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Climate Action on TikTok: Evaluating Climate-Related Content Driving User Engagement

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Abstract

This study investigated factors driving user engagement with TikTok videos that advocate for climate change awareness, using the hashtag #ClimateAction. The top 100 relevant videos were analyzed through qualitative content analysis, identifying nine major content categories: (i) policies and regulations (ii) ecological impacts, (iii) sustainable projects, (iv) fossil fuels, (v) scientific findings, (vi) political understanding, (vii) climate-related phenomena, (viii) clarification of misinformation, and (ix) others. Two-tailed independent t-tests were conducted to compare engagement metrics across these categories. The results indicated that videos focusing on ecological impacts received the most views, likes, and comments, while those addressing policies and regulations were the most shared. Videos featuring scientific findings, political understanding, and other topics had relatively lower engagement. These findings suggest that highlighting ecological impacts is the most effective way to engage TikTok users in climate change awareness discussions.

Keywords: Climate Change, Social Media Campaign, TikTok, Hashtag, Environment.

1. Introduction

Climate change refers to the long-term shift in average weather conditions experienced in local, regional, and global levels. With the global temperature steadily rising over decades, climate change has become a major global concern. Figure 1 shows the average annual temperature since the post-industrial period, indicating a notable increase since the late 1970s. In 2023, the temperature was 1.18 degrees Celsius above the 20th-century average of 13.9 degrees Celsius, making it the warmest year on record (National Centers for Environmental Information, n.d.).

Climate change results from a combination of two factors: natural occurrences and anthropogenic activities (Abbass et al., 2022). Natural shifts in climate have occurred over millions of years through events including emissions from volcanic eruptions and changes in solar and Earth‟s orbital patterns (U.S. Environmental Protection Agency, 2024). However, extensive scientific consensus establishes that anthropogenic activities are primarily responsible for climate change observed in the last century (Jain, 1993; Salam & Noguchi, 2005; Yue & Gao, 2018). These activities, such as burning of fossil fuels for electricity generation, agriculture, and vehicular emissions, collectively contribute to the abundance of greenhouse gasses in the atmosphere, posing immense harm to the environment and wildlife (Yue & Gao, 2018). Biodiversity is among the most serious casualties of climate change, forcing species found across marine, freshwater, and terrestrial ecosystems to tolerate environmental challenges (Abbass et al., 2022). In particular, there is a high risk of population decline and even extinction for specialist species that are incapable of adapting to habitats outside of their range (Hernando et al., 2022). Humans themselves are not an exception to the severe impacts of anthropogenic climate change. Over the past five decades, extreme weather has claimed at least two million lives and inflicted $4.3 trillion in economic damage (Associated Press, 2023). It is estimated that climate change will cause an additional 250,000 deaths annually between 2030 and 2050 (World Health Organization, 2023). Furthermore, it increases the risk of infectious diseases, respiratory conditions, psychological conditions, and food and water security, all of which pose negative impacts on human health (Abbass et al., 2022; Ebi & Hess, 2020; Rocque et al., 2021).

Such complex effects of climate change point to the importance of raising awareness and mobilizing action. Social media, as frequently used all around the world, can be a great tool for achieving this. Research suggests that each platform offers different capabilities and user practices,

resulting in a variety of forms of communication and content dissemination (Pearce et al., 2018). TikTok is among the most downloaded and used social media platforms and has reached one billion active users (Brandon, 2023). It provides a unique opportunity to communicate with a wide range of audiences through short videos and interactive features. By examining how TikTok is being utilized for climate change awareness, this study aims to provide insights into the manner in which various types of content engage users on the platform.

2. Literature Review

Climate action, as part of the 17 goals of the 2030 Agenda for the United Nations Sustainable Development, refers to the collective efforts that have been and will be made worldwide to confront the issue of climate change. The journal Climate Action claims that climate action can take different forms, including international cooperation and governmental action (Tosun, 2022). A prime example of an international commitment to addressing climate change is the Paris Agreement signed by 196 nations at the 2015 UN Climate Change Conference. This agreement established long-term goals to guide all nations in reducing global greenhouse gas emissions and slowing the increasing global temperature. Many governments, particularly those in nations with high rates of greenhouse gas emissions, have subsequently attempted to combat climate change in several ways. For instance, in China, the world‟s largest greenhouse gas producer, President Xi promised to achieve carbon neutrality by 2060 as part of the agreement (People‟s Republic of China, 2020). The United States, as the second largest greenhouse gas producer, has also made some substantial progress under the Biden administration. This includes the enactment of the Inflation Reduction Act of 2022, which proposed to significantly increase investment in clean energy and related eco-friendly initiatives (Lashof, 2024).

Such government-oriented climate actions present a model for citizens to participate in efforts to mitigate climate change. Tosun (2022) exemplifies the collaboration between citizens and local governments to create frameworks for strategizing and implementing climate action. These could include renewable energy cooperatives formed by local communities and citizens‟ assemblies consisting of representatives to deliberate on climate policies (Tosun, 2022). Another means of facilitating public discussion is offered by social media (Tosun, 2022). Statistics show that over 60 percent of millennials and Generation Z prioritize addressing climate change as crucial to ensure a sustainable future, with a majority reporting to have seen information on social media about the need for climate action (Tyson et al., 2021).

Pew Research Center analysts claim that digital news has become integral to Americans‟ news consumption habits (Liedke & Wang, 2024). Half of American adults obtain news through social media occasionally at least, indicating its significance nowadays (Liedke & Wang, 2024). Researchers posit that despite several drawbacks, social media platforms present an open environment for users to shape and organize discussion surrounding climate change (Pearce et al., 2018). Huang (2016) conducted a nationwide survey in Taiwan to investigate the effects of media consumption on spreading information about global warming and promoting pro-environmental behavior in individuals. As a result, it revealed that media coverage of global warming enhances individuals‟ understanding of the phenomenon and related environmental issues, thereby encouraging civilian participation in environmental action (Huang, 2016). Similarly, Gómez-Casillas and Márquez (2023) found that social media plays a positive role in shaping pro-environmental behavior among Latin American users across different platforms. With each social media platform offering its unique form of content dissemination, studies have examined the ways in which climate change awareness is promoted on various platforms. León et al. (2022), for example, analyzed images on Twitter to identify key principles for effective visual communication of climate change. These principles are as follows: (i) use of real, non-staged images of people with identifiable emotions, (ii) use of visual storytelling, (iii) incorporation of elements that connect a specific climate issue to the local context of the audience, and (iv) demonstration of direct impacts of climate change on people (León et al., 2022). Several other studies complement León et al.‟s findings, one of which was conducted by Deo and Prasad (2020) on how users of a Facebook fan-based page titled “Global Climate Change Awareness” engage with the issue of climate change. This study found that posts containing information on the general issue of climate change—which includes global warming, extreme weather, and sea level rise—and natural disasters are the two main contents that drive the most user

engagement (Deo & Prasad, 2020). Specifically, among climate change-related content, posts that highlight the direct impacts of climate change on people‟s livelihoods had a greater reach and were more likely to attain responses from users (Deo & Prasad, 2020). Additionally, posts those express emotions and gratitude received more responses from users, suggesting that building emotional connections between content creators and their audience through these impacts is a successful strategy for user engagement (Deo & Prasad, 2020). Similar results were observed in Basch et al.‟s (2021) study, which focused on TikTok videos featuring climate change content using the hashtag #ClimateChange. The total number of views, likes, and comments for each content were referred to as metrics of user engagement. This study revealed that within the majority of the sampled videos, which portrayed climate change as a real event, many expressed anxiety and frustration about the issue, and at least one of the many negative impacts of climate change on the environment was featured (Basch et al., 2021). On the other hand, conveying information about natural disasters exhibited a low statistical effect in gathering likes, as well as policy-related content positioned at the lower band across the metrics (Basch et al., 2021).

Since its global launch in 2017, TikTok has gained worldwide popularity with 150 million of its users coming from the United States alone (TikTok, 2023). A recent report shows that the percentage of American adults who regularly obtain news from TikTok has increased significantly, rising from 3% in 2020 to 14% in 2023 (Matsa, 2023). Despite the platform‟s growing fame, climate change awareness campaigns taking place on TikTok remain largely underexplored. Basch et al.‟s (2021) study provides a general understanding of climate change discussions, especially regarding the variety of types of content related to climate change present on TikTok, yet no research has specifically addressed how advocacy for climate action is taking place on TikTok. This study aims to answer the following question: How is climate change awareness being advocated through the hashtag #ClimateAction on TikTok, and what patterns of user engagement are observed in different types of content? Based on the findings by León et al. (2022), Deo and Prasad (2020), and Basch et al. (2021), I hypothesize that, first, content with an emphasis on the direct impacts of climate change on human life and diverse ecosystems will engage users the most. In addition, I hypothesize that, if present in the sample, the mentioning of natural disasters or policies associated with climate change will have a low effect in driving user interaction. Through a content analysis of TikTok videos that explicitly promote action using the hashtag, effective communication strategies for further advancement of climate action may be uncovered.

3. Methods

3.1. Hashtag Determination

Prior to data collection, hashtags related to climate change other than #ClimateChange were searched in order to identify the one with the highest cumulative number of posts as of February 12, 2024. This hashtag page would produce a representative sample that reflects the content creators‟ use of algorithmic strategies to expand their audience reach. The messages of advocacy or awareness campaigns become more memorable and increase awareness when they use more specific hashtags rather than generic ones (Saxon et al., 2018). As argued by Saxon et al. (2018), the use of specific, call-to-action hashtags marks a more noticeable and positive influence on user engagement. In order to access the number of videos on a hashtag, I recorded a one- second video, followed by typing "#[hashtag]." I looked for as many specific hashtags as possible that include the word "climate" (e.g., #ClimateAction, #ClimateChangeIsReal, #ForClimate, etc.) in an effort to stay focused on climate change without capturing content focused on other environmental concerns (e.g., the hashtag #SaveOurPlanet may be used to discuss issues like water pollution). As a result, the hashtag #ClimateAction, with 146,800 cumulative posts, was selected for data collection, limiting the data to videos that specifically advocate for action on climate change.

3.2. Data Collection and Content Determination

The first 100 videos posted between January 2023 and January 2024 that appeared on the "Top" page when the hashtag #ClimateAction was searched were gathered for the sample. The sample excluded videos in languages other than English to avoid potential misunderstanding and to ensure clear interpretation of both visual and accompanying verbal explanations, when present. This approach to data collection closely reflects that of the study by Basch et al. (2021), which conducted a

content analysis of the top 100 English-language videos. Videos that were irrelevant to the goal of this study (e.g., conveying skepticism of climate change) or that had no visual representation at all (e.g., a black background) were also excluded from the sample.

Each sampled video was viewed multiple times to determine the presence or absence of a type of content. Throughout this process, I referenced a coding sheet that was created while watching the videos for the first few times (at least twice). While Basch et al. (2021) identified a variety of content types, I aimed at narrowing down the content categories and examining whether there are any other topics not covered in their study. Therefore, precise assumptions about the content were avoided prior to viewing the videos; Basch et al.'s (2021) categorization was referred to when defining the content categories for this study. In addition, the number of views, likes, comments, and shares of each video as engagement metrics was noted down on Microsoft Excel. The cumulative number was calculated at the end using the built-in calculation system to ensure no errors were made.

The number of views served as the major outcome variable and was the primary focus when analyzing the level of engagement. The secondary outcome variables were the number of likes, comments, and shares, which were considered equally. In the coding process, the videos were coded as 1 when a content category was covered; they were coded as 0 otherwise. This approach allowed for a much more straightforward and efficient analysis process by grouping each video into distinct categories based on whether or not it addresses a certain category.

3.3. Statistical Analysis

A two-tailed independent t-test was used for a quantitative analysis on Microsoft Excel. T-tests are used in various fields to calculate any potential differences between the means of two groups. In specific, a two-tailed independent t-test is "used to know whether the unknown means of two populations are different from each other based on independent samples from each population" (Skaik, 2015, p. 1558). In this study, the t-tests were performed to evaluate the differences in average number of views, likes, comments, and shares between videos under a certain content category versus those that were not.

4. Results

A total of nine major content categories were identified among the 100 sampled videos: (i) policies, regulations, or legal actions, (ii) direct impacts on human life, wildlife, and the environment, (iii) scientific findings, fossil fuels and oil, (v) sustainable projects, (vi) political understanding, (vii) climate-related phenomena, (viii) misconceptions and misinformation, and (ix) others. Table 1 shows the definitions of these categories that were referred to for classification of videos into content categories.

A few videos (n=23) included more than one main content area. Every major content area covered in these videos was noted on account of accurate analysis. One video, for instance, displayed pictures of desertification—the degradation of fertile lands into dryland regions—which is a significant environmental consequence of climate change. Later in the video, the creator introduced their sustainable initiative, in which the participants dig semicircular holes, namely "earth smiles," to help restore the natural water cycle and bring back the greenery in the area. As this video addressed both a direct environmental impact of climate change and a project that aimed to mitigate it, it was classified under the "environmental impacts" and "sustainable projects" categories.

The aforementioned content categories and the associated user engagement metrics are presented in Table 2. Table 2 lists the number of videos that featured certain content along with their views, likes, comments, and shares. Percentages are also provided for comparison purposes.

The predominant content category was observed to be "policies, regulations, or legal actions," representing 33% of the total videos, followed by "ecological impacts" at 30%. In terms of viewership, "ecological impacts" had the most with 34,371,600 views (37.20%), while "sustainable projects" came in second with 26,800,224 views (29.00%). As for likes, "ecological impacts" received the highest engagement with 2,046,523 likes (26.27%), closely followed by "policies, regulations, or legal actions" with 1,936,568 likes (24.863%). The content category with the most comments was "ecological impacts" with 39,203 comments (36.16%), followed by "fossil fuels and oils" with 28,565 comments (26.35%). Finally, "policies, regulations, or legal actions" garnered the

most shares with 103,829 shares (46.44%). “Ecological impacts” came in second with 71,766 shares (32.10%).

Two-tailed independent t-tests were conducted to compare the mean number of views, likes, comments, and shares for each content category to the average for all the other categories ($p<0.025$). No statistically significant differences were found for “ecological impacts” in terms of viewership, likes, comments, and shares ($p=0.261$, $p=0.724$, $p=0.324$, and $p=0.807$, respectively). Similar results were found for “policies, regulations, or legal actions” in terms of likes ($p=0.860$) and shares ($p=0.408$). “Sustainable projects” yielded no statistically significant differences in its views ($p=0.388$)”. Fossil fuels and oils,” in terms of comments, did not have any statistically significant differences as well ($p=0.158$). However, the mean number of views for videos that discussed “scientific findings” ($p=0.004$), “political understanding” ($p=0.001$), and “others” ($p<0.001$) was significantly lower than the mean number of views in all the other categories. Videos containing ideas on “political understanding” ($p=0.006$) and “others” ($p<0.001$) had significantly lower average likes. For both comments and shares, the average was significantly lower for videos containing “scientific findings” ($p=0.008$ and $p=0.025$, respectively) and “others” ($p<0.001$ and $p<0.001$, respectively).

5. Discussion

This study aimed to examine the factors that influence user engagement with videos that advocate for climate action on TikTok. As mentioned previously, I initially hypothesized that videos emphasizing the impacts of climate change would attract the most attention from users. My other hypothesis was that the content about climate policies, if presented in the sampled videos, would attract the least attention. While the content “ecological impacts” did receive a significant number of views, likes, comments, and shares, there was a notable prevalence of videos about “policies, regulations, or legal actions” related to climate change. This is potentially influenced by recent lawsuits against big corporations for their contributions to environmental degradation and subsequently to climate change. For instance, the case People of the State of California v. Big Oil in September 2023 targeted five major oil companies for their roles in increasing the global temperature (Newsom, 2024). Given the timeframe of data collection from January 2023 to January 2024, these legal actions most likely contributed to the frequency of such content being posted. However, as predicted, the most popular content focused on highlighting impacts on human life, wildlife, and the environment. This result aligns with León et al. (2022), Deo and Prasad (2020), and Basch et al.’s (2021) studies. Previous research suggests that climate change significantly affects individual species and their interactions with surrounding ecosystems, causing variations in the function of and services provided by natural systems (Abbass et al., 2022). As discussed in Deo and Prasad’s (2020) examination of user engagement with the issue of climate change in a Facebook fan page, stressing these impacts with the use of emotional appeals can form a stronger bond between the audience and the content creator, supporting the audience to resonate with the positive attitude towards climate change activism. Deo and Prasad’s (2020) argument further elaborates on this study’s observed high user engagement with content displaying ecological impacts, which could obtain empathy from viewers towards those directly affected. Moreover, this study’s alignment with Leon et al.’s (2022) findings suggests the effectiveness of visual representations to show the lives of those directly affected. Combined, the results highlight the potential of these visualizations as an effective method of portraying climate change as an ongoing threat to the planet, further reinforcing the urgency for immediate action and the viability for long-term sustainable goals.

A higher percentage of shares for videos about “policies, regulations, or legal actions” might be related to several factors. Users passionate about climate policy often view such content as essential for advocacy and education, sharing it to inform others and rally support for specific actions or reforms. These videos can serve as a means to mobilize networks for petitions, protests, or legislative support. Additionally, the content might be especially relevant to professionals and academics in the field, who share it within their circles for discussions or to influence policy-making. The format and presentation of the content “policies, regulations, or legal actions,” such as concise summaries or infographics, can also make it more shareable, as users are more inclined to spread easily digestible and precise information. Further, timely updates of related policies may drive users to share in an effort to highlight urgent issues and their broader implications. Despite lower overall

engagement in terms of views, likes, and comments, the perceived strategic value of "policies, regulations, or legal actions" can increase its shareability.

It is also worth noting that videos addressing causes of climate change, specifically focusing on fossil fuels and oils, led to considerable user engagement. This finding contrasts with that of Léon et al. (2022), who suggested that informing users about the causes of climate change was not among the most effective strategies to increase awareness of users in climate change discussions. I believe that this difference could be associated with the inclusion of videos in the sample that not only explained how fossil fuels and oils contribute to climate change but also integrated these discussions with other topics, such as describing specific phenomena or explaining the environmental impacts resulting from these causes. Therefore, the higher levels of engagement may have resulted from the inclusion of these other content types.

While both „scientific findings" and „political understanding" contents had an equal number of videos, user engagement metrics showed slight differences. Notably, „political understanding" received 2.31% more comments, whereas there were hardly any differences in other metrics. To understand such differences, it is important to consider the nature of communication on social media. Research demonstrates that social media platforms serve as significant forums for political discussion, particularly due to the diversity of political opinions (Pearce et al., 2018). Consequently, users often utilize the comments section to express their viewpoints on contentious topics (Pearce et al., 2018). Scientific findings and news related to climate change typically present non-controversial, factual information, which may contribute to their comparatively lower engagement in terms of comments. This result is found to be the same as Basch et al.'s (2021) study on the discussion surrounding climate change in general.

A few (n=2) of the sampled videos contained clarifications of misinformation and misconceptions, which gained a considerable amount of user engagement. These points to several significant insights. First, it indicates an increasing public awareness and interest in obtaining accurate information about climate change. Inaccurate information or fake news can now be easily spread with the increasing use of social media platforms, which often leads to confusion and misunderstanding among the public. The popularity of such content also suggests that users are more open and motivated to educate themselves on the scientific facts and potential impacts of climate change. This shows that the users recognize the importance of evidence-based knowledge in informing decisions and actions to combat climate- related issues. By actively engaging with content that educates about and provides clarifications between accurate and misleading information, individuals can better understand the urgency of the issue of climate change and the need for collective action.

6. Conclusions

6.1. Limitations

This study has several limitations. First, data collection was conducted by one researcher at a single point of time. I took this approach to avoid the possibility of changes to displayed videos under the "Top" page upon reloading, which could result in losing data shown at one point. Moreover, each user may see the videos on the page in a different order, which makes it difficult to involve a second researcher in the data collection process. However, this approach might lead to biases in data interpretation, which potentially undermine the objectivity of the results. This further leads to my limited ability to collect and analyze a larger volume of data within the given time frame for this study. The sample size was therefore restricted to 100 videos. This number might not fully represent the entirety of content available due to the constant stream of new videos on TikTok, especially with the hashtag #ClimateAction having been used in 146,800 posts at the time of data collection. Furthermore, restricting the study to only one hashtag associated with climate action might oversimplify the issue and overlook important details presented in videos using other relevant hashtags, narrowing the generalizability of the results. The focus on English language videos also limits the scope of the study to a specific cultural context, in which the sample might not adequately represent the diverse perspectives and content available under the hashtag. Lastly, the content categorization of ecological impacts might be deemed too broad, as it includes all of human, wildlife, and environmental aspects. Although this approach was taken because of the abundance of videos that incorporate more than two aspects within the impacts of climate change, separating them into human

life and wildlife and the environment might allow for a deeper understanding of the levels of user engagement with videos related to these different topics.

6.2. Implications

This study demonstrates that while various concepts of climate change are introduced and discussed among TikTok content creators to advocate for climate action, an emphasis on impacts on human, wildlife, and the environment result in the most user engagement. By explaining the real-world consequences of climate change, such as human health concerns, infrastructure damage, or habitat loss, content creators can effectively capture the interest of TikTok users. This implies that future advocacy efforts for climate action should prioritize messages that highlight these direct and relatable impacts as they resonate more strongly with audiences on social media platforms. Furthermore, this study illustrates the practicality of utilizing TikTok as a platform for advocating for climate action. The cumulative number of views of these contents within the sample only, which approximates to 80 million, indicates that TikTok affords mobilizing support for climate-related issues with its ability to reach extensive audiences and disseminate messages rapidly. The results of this study can also have broader implications for efforts towards mitigating climate change beyond TikTok. The approach of emphasizing the ecological impacts of climate change can be adopted in a variety of communication platforms to inspire action of the audience on climate change.

6.3. Future Research

Future research should be done to enhance the understanding of climate action and the broader topic of climate change awareness. Many aspects of the topic have not been covered in depth, such as the comparison of climate action advocacy strategies across different cultural or regional contexts or how collaborative initiatives like partnerships between organizations and content creators can maximize the reach and effectiveness of climate change-related content. Through further exploration of these gaps, researchers may yield valuable contributions to the growing field of environmental communication and advocacy in the digital age.

Table 1: Content categories and corresponding definitions

Content	Definition
Policies, Regulations, or Legal Actions	Shows or informs about policies, regulations, or legal actions that have been conducted internationally, nationally, or locally.
Ecological Impacts	Shows or informs about direct impacts that climate change poses to human life, wildlife, and other environments.
Sustainable Projects	Shows or informs about sustainable projects, jobs, or such initiatives that take climate change into account.
Fossil Fuels and Oils	Conveys the message that fossil fuels and oils have negative impacts on the climate.
Scientific Findings	Informs about scientific findings or news on climate change.
Political Understanding	Informs about a specific political party‟s or politican‟s stance on climate change.
Climate-Related Phenomena	Informs about a certain phenomenon that is often caused by climate change (i.e., sea level rise, ocean warming, droughts, etc.)

Misconceptions and Misinformation	Clarifies misconceptions and/or misinformation on climate change.
Others	Pertains to minor themes, such as a brief video that claims that climate change is real but does not go into any details.

Table 2: Views, likes, comments, and shares by each content category (not mutually exclusive)

Content	n	%	Views	%	Likes	%	Comments	%	Shares	%
Cumulative number of views, likes, comments, and shares		100	92,408,932	100	7,790,678	100	108,421	100	270,565	100
Policies, Regulations, or Legal Actions	33	33%	10,655,104	11.53%	1,936,568	24.86%	25,617	23.63%	103,829	38.37%
Ecological Impacts	30	30%	34,371,600	37.20%	2,046,523	26.27%	39,203	36.16%	71,766	26.52%
Sustainable Projects	20	20%	26,800,224	29.00%	1,794,417	23.03%	12,905	11.90%	29,890	11.05%
Fossil Fuels and Oil	14	14%	14,237,961	15.41%	927,592	11.91%	28,565	26.35%	19,266	7.12%
Scientific Findings	10	10%	1,686,735	1.83%	233,730	3.00%	3,453	3.18%	7,616	2.81%
Political Understanding	9	9%	1,026,200	1.11%	191,746	2.46%	5,950	5.49%	9,747	3.60%
Phenomena	4	4%	3,682,518	3.99%	438,223	5.62%	5,497	5.07%	22,991	8.50%
Misconceptions and Misinformation	4	4%	1,524,925	1.65%	215,578	2.77%	1,898	1.75%	5,404	2.00%
Others	2	2%	182,400	0.20%	6,301	0.08%	238	0.22%	56	0.02%

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