Comparing AI-generated- and conventional images in raising public awareness on the potential impacts of sea level rise in the Netherlands

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Abstract

The use of AI-generated images is a relatively new phenomenon. This tool offers the capability to create visualizations of sea-level rise, showing the potential impacts of sea-level rise. Through the generation of such imagery, individuals may enhance their comprehension of the far-reaching consequences of sea-level rise, consequently fostering a heightened awareness regarding the urgency for proactive measures. This quantitative research compares AI-generated to conventional imagery on raising awareness about the potential impacts of sea level rise on the Netherlands. The data collection instrument was a questionnaire. The respondents answered eight statements and ranked 7 AI-generated, and 7 conventional images from “makes me most aware” to “makes me least aware”. The images show (possible) impacts of climate change on the Netherlands. The findings indicate that people do not distinguish between AI-generated and conventional images in their ability to raise awareness about the potential impacts of sea level rise on the Netherlands. The results of the statements imply that conventional imagery did not necessarily motivate people to reduce their carbon footprint yet. Moreover, people have a moderate level of comfort regarding AI imagery in raising awareness about the possible impacts of sea level rise. However, ethical issues need careful consideration.

Keywords Artificial Intelligence, AI-generated images, Conventional images, Sea level rise, Awareness

1 Introduction

With the rapid development of Artificial Intelligence technologies, it is now possible to generate high-quality AI-generated images, this attracted significant attention (Carlini et al., 2023). In light of these developments, this paper aims to delve into the exploration and utilization of AI-generated images. These images are created using advanced machine learning algorithms that learn patterns and features from large datasets of visual content. Specifically, this research focuses on its application in the context of generating images directly from text descriptions, opening up new horizons for creating public awareness about the potential impacts of sea level rise.

The subject is relevant because humans might be a factor in reducing the chances of floods happening. Scientists have proved that humans are causing the temperature rise (IPCC, 2014). Considering the continuous impact of human activities on radiative forcing, particularly the emission of greenhouse gases, the risk of natural disasters seems to be increasing (Morana & Sbrana, 2018). Taking measures to reduce emissions of short-lived gases could alleviate centuries of additional sea-

level rise (Zickfeld et al., 2017). And therefore, possibly reduce the chance of flooding in the Netherlands. Hence, it is crucial to understand the public awareness of sea-level rise and how people perceive this threat. Imagery is widely used to influence public perceptions of climate change (O'Neill et al., 2013). For example, in depicting natural disasters and floods. However, there is a limitation to the imagery of floods in the Netherlands. The footage was limited to the flood disaster of 1953, and the river floods of Eastern Netherlands. Hence, there are no 'clear' visualizations of coastal floods. 55% of the Netherlands is sensitive to flooding, of which 26% is below sea-level, thus vulnerable to coastal floods, and 29% is sensitive of river floods (Rijksoverheid, n.d; Planbureau voor de leefomgeving, n.d.). To illustrate the effects of coastal floods and facilitate their comprehension by the audience, AI-images can generate visual representations. These images might enhance public awareness regarding the possible impacts of sea level rise.

The aim of this research is to compare the ability of AI-generated images to conventional images in raising awareness about the impacts of sea level rise in the Netherlands. Therefore, the main research question is: "How do AI-generated images compare to conventional images in terms of their ability to raise public awareness about the potential impacts of sea level rise in the Netherlands?" To address the main research question, the following sub-questions are explored: "How have conventional images impacted public awareness about the impacts of sea level rise on the Netherlands?" and "How do people perceive the credibility and trustworthiness of AI-generated images and conventional images?" the research questions are answered through literature- and quantitative research conducting a survey.

By investigating these questions, this research aims to contribute to understanding the comparative impact of AI-generated images and conventional images in terms of raising awareness about sea level rise. The findings can inform future strategies for using imagery effectively to enhance public understanding and engagement with climate change issues. All to support the eventual goal of fighting climate change, and preventing its possible disastrous impacts.

The rest of this paper is organized as follows. Section 2 introduces the theoretical framework of AI-generated images, the usage of conventional images, and the threat of sea level rise in the Netherlands. Section 3 explains the methodology of this research. Section 4 further reflects on the results of the data. Section 5 discusses the results, its limitations, and its findings. Section 6 concludes everything concisely.

2 Theoretical framework

The term "Artificial Intelligence" encompasses the field of computer science focused on creating systems capable of emulating human cognitive abilities, including tasks like perceiving information, language understanding, reasoning, learning, planning, and problem-solving (Nelson et al., 2020). This paper focuses on AI-generated images. Examples of AI-image generator platforms are DALLE, Midjourney, Stable diffusion, Glide, or Craiyon. These platforms allow users to generate images automatically based on a given text prompt, this method is txt2img (Göring et al., 2023). Another method is img2img, likewise it operates on a given text prompt. However, the user provides an example image, and the output corresponds with this image. The users can explore numerous word combinations and settings until they reach their desired image. An example of a prompt used in this study is "Flooded Dutch inner city". After trying different settings, an AI-generated-image of a flooded Dutch inner city was produced.

This paper focuses on and uses the AI-image-generating tool "stable diffusion". And specifically, the text-to-image, and image-to-image part of the model released in 2022. The system is trained on a

large dataset of images and learns to generate new images that exhibit similarities in both style and content to the input images. It uses a deep learning technique called latent diffusion to generate images based on text descriptions. According to Zhang et al. (2015), by implementing stable diffusion, a reverse diffusion process is applied to counteract latent space with noise. Training the model is necessary to eliminate the noise. Although the resulting latent image may not be an exact replica of the original, it exhibits a high level of resemblance (Amer, 2023). Moreover, "stable diffusion introduces cross-attention as general-purpose conditioning for various condition signals like the text" (Zhang et al., 2015, p.4). In contrast to certain prior Text-to-Image models, the code and model weights of Stable Diffusion are openly accessible and compatible with commonly available consumer hardware (Dehouche & Dehouche, 2021).

Reflecting on the realism and quality of the AI-generated images, Göring et al., (2023) did an online subjective study comparing real photos with 135 AI images, generated with five different AI-Text-To-Image generators. Their results indicate real photos are rated superior to AI-generated images. Furthermore, the majority of the participants were able to distinguish between real photos and AI-generated images. Therefore, their research implies that image generators still have limitations considering how realistic the images are. Contradictory to the findings presented by Göring et al. (2023), the studies conducted by (Lee et al., 2023; Bird & Lotfi, 2023) propose that recent technological advances have enabled the generation of images with such exceptional quality that they closely resemble real-life photographs, thereby making it challenging for humans to discern any difference. The contrasting views of these two studies highlight the ongoing debate and evolving nature of AI generation. The field is constantly advancing, research may have different perspectives based on their methodologies, datasets, and evaluation criteria. Therefore, this research digs into imagery depicting the impacts of sea-level rise and how AI-generated images can help this field address the ongoing problems.

Continuing the debate of contrasting views on AI-generated images, a growing body of research acknowledges the social issues related to AI-generating services. Cao et al. (2018) found that issues such as bias and ethics arise. Moreover, AI models can unintentionally maintain or amplify existing societal biases. Especially, if the trained data of the models are biased. The dissemination of offensive, insulting, or threatening information possesses the potential to yield substantial adverse repercussions, notably by perpetuating discriminatory practices. This perspective is shared by Zhang et al. (2015), who state that "Text-to-image" generation is a highly data-driven task. Thus, models trained on largescale unfiltered data may suffer from reinforcing the biases from the dataset, leading to ethical risks. Moreover, Zhang et al. (2015) state that cultural bias can arise. Struppek et al. (2022) elaborated on this subject, determining simple homoglyph replacements in the text descriptions can induce culture bias in models. Hence, this paper measures and reflects on the perceptions of people on the trustworthiness of AI-generated images.

O'Neill et al. (2013), researched the engagement with conventional imagery on climate change, and how imagery raises awareness. They applied a Q-methodology with two Q-sorts about salience and efficacy. Salience is the sense of importance in climate change, and efficacy is the feeling of being able to do something about climate change. Zooming into the flood imagery results of their research, O'Neill et al. (2013) found that the images of floods were highly salient, indicating that they captured people's attention and were perceived as significant in the context of climate change. Despite their salience, flood images did not generate a sense of self-efficacy among the participants. Suggesting that while the imagery effectively raised awareness and emphasized the importance of the climate change issue, it did not necessarily empower individuals to believe in their own ability to take action and make a difference. Meaning that both AI-generated- and conventional images increase the

salience of people, capturing their attention and emphasizing the significance of sea level rise. This research compares the salience, and self-efficacy of AI-generated- and conventional images.

Melting glaciers, polar bears, and destruction from natural disasters are image types that create awareness. Past studies investigated this, asking participants to mentally visualize climate change (Nicholson-Cole, 2004; Leiserowitz, 2006; O'Neill and Nicholson-Cole, 2009). Moreover, images depicting dramatic outcomes of climate change like dried-up lakes and floods are perceived most important by people (O'Neill and Nicholson-Cole, 2009; O'Neill et al., 2013). O'Neill et al. (2013) strikes a negative aspect about the aforementioned iconic images of climate change. For example, the polar bear on a shrinking ice floe can create the impression that climate change is distant and hence irrelevant. O'Neill (2017) stated that these images became cliché, and new images are more effective. Duan et al. (2019) argued further on this theory stating that abstract images also tend to make climate change a spatially and temporally distant issue. AI-generated images may add to the new imagery, creating visualizations of the consequences of sea level rise.

According to Lewandowsky and Whitmarsh (2018), the characterization of climate change as a crucial attribute to legitimate triggers is recognized as a long-term trend. Short-term phenomena or random events are perceived as caused by the weather. Furthermore, the triggers must represent a global pattern rather than a "cherry-picked" result (Lewandowsky & Whitmarsh, 2018). O'Neill (2017) provided a classification system, depicting what imagery is effective in raising awareness about climate change. This classification system includes identifiable people, impacts of climate change, depictions of energy, emissions and pollution, protests, and scientific images. Leon et al. (2022) investigated how to foster user interaction on social media via images of climate change, and provided four principles. The four principles that proved to be effective are: show real people, tell a story, include a local connection, and show people who are directly affected by climate change. Because imagery has effectively raised awareness about climate change, this research will investigate how AI images compare to conventional images in their ability to raise awareness about the possible impacts of sea level rise on the Netherlands. The conventional- and AI images will be chosen and made according to the classification system and principles of (O'Neill, 2017) and (Leon et al., 2022).

The Netherlands can handle a sea level rise of 1 meter very well (Ministerie van Infrastructuur en Waterstaat en de Deltacommisaris, 2021). However, new research found some striking possibilities in sea level rise. According to van Alphen et al. (2022), a high warming scenario might occur. In this scenario the sea level will rise 2 meters higher than present. van Alphen et al. (2022) predicts an increase in the challenge for planning in coastal strategies in densely populated coastal zones. Thomas & Lopez (2015), propose a link between the rising occurrence of natural disasters and the anthropogenic release of greenhouse gases into the atmosphere. Meaning if there will be more awareness about the sea level rise and the inhabitants, companies and institutions reduce their emissions, the likelihood of this occurrence might decrease. The phenomenon is preventable by creating more awareness and acting as a result. The numbers in table 1 on how people see climate change as a problem and how concerned they are about the consequences are essential for this paper. They indicate that 62% are convinced that climate change is currently a big problem, and 64% think that humans can partly stop climate change. Therefore, public awareness about the consequences of climate change could increase. Imagery have proven effective creating awareness. Therefore, this paper will research how AI-generated images compare to conventional ones. A portion of the remaining 38% may be persuaded to acknowledge climate change as a significant issue.

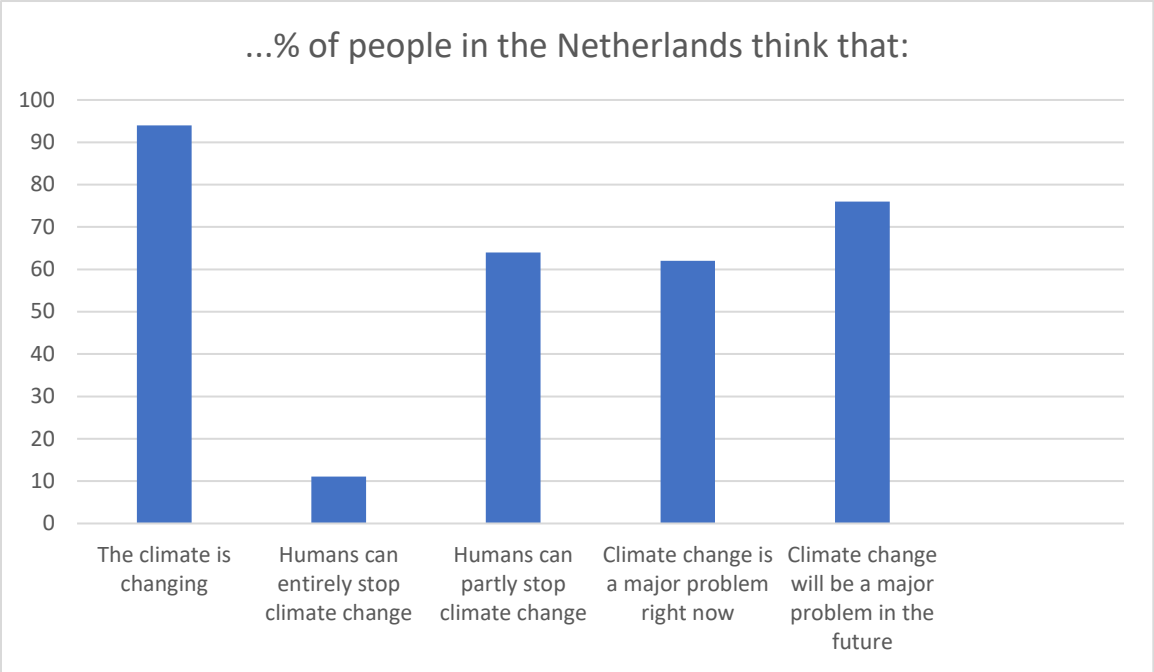

Table 1: Research depicting the awareness of climate change in the Netherlands (CBS, 2021).

3 Methodology

To answer the main research question of the paper, a questionnaire was used as a data collection instrument. The obtained data is quantitative. The participants are aged eighteen or older, living in the Netherlands, and were recruited via social media using the snowballing method. The link was sent to WhatsApp groups and posted on Instagram stories, people were asked to share it with other WhatsApp groups and in their Instagram stories. This method of convenience sampling might have led to bias. It is mostly sent to young people, this specific demographic group, might be the dominant group in responding. People were asked to give their informed consent and participate in a questionnaire regarding the use of imagery in raising awareness about sea level rise.

Firstly, the respondents were asked about their gender and age. Secondly, eight statements with two checking questions were given, the statements were answered on a five-point Likert scale, ranging from “1” strongly agree, to “5” strongly disagree. The statements are: “Sea level is a threat to the Netherlands”, “Human beings don’t have an influence in causing sea level rise”, “I feel informed about the potential impacts of sea level rise on the Netherlands”, “I am worried about the potential impacts of sea level rise on the Netherlands”. Then, to ensure that people have knowledge about the subject of imagery on sea level rise, the following checking question was asked: “I have seen imagery of the potential impacts of sea level rise on the Netherlands”. If they answered “no”, they proceeded to the image ranking part of the survey, if they answered “yes”, the following statements were shown. “The imagery that I have seen has motivated me to take action to reduce my carbon footprint”, and “(AI) imagery on the potential impacts of sea level rise on the Netherlands could help in motivating me to take action to reduce my carbon footprint”. Then, to ensure that the respondent has knowledge of AI imagery, the second checking question was asked: “I know what AI-generated images are”, if they answered no, they proceeded to the image ranking part of the survey. If they answered yes, they proceeded to the following questions: “I am comfortable with the usage of AI images to raise awareness about climate change”, and “I perceive AI-generated images as trustworthy and credible”. This information gave descriptive statistics about the respondents.

To determine if the participants perceive AI-generated and conventional images differently in depicting the potential impacts of sea level rise on the Netherlands, the respondents were asked to rank 7 AI-generated images and 7 conventional images from “makes me most aware” to “makes me least aware”. The images that were shown are based on the criteria that have been proven effective in conventional imagery. They are discussed in the theoretical framework.

Furthermore, there was no distinction in criteria between AI-generated and conventional images. In this way, bias is prevented because people may like “showing real people” more than the “local connection”. The participants were tested if they perceive AI-generated- and conventional images differently. The most important difference between the groups is that conventional images only show visualizations of river floods that happened in the (south)east of the country and the coastal flood of 1953 in the Netherlands. The AI-generated images visualize coastal, river, and city floods. In this sense, the two groups differ from each other.

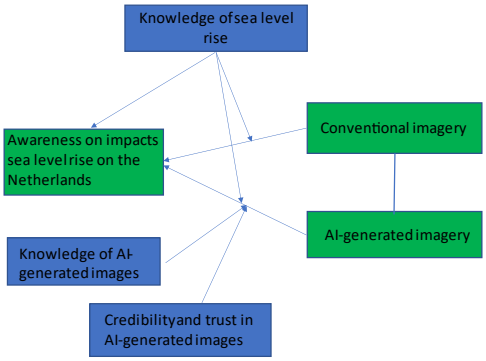

Figure 1: Conceptual model of this research. The green boxes represent the main aspects of the study. The blue boxes represent sub-aspects of this research. The arrows represent whether boxes directly influence each other (arrow directly to box) or if a factor influences the interconnectedness between two boxes (arrow aiming another arrow).

The AI-generated images were produced using the Stable Diffusion (v2.1) program automatic1111. The generating tool txt2img generated an example image. Subsequently, img2img enhanced the images using longer or different prompts, and several setting combinations. Regarding the generation of faces, the image was enlarged. Thereafter, the image was sent to the tool Inpaint. There the face was generated while the remainder of the image stayed the same. After finishing this process, the image was restored to its former size. All images were generated at the size of 512 by 512, in the survey they had the size of 300 by 300. To prevent bias in image sizes, the conventional images are edited to the same size. The AI-generated- and conventional images are below in Figures 2 and 3. In the Appendix, they are visible in a bigger size.

Figure 2: Set of AI-generated images

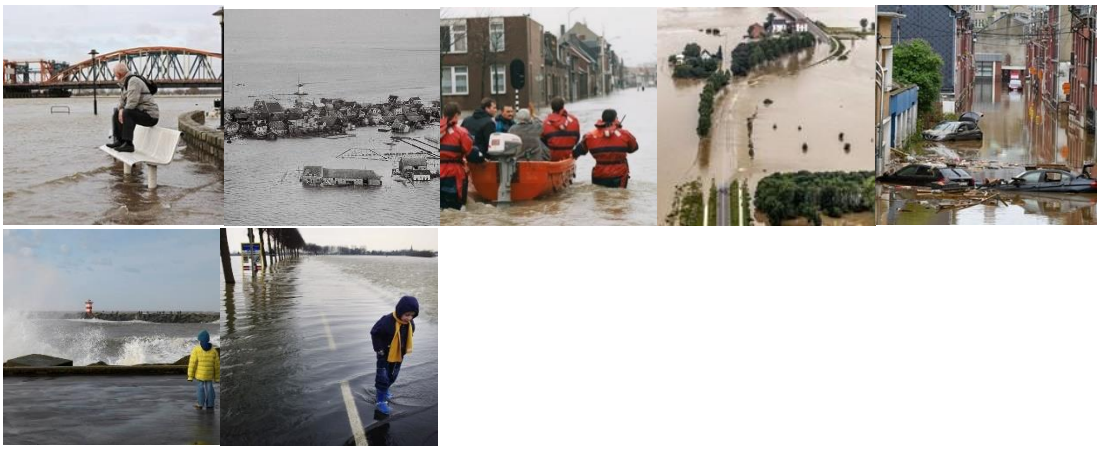

Figure 3: Set of conventional images

3.1 Ethical considerations

The imagery of the potential impacts of sea level rise might evoke negative emotions, and people might experience fear (Lewandowsky & Whitmarsh, 2018). Therefore, the participants can withdraw from the research whenever they want. This research considers participant privacy, informed consent, data security, and potential psychological impacts.

3.2 Data analysis

The obtained data is sorted as follows. The independent variables are age (ratio), gender (nominal), and the answers on the statements rated on a 5-point Likert scale (ordinal). The dependent variable is the mean rankings of AI-generated- and conventional images (ordinal). This data is analysed using statistical methods to measure potential differences or similarities. To answer the main research question, “How do AI-generated images compare to conventional images in terms of their ability to raise public awareness about the potential impacts of sea level rise in the Netherlands?”. A paired samples t-test is conducted. The paired samples t-test measures a possible significant difference between the means of AI-generated- and conventional images. This test focused on comparing the means of the groups, not of all the individual images. The individual images are aggregated with the compute tool in SPSS, calculating the means of both groups. The null hypothesis is: In the population, there is no difference between the mean ranking of AI-generated images and conventional images.

Moreover, the means of the statements “The imagery that I have seen has motivated me to take action to reduce my carbon footprint” and “(AI) imagery on the potential impacts of sea level rise on the Netherlands could help in motivating me to take action to reduce my carbon footprint” are analysed to answer the sub-question “How have conventional images impacted public awareness about the impacts of sea level rise on the Netherlands?”. Because the statement “(AI) imagery on the potential impacts of sea level rise on the Netherlands could help in motivating me to take action to reduce my carbon footprint” might be leading, Kendall’s tau-b and Spearman’s rho correlation analysis is done. Furthermore, assumptions regarding the means of the statements “I am comfortable with the usage of AI-images to raise awareness about climate change” and “AI-images can provide an accurate representation of reality”, are answering the sub-question: “How do people perceive the credibility and trustworthiness of AI-generated images?”.

4 Results

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Mean_CV	7,6196	80	1,01626	,11362
	Mean_AI	7,38	80	1,016	,114

Figure 4

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Mean_CV - Mean_AI	,23929	2,03251	,22724	-,21303	,69160	1,053	79	,296

Figure 5

Figure 4 shows an N of 80, which is above the minimum for the recommended threshold (30) of conducting a paired samples t-test, this reinforces the suitability of the sample size for this statistical analysis (Burt et al., 2009). The paired samples t-test tested the null hypothesis “In the population, there is no difference between the mean ranking of AI-generated images and conventional images”. H0 tested the variables “conventional images” and “AI-generated images”. The test performed on SPSS software, the results are presented in figure 4 and 5. The descriptive statistics for the conventional- and AI-generated images are respectively (m = 7.62, std. dev. = 1.02) and (m = 7.38, std. dev. = 1.02). This implies that they are proximate.

The results of Figure 5 show that the test is not significant (t = 1.053, Sig. (2-tailed) = .296). Hence, the null hypothesis is not rejected. Therefore, this research assumes there is no difference between the mean ranking of AI-generated images and conventional images. Indicating that people do not distinguish between AI-generated or conventional images in creating awareness about the possible impacts of sea level rise on the Netherlands. Hence, both types of images (conventional, and AI-generated images) are equally effective.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
The imagery that I have seen has motivated me to take action to reduce my carbon footprint.	58	1	5	2,88	1,093
(AI) imagery on the potential impacts of sea level rise on the Netherlands could help in motivating me to take action to reduce my carbon footprint.	91	1	5	2,44	,872
I am comfortable with the usage of AI-images to raise awareness about climate change	67	1	4	1,94	,694
AI-images can provide an accurate representation of reality	67	1	5	2,22	,794
Valid N (listwise)	44				

Figure 6: Descriptive statistics of the statements answered by the respondents on the 5-point Likert scale: 1 = “Strongly agree” 2 = “Somewhat agree” 3 = “Neutral” 4 = “Somewhat disagree” 5 = “Strongly disagree”.

Correlations

			Sea level rise is a threat to the Netherlands	Human beings DON'T have an influence in causing sea level rise	I feel informed about the potential impacts of sea level rise on the Netherlands.	I am worried about the potential impacts of sea level rise on the Netherlands.	The imagery that I have seen has motivated me to take action to reduce my carbon footprint.	I am comfortable with the usage of AI-images to raise awareness about climate change	AI-images can provide an accurate representation of reality
Kendall's tau_b	(AI) imagery on the potential impacts of sea level rise on the Netherlands could help in motivating me to take action to reduce my carbon footprint.	Correlation coefficient	,302	-,142	,018	,294	,352	,284	,176
		Sig. (2-tailed)	,001	,128	,847	,001	,002	,010	,105
		N	91	91	91	91	58	67	67
Spearman's rho	(AI) imagery on the potential impacts of sea level rise on the Netherlands could help in motivating me to take action to reduce my carbon footprint.	Correlation coefficient	,335	-,158	,021	,337	,401	,309	,190
		Sig. (2-tailed)	,001	,135	,847	,001	,002	,011	,123
		N	91	91	91	91	58	67	67

Figure 7: Results of exploratory analysis of the statement “(AI) imagery on the potential impacts of sea level rise on the Netherlands could help in motivating me to take action to reduce my carbon footprint”.

The N is different because the statements of N = 58, and N = 67 were follow-up questions. Nevertheless, the N is sufficient for all statements to make assumptions (Burt et al., 2009). The statement "The imagery that I have seen has motivated me to take action to reduce my carbon footprint" yielded (m = 2.88, std. dev. = 1.093), indicating a position proximate to "Neutral”. Similarly, the results pertaining to the statement “(AI) imagery on the potential impacts of sea level rise on the Netherlands could help motivate me to take action to reduce my carbon footprint” indicate (m = 2.44, std. dev. = .872). Hence, individuals’ viewpoints are within the range of “somewhat agree” and “neutral”. Figure 7 shows the correlation analysis with related statements. The results revealed

significant correlations with "sea level rise is a threat to the Netherlands" (c = .302, sig (2-tailed) = .001), "I am worried about the potential impacts of sea level rise on the Netherlands" (c = .294, s = .001), "the imagery that I have seen has motivated me to take action to reduce my carbon footprint" (c = .352, sig (2-tailed) <= .002), and "I am comfortable with the usage of AI-images to raise awareness about climate change" (c = .284, sig (2-tailed) =.010).

The descriptive statistics of “I am comfortable with the usage of AI-images to raise awareness about climate change” is ranked between “Strongly agree” and “Somewhat agree”. (m = 1.94, std. dev. = .694) lean closer to “Somewhat agree”. Respondents generally expressed a moderate level of comfort with the usage of AI-generated images. While they may not strongly agree with the statement, they still lean towards an agreement, suggesting that people generally find the idea of utilizing AI-generated images for climate change awareness acceptable. Moreover, no one filled in “Strongly disagree”, indicating that no one has a strong aversion toward the usage of AI-generated images.

In order to measure public opinions about the realism of AI-generated images, the statement “AI images can provide an accurate representation of reality” was given to the respondents. The results in Figure 6. (m = 2.22, std. dev. = .794) align closer to “Somewhat agree”. Overall, people tend to lean towards agreement with the notion that AI-generated images can provide an accurate representation of reality.

4.1 Limitations of the research

A minor problem arose during the data collection phase, the Qualtrics platform, which was provided by the university, was not mobile-friendly. In the image ranking section, users had difficulties dragging the images up and down. Resulting in a decision to make the images smaller. Consequently, the images were easier to drag on the screen. Hence, there is a potential bias because bigger images are easier to judge for the respondents. Moreover, participants might have given up because it took too much time. To solve this problem, the participants were advised to fill in the survey on their laptops. If they wanted to fill it in on their phones, the respondents were asked to take their time. The image sorting part was laptop friendly as the images appear bigger on a laptop screen. Therefore, it was a good alternative.

5 Discussion

The main research question, "How do AI-generated images compare to conventional images in terms of their ability to raise public awareness about the potential impacts of sea level rise in the Netherlands?" was researched using an image ranking section in a survey. Based on the results of the paired samples t-test, people do not distinguish between the AI-generated images and conventional images in terms of their ability to raise awareness about the possible impacts of sea level rise on the Netherlands. In contrast, Göring et al. (2023) theorized that real photos are rated better than AI-generated images in their research. It is worth noting that the images of both pieces of research were different, Göring et al. (2023) used close-up imagery, while this research used aerial images, images of landscapes, cities, or villages. On the other hand, the assumption of (Lee et al., 2023; Bird & Lotfi, 2023) is in line with the results of this research. They assumed that humans cannot differentiate between a real-life photograph and an AI image because recent technological advances enabled image generation that enhance exceptional quality. This correlates with the possibility that respondents did not differentiate between AI-generated- and conventional images.

Firstly, the findings suggest that AI-generated imagery could be a cost-effective and efficient alternative for visual communication in raising awareness about sea level rise. The production of

conventional images, such as hiring professional photographers or conducting extensive fieldwork, can be time-consuming and expensive. Moreover, the use of AI-generated images offers the advantage of enhanced flexibility, creativity, customization, and personalization. Sea level rise is a gradual process, and its full extent and impact may take time to be visible or apparent. By utilizing AI-generated imagery, it becomes possible to depict potential future scenarios and make the abstract concept of sea level rise more tangible and relatable to the public. Additionally, as some AI-generating platforms are open for use, the general public can generate images regarding the possible impacts of sea level rise on the Netherlands. AI imagery can subsequently integrate with other media formats. Social media trends depicting possible impacts of sea level rise can go viral. It is important to note that these possibilities should carefully be explored and implemented while considering the ethical implications and potential limitations of AI-generated imagery. This subject will be further discussed in the paragraph “How do people perceive the credibility and trustworthiness of AI-generated images?”.

Regarding the limitations of these results, the small size of the images is possibly a factor in the ranking. Moreover, the images were ranked from “makes me most aware” to “makes me least aware”. The respondents may have ranked the images based on other criteria, such as aesthetic appeal, and personal preferences. This introduces potential bias in the ranking results and may have influenced the lack of distinction between AI-generated- and conventional images. Additionally, the generalizability of the findings should be considered. This research used the snowballing method in the data collection, which led to a specific sample of respondents. In particular, their demographic characteristics, (cultural) backgrounds, and prior knowledge about sea level rise and AI images, could have influenced their ranking decisions. To strengthen the research validity, future studies should aim for a more diverse and representative sample.

How have conventional images impacted public awareness about the impacts of sea level rise on the Netherlands?

According to the results of the statement "The imagery that I have seen has motivated me to take action to reduce my carbon footprint", conventional imagery slightly motivated people to reduce their carbon footprint. O’Neill et al. (2013), found similar results, images of floods were highly salient in their research, indicating that they captured people's attention and were perceived as significant in the context of climate change. However, despite their salience, these flood images did not appear to generate a sense of self-efficacy among the participants. Indicating that conventional imagery did not necessarily empower individuals to believe in their ability to take action and make a difference. Moreover, the results of the statement: ‘(AI) imagery on the potential impacts of sea level rise on the Netherlands could help in motivating me to take action to reduce my carbon footprint’ goes further into this subject. People think they could be moderately motivated by (AI) imagery. Although not strongly motivated, respondents express a level of motivation that goes beyond a completely neutral stance. This result is slightly supporting the assumption of O’Neill (2017), who states that new imagery tends to be more effective. The significant positive correlations between the statement and related statements indicate that individuals who perceive sea level rise as a threat to the Netherlands expressed worry about its potential impacts, find imagery motivating in taking action, and feel comfortable with the usage of AI images to raise awareness about climate change are more likely to believe that AI imagery can motivate them to reduce their carbon footprint. These findings suggest that there is a potential for AI imagery to play a motivational role in influencing individuals' attitudes and behaviours toward reducing their carbon footprint. However, caution should be exercised when interpreting these results, as the moderate mean score and the potential for leading language in the statement could introduce bias or limitations in the responses. Moreover, because results from

statements cannot create groundbreaking conclusions, they are closely compared to existing literature.

These findings imply that both conventional and, possibly AI-generated imagery can influence individuals' motivation to address climate change. Although the level of motivation may not reach high levels, the positioning of respondents closer to the "Somewhat agree" category, combined with the theories proposed by O'Neill et al. (2013), indicate that imagery of this nature does indeed contribute to inspiring action. It is essential to consider motivations can vary among individuals due to various factors, such as personal values, prior knowledge, and individual circumstances. Moreover, it is crucial to recognize that there are many other possible factors in driving the behaviour of people in fighting climate change, and thus sea level rise. Additional factors such as education need to be considered in public awareness. Imagery is a potential tool for visualizing the impacts explained through education. For example, the images can be part of an educational program in raising awareness.

How do people perceive the credibility and trustworthiness of AI-generated images?

According to the results of the statements about AI images in the survey, people have a moderate level of comfort regarding the use of AI imagery in raising awareness about sea level rise. Moreover, no one strongly disagreed with the usage of AI images in raising awareness about sea-level rise. While a moderate level of comfort may encourage the usage of AI-generated images, there is a need for further examination regarding the ethical implications of AI-generated images. These concerns primarily revolve around the perpetuation of social and cultural biases, and the ethical implications surrounding the creation and dissemination of AI imagery (Cao et al., 2018; Zhang et al., 2015; Struppek et al., 2022). The positive response indicates that individuals are not entirely deterred by the potential drawbacks linked to AI-generated images. It is imperative for researchers, policymakers, and developers to further engage with these concerns, address their impact and develop measures to mitigate potential harms, to achieve a responsible and inclusive environment for the creation and usage of AI-generated images.

6 Conclusions

This research compares AI-generated and conventional images with a particular focus on their ability to raise awareness of the possible impacts of sea level rise on the Netherlands. In addition, the impact of conventional images in the past and public perception of the credibility and trustworthiness of AI-generated images are reflected upon. The main research question was addressed through an image ranking section in a survey. The main findings revealed that people do not distinguish between AI-generated and conventional images in their ability to raise awareness about the potential impacts of sea level rise on the Netherlands. The implications of these findings suggest that AI-generated imagery could serve as a cost-effective and efficient alternative to conventional images in raising public awareness about sea level rise. It is important to acknowledge the limitations of the study. The small size of the images, subjective ranking criteria, and the specific sample introduce potential bias. Furthermore, the conventional imagery captured people's attention and was perceived as significant in the context of climate change. Contradictory, it did not necessarily motivate people to reduce their carbon footprint yet. Noteworthy is that despite all the ethical issues that AI imagery brings, people have a moderate level of comfort regarding the use of AI imagery in raising awareness about the possible impacts of sea level rise. However, researchers, policymakers, and developers need to consider these ethical issues carefully in order to foster a context that promotes responsibility and inclusivity in the creation and utilization of AI-generated images.

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8 Appendix

Figure 8: (AI) Aerial view of flood in a coastal place

Figure 9: (AI) Flooded farmland

Figure 10: (AI) Aerial view of a flooded village

Figure 11: (AI) Aerial view of a flooded city

Figure 12: (AI) Street view of flooded inner city

Figure 13: (AI) street view of flooded village

Figure 14: (AI) View into flooded house

Figure 15: (CV) Streetview of flooded farmland

Figure 16: (CV) Flooded river

Figure 17: (CV) Flood of 1953

Figure 18: (CV) Safeguards at riverflood

Figure 19: (CV) Material damage of river flood

Figure 20: (CV) Threat of flood

Figure 21: (CV) Aerial view of river flood