

For instance, according to the British natural calendar in the UK, around fifty thousand people are now involved with the nature's calendar survey. As Jensen (2004) claims, the data collected by those amateur naturalists in the UK has now become a big archive. In addition, it has important links between amateur naturalists and scientists. According to Ydstie (2004), climate researchers in Britain enlisted the help of amateur naturalists in that country to participate by sending in recorded data about various natural events. Many people in different countries record natural events for different approaches. However, it seems that they do not have a valuable effect on the public understanding of climate change and global warming. As Jensen (2004) argued that, even with some people working as an amateur naturalist, the rest of them, or the majority of people do not have information about it. In other words, the amateur naturalist's role commonly appears with the scientists' approach to understanding the effects of climate change on plants and animals. However, it does not work very well to affect public opinion. Furthermore, nowadays, many countries commenced to create a strong link between the public and those people who work as amateur naturalists, in order to encourage public opinion about these issues (Jensen, 2004). Phenology or a phenology network is another component scientists used in this term. The short definitions of phenology can be, 'timing of seasonal activities of plants and animals with climate conditions or the relationships between biological phenomenon and climatic conditions' (Walther et al., 2002). A scientist often uses birds, butterflies and wild animals to monitor the effects of climate change and global warming on the seasonal activities of these organisms, because it can be easy to identify the changes and effects. Thus, it might be paid considerable attention to by the public. As Annette (2002) argued that, recently, a biotic seasonal change increased and became more obvious, so as to be noticed by the public, such as melting ice and freezing, especially in northern latitudes. These changes hardly influenced animals and plants in this area, especially in the birds' migration system. For example, some timed their arrival earlier or later than usual and also changes in lowering plants and many more (Walther et al., 2002). Generally, there are many phenology groups working in different countries, especially in Europe and the United Kingdom. For instance, Deutscher Wetterdienst (German Weather Service) collected phenology data by using some volunteers interested in nature (Annette, 2002). In the United Kingdom, according to nature's calendar survey, everybody have permeation to record natural events on this web site which is widely used by researchers and studies. As a result of that, phenology data plays an important role in determining the effects of climate change on animals and plants, as shown by various studies on butterflies and birds and providing long term data. At the same time, it plays an important role in providing good information for environmental education and the public about CC and GW. For example, The Global Program offers phenology data for students, in order to be able to gain an excellent understanding of links between climate change and organisms. On the other hand, a country like the United Kingdom included phenology in the lists of climate change indicators (Annette, 2002, p. 381). Although phenology data in many countries became more valuable in terms of determining the effects of climate change on organisms, it

seems that a phenology network or phenology data cannot have much influence on the public's understanding of CC and GW. As Annette (2002) argued, the effects of phenological data on public opinion about CC and GW depends upon the quality of phenological observed data. In many countries, these data are collected by volunteer groups and they use manual methods to record the data. As a result of that, the quality of phenological data is not good. It might be factual to say phenology data are used as a minor important source by researchers who study global climate changes on the community. Thus, the phenological data or phenology roles in their effect on public opinion and ideas on understanding climate change and global warming are not valuable.

In order to examine or evaluate the role of bio-indicators, amateur naturalists and phenology networks in term of their effectiveness on public opinion, it should be taken from the results of some surveys which have been carried out by some scientists and researchers in the United Kingdom. According to Whitmarsh (2009), people usually get information about CC and GW from some important sources like mass media. The most important source to transfer and deliver scientists' ideas and information in the United Kingdom is mass media Whitmarsh says. According to Whitmarsh (2009), the survey result showed that people who participated in this survey, with just 8.8 per cent, responded that climate change and global warming impacted upon wildlife and vegetation, (see table 1). It is an understandable answer to explain the question of "...to what extent do bio-indicators play an important role in the understanding of the public of climate change and global warming". In other words, people usually familiar with phrases like CC and GW but who at the same time do not have enough information about the impact of climate change and global warming on our lives and organisms. For instance, according to another survey carried out by the MORI Social Research Institute in the UK, the results showed that almost half of those people who participated in this survey had never heard about bio-diversity and 17.5% of them knew a great deal or fair amount about it. Generally, it can be easy to note that public awareness about CC and GW has increased rapidly in many countries, especially in developed countries. However, public understanding of the impact of CC and GW is not more or it is not valuable in order to have an important role in providing solutions or making adaptations for the problems like that. In other words, bio-indicators play a weak role in terms of their effect on the public in understanding environmental issues like CC and GW.

Table 1: showing the result of the survey carried out by Whitmarsh

"What impacts, if any, do you think climate change/global warming may have?" (open-ended) (categories of 20 responses or fewer are excluded)	% of total survey respondents ^a	% of survey respondents by questionnaire version		
		Climate change	Global warming	Sig.
Changes/extremes in weather ^a	22.6	19.5	25.3	n.s.
Flooding ^a	21.6	20.6	22.4	n.s.
Sea level rise/loss of land ^a	21.2	19.5	22.8	n.s.
Impact on agriculture/food supply ^b	13.6	18.1	9.6	$p < .01$
Melting ice caps/icebergs ^a	10.9	7.2	14.1	$p < .01$
Climatic impacts ^a	9.7	4.0	14.7	$p < .001$
Impacts on wildlife/vegetation/flora and fauna ^c	8.8	10.5	7.4	n.s.
Human health/spread of disease ^b	8	8.3	7.7	n.s.
Temperature increase/heat ^a	7.8	7.9	7.7	n.s.
Extinction of species ^c	7.3	7.2	7.4	n.s.
Drought/water shortages ^a	7.1	7.2	7.1	n.s.
Catastrophe/destroy earth ^a	4.9	4.0	5.8	n.s.
Long-term/future impacts ^a	4.6	4.7	4.5	n.s.
Uncertainty—unsure/lack of knowledge ^d	4.2	4.3	4.2	n.s.
General impacts—all other ^a	18	16.2	19.6	n.s.
Human impacts—all other ^b	14.4	15.9	13.1	n.s.
Non-human impacts—all other ^c	7.1	7.6	6.7	n.s.
Uncertainty—all other ^d	5.9	4.3	7.4	n.s.

Source: Whitmarsh (2009)

In conclusion, it might be easy to say that one of the emerging environmental issues today and for the next millennium is global climate change (GCC), often characterized as 'global warming'. The causes of these issues are certainly human activities as in producing greenhouse gases. On the other hand, public care of CC and GW has become a hot topic, because of public opinion or the public understanding of global warming and climate change and it can be counted as a basic core for making solutions and adaptations to these problems. Furthermore, in the two last decades, public awareness of CC and GW was recorded in great number in many countries, especially in the United Kingdom, the United States and Europe. According to some surveys carried out by these countries, the people had already heard about CC and GW but they do not have enough information about the effects on our lives and organisms. In other words, it seems that scientists worked very hard on this situation by providing a lot of research on the effects of CC and GW for the public; however, the effects of scientists' studies on the public's understanding of these problems until now are not effective influences. In addition, the role of bio-indicators in terms of impact upon public understanding of CC and GW is not a strong effect or it may be true to say that the bio-indicators' role in this term is very weak.

References

[1] Whitmarsh, L. (2009). What's in a name? Commonalities and differences in public understanding of "climate change" and "global warming". *Public Understanding of Science*, 18(4), 401-120.

- [2] Andrew, N., & John, L. (2004). *The Day After Tomorrow: Public Opinion on Climate Change*. MORI Social Research Institute.
- [3] Annette, M. (2002). Phenology: Its Importance to the Global Change Community. *Climatic Change*, 54(4), 379-385.
- [4] Bierbaum, R. (2005). Climate change--the big environmental issue. *Journal of environmental monitoring*, 832-833.
- [5] Harris Gill, G., & Cynthina, B. (1996). *Environmental Issues In education*. Arena, Hants, England.
- [6] Hynson, C. (2008). *Climate change*. London: Franklin Watts.
- [7] Johanna, R., & Niemelä, J. (2003). Ground beetles (Coleoptera: Carabidae) as bioindicators. *Biodiversity & Conservation*, 12(3), 487-506.
- [8] John T. Hardy. (2003). *Climate Change: Causes, Effects, and Solutions*. Chichester, West Sussex, England: Wiley.
- [9] Morris, N. (2007). *GLOBAL WARMING*. LONDON. SYDNEY: FRANKLIN WATTS.
- [10] Rosanne, W., Fortner, J.-Y., Jeffrey, R., Samantha, R., Joseph, B., Brian, L., et al. (2000). Public Understanding of Climate Change: Certainty and willingness to act. *Environmental Education Research*, 6(2).
- [11] Trumbo, C. (1996). Constructing climate change: claims and frames in US news coverage of an environmental issue. *Public Understanding of Science*, 5(3), 269-283.
- [12] Walther, G. (2002). Ecological response to recent climate change. *Nature*, 416(6879), 389-398.
- [13] Yuki, S., & Midori, A.-U. (2009). Mass-media coverage, its influence on public awareness of climate-

change issues, and implications for Japan's national campaign to reduce greenhouse gas emissions. *Global Environmental Change*, 19, 203–212.

- [14] Zia , A., & Todd , A. (2010). Evaluating the effects of ideology on public understanding of climate change science: how to improve communication across ideological divides? *Public Underst Sci*, 19(6), 743-761.

