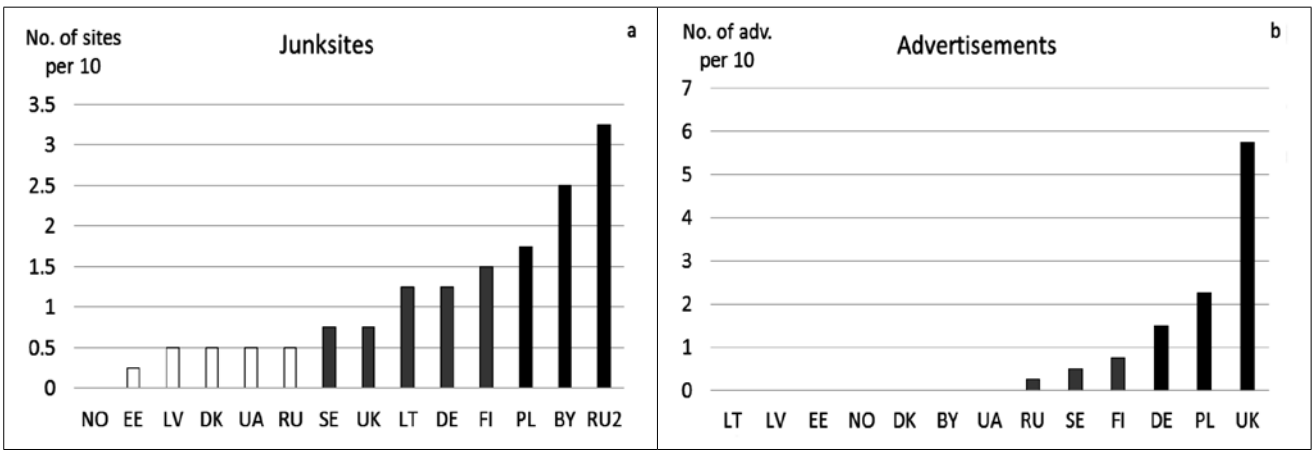

Fig. 3. Number of *junksites* (a) and *advertisements* (b) per 10 sites in top10 Google search of 4 phrases (Climate change, Global warming, Adaptation to climate change, Climate change policy) by country (January 18, 2018). Levels: high (black), intermediate (grey) and low (white). RU2 – *Yandex* search engine in Russian language

Another negative aspect along with junksites are advertisements appearing on the top and at the bottom of search results. Even the advertisements are very much related to climate change topic and are marked with special signs (*adv.* in English), they still occupy best top places; and the ranking of the webpage directly related to popularity (Chitika, 2013). The advertisements appearance on climate change Google search results are not typical in every (Fig. 3b). Actually, the number of advertisements related to internet market share and availability to reach wider audience. Climate change topic popularity and accessibility in English much higher than in Lithuanian language (Kažys, 2017).

Google top10 search results on climate change information contain more extra information (Table 2). As an advertisements *News boxes* show economy potential and internet market width of the country; the boxes positioned in different sections of top10 searches. Links to *Google Images* found in four languages, which is good because *Google* has special tool for images search. Kažys (2016) found links to *Google Images* almost by every language; the situation is by a long way better now. However, not all extras distracts and occupies search results positions, some of them have positive effects on information (*Info box, Scholar*). Using *Info box*, It is a very

easy to reach reliable information. The phrases *Climate Change* and *Global Warming* had these boxes in almost every language (Table 2), and there were almost no *Info boxes* in previous research (Kažys, 2016). Mostly *Info boxes* have links to *Wikipedia* pages and sometimes to the national climate change websites. Unfortunately only English version of phrases *Adaptation to climate change* and *Climate change policy* had links to *Google Scholar* (scholar.google.lt), even though UNSECO believes that open access to scientific literature is a key to success to conquer fake climate news (Nature Communications, 2017).

Table 2. Existing of various extra information categories in top10 Google search of 4 phrases (Climate change, Global warming, Adaptation to climate change, Climate change policy) by country (January 18, 2018). Matches: $^{+}$<5, $^{++}$5-8, $^{+++}$>8

Country	Info box	Scholar	News	Images	Adv. top	Adv. bottom
BY						
DE	+		+	+	++	
DK	+		+	+		
EE						
FI	+				+	+
LT						
LV				+		
NO	+					
PL	+		+		+	++
RU	++		++			+
RU2			+	++		
SE	+					+
UA	+					
UK	+	+	+++		+++	+++

3. 3 Climate change pages in *Wikipedia*

In this case study of January 18, 2018 *Wikipedia* site was most popular among *Google* top10 search results. The same findings appeared analysing longer time periods of Google search results in BSR (Kažys, 2016) and in Lithuania (Kažys, 2017). The information abundance illustrated by total amount of information in Wikipedia pages (Fig. 4a). The sum of kilobytes (KB) of all four phrases work as controlling mechanism of information reliability. It means that information amount triggers quality, because more people are in control of the content. Sixty percent of information fall on phrase *Global Warming*; phrases *Climate change, Adaptation to climate change*, *Climate change policy* share 21, 7 and 12 percent respectively. It is not surprise that information amount in English and German versions are the highest. In general, all bigger countries (languages) create more information about climate change. However, the amount of information does not guarantee having more users of it; the number of visits in Wikipedia pages are very low in Russian and Ukrainian languages (Kažys, 2017). For the countries in the red level (Fig. 4a), it is a huge perspective for adding new materials on climate change topics in *Wikipedia* pages, e.g. Latvian version of *Climate change* page is still a formality without any consistent information on it. Moreover, before August 2017, *Climate change* page did not existed in Byelorussian language; and now it exists.

Wikipedia pages provide a lot different information on climate change topic. For deeper understanding of climate change topicality, three more pages (*Paris Agreement, Climate change denial, Global warming controversy*) added to the analysis. No doubt, that Paris Agreement (2015) is one of the most environmentally significant events in recent years (Nature Communications, 2017). The adoption of the Paris Agreement is a milestone in international climate politics (Streck et al., 2016), even thou importance and viability of the agreement is still part of the discussions (Clémençon, 2016). Cook et al. (2016) found that the finding of 97% consensus (that humans are causing recent global warming) in published climate research is robust and consistent with other surveys of climate scientists and peer-reviewed studies. However, 2016 survey by the Yale Program on Climate

Change Communication showed that more than half of American adults are unaware that a consensus exists (Nature Communications, 2017). Wikipedia pages present wide spectre of climate change denial topic as an instrument to fight against this scepsis in public and even though among politics (Mildenberger et al., 2017; Ringailaitė, Jonušauskaitė, 2014).

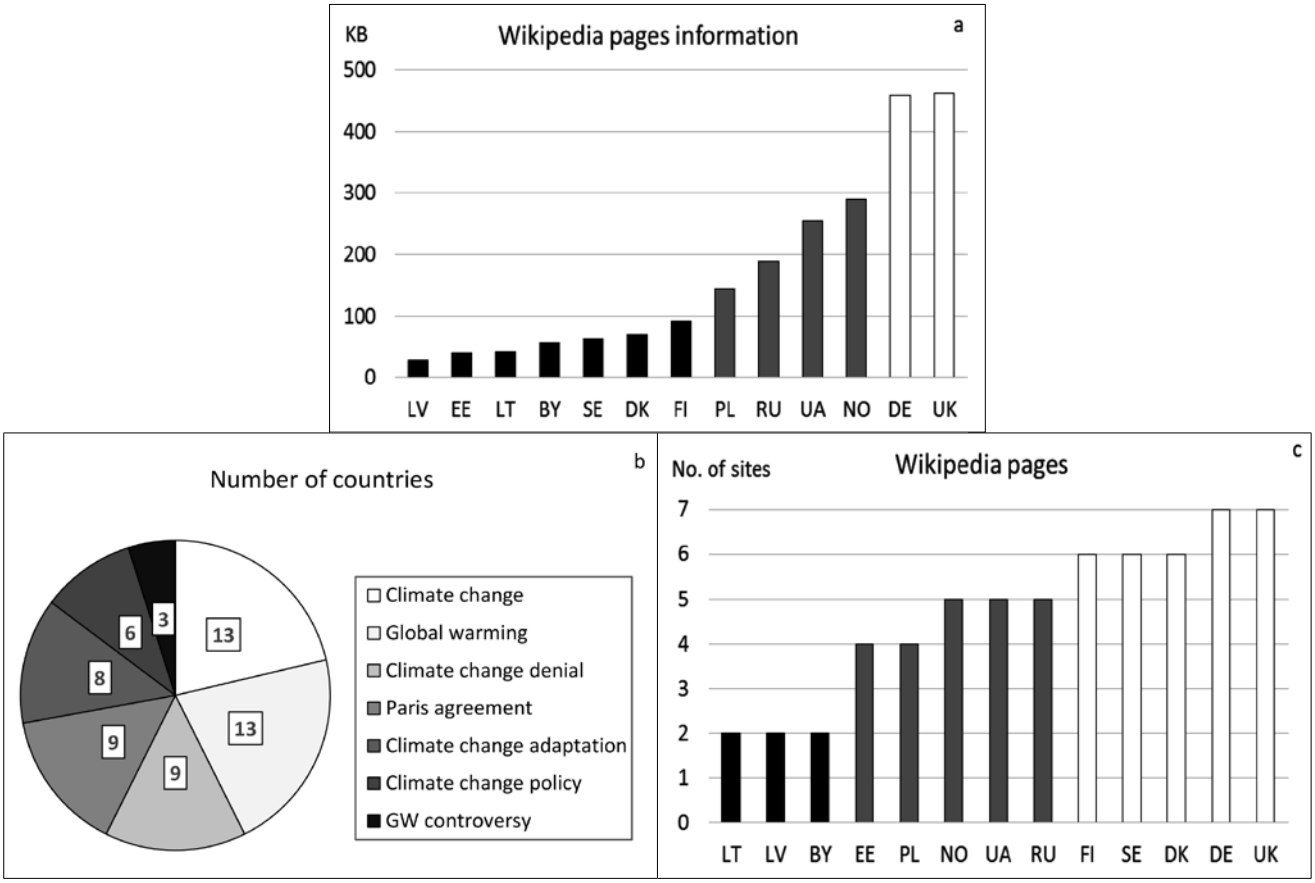

Fig. 4. Pages' lenth in kylobytes (KB) of 4 *Wikipedia* pages (Climate change, Global warming, Adaptation to climate change, Climate change policy) (a). Number of country per page (b) and pages per country (c) which include climate change information (Pages: Climate change, Global warming, Adaptation to climate change, Climate change policy, Paris Agreement, Climate change denial, Global warming controversy) by country (January 18, 2018) by country (January 18, 2018). Levels: high (white), intermediate (grey) and low (black)

Source: Wikipedia Page information tool

Only *Wikipedia* site is providing the information on phrases *Climate change* and *Global warming* in every language (Fig. 4b). *Paris Agreement* and *Climate change denial* topics have pages in nine from 13 languages comparing to *Climate change policy* pages; they exist only by three languages. Again the differences between western and eastern European countries exist for climate change information coverage in Wikipedia (Fig. 4c). Only four countries have from 6 to 7 active Wikipedia pages. For Baltic States and Belorussia are still a lot of to improve for covering climate change topics in Wikipedia.

Conclusions

Mostly climate change disinformation and misinterpretation on *Google* internet search displayed in indirect forms exist by every Baltic Sea Region (BSR) language. These forms are old and not regularly updated sites; unequal share of top results between governmental, NGOs, media and social sites; lack of scientifically based information; existing of junksites, advertisements, etc. There are significant differences between Western and Eastern BSR languages. Even though there are some improvement of information quality on the internet among Easter BSR countries, still climate change topics are exposed to more challenges comparing to western coun-

tries. Keeping the right balance between governmental and mass media sites informing about climate in the internet is very important. Moreover, information should be updated at least once per year and it should have scholarliness content. Different EU (European Environmental Agency, European Climate Adaptation Platform) and NGOs (Greenpeace, WWF) climate change initiatives could be a solution to keep the right balance and share reliable information on international and regional levels in every language. Hoverer, official climate change portals should be available in every BSR language for meeting national and regional needs.

It is impossible to avoid junksites in top10 search results because *Google's* (and other search engines) *PageRank* algorithm are still not capable to distinguish every disinformation and fake news threats on the net. Unfortunately, usage of SEO tools allows manipulating with search results content. It opens the ways for fake news to soak up in top10 search results. Moreover, global web market share and potential number of language users, accompanied with individual preferences of the users (*PageRank* algorithm), directly correlate to amount of additional information on the search results page. On perspective, such environmental topics as *climate change* should be more protected from any commercial and not attributed information (advertisements, news box, etc.). The future policy for the search engines should be focused on the development of disinformation protection strategy to clarify content of the search.

Wikipedia pages are most usual and often top presenters of climate change information on *Google* search engine. The amount of information and variety of different climate change topics in *Wikipedia* pages lead to keep regular updating and checking of information, which is very important issue avoiding disinformation and incorrect interpretations. Multi-language approach makes *Wikipedia* pages as very important actor to access scientifically proofed information for the public. Eastern BSR countries, especially Byelorussia, have huge potential to improve and to develop information quality and quantity on *Wikipedia* pages.

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