Professor Gregory R. Carmichael to lead United Nations Global Greenhouse Gas Watch

by Margaret L. Eginton

(A) University of Iowa engineering professor, Dr. Gregory R. Carmichael, will co-chair the Global Greenhouse Gas Watch (G3W), a new program of the United Nations World Meteorological Organization (WMO) in Geneva, Switzerland. The WMO's initiative was unanimously passed by the 193 member nations of the WMO Congress on June 2. The G3W initiative will implement standardized monitoring of reportage and mitigation of greenhouse gas levels as early as 2024. It will also ensure that less wealthy nations have access to resources, enhancing their capacity for observation and scientific development. By providing daily world wide reports on emissions levels, similar in scope to the worldwide weather forecasts, the G3W will ensure better prediction of atmospheric quality on a daily basis, even to a sub-county scale. The new wealth of accurate data provided by standardized methodology will improve scientific understanding of greenhouse gasses and better predict future climate trajectories and could salvage the Paris Agreement, the UN international treaty signed in 2016.

The faltering Paris Agreement pledged to limit global warming to well below 2 degrees Celsius, and preferably to 1.5 Celsius above pre-industrial temperatures. According to Professor Carmichael, the world is on a catastrophic trajectory; unless emissions are reduced, by the year 2100 global temperatures will likely rise 3.5 Celsius above the desired standard. The Paris Agreement is hampered, he said, because while each signing nation committed to reduce greenhouse gasses, there is no global oversight of pledges.

"*We do not have accurate reportage of either efforts or results because the reporting for the Paris Agreement is done on a voluntary basis. Each country comes up with their own pledge of reduction. The data presented by many nations is not transparent and traceable."* said

Carmichael in an email interview. In addition to his new appointment as co-chair of G3W, Carmichael has for eight years chaired The Scientific Steering Committee of the Global Atmospheric Watch (GAW). This program of the WMO coordinates all the greenhouse gas measurements gathered all around the world. These measurements are used in all climate assessments everywhere. The G3W will expand the reach of the GAW into practical as well as scientific arenas, explained Carmichael:

"Analogous to global weather predictions, the Global Greenhouse Gas Monitoring Infrastructure would establish a common framework to deliver timely, authoritative, quantitative, transparent observation-based data on greenhouse gas concentrations and net emissions fluxes of carbon dioxide, methane, nitrous oxide, and other human-caused pollutants on a regular basis. The goal is to meet necessary reductions of heat-trapping pollutants in the atmosphere which are fueling temperature increases, in hopes of reaching net zero by 2050."

United Nations Secretary General António Guterres named the lowering of greenhouse gas emissions to be the most important conflict facing humanity today. At the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP27) in June 2022, Guiterres called on all nations to increase their transitions away from fossil fuels, despite the burdens of the Ukrainian war and other economic conflicts, to honor pledges.

"We are in the fight of our lives, and we are losing ...Greenhouse gas emissions keep growing, global temperatures keep rising, and our planet is fast approaching tipping points that will make climate chaos irreversible,...The science is clear: Any hope of limiting temperature rise to 1.5 degrees means achieving global net-zero emissions by 2050." Guterres pressed on: "Developed countries must take the lead, but emerging economies are also critical to bending the global emissions curve.

"Humanity has a choice," Guterres concluded. *"Cooperate or perish. It is either a Climate Solidarity Pact, or a Collective Suicide Pact."*

In an email interview Carmichael characterized the thrust of the WMO initiative as an historic moment in the fight against climate change:

"The Global Greenhouse Gas Watch is, to me, the WMO's Climate Solidarity Pact, as called for by Guterres at COP27. I have long been concerned about the lack of accountability plaguing the accord's progress."

Under Dr. Carmichael's leadership, GAW had earlier concluded that reporting of emissions levels and strategies for mitigating emissions levels were difficult to scientifically verify. According to GAW, many wealthier nations do not accurately report either their emissions numbers or their mitigation strategies, presumably for political and economic growth reasons. Developing nations are unable to meet the demands of the Paris Agreement because they don't have the financial means or scientific programs and instruments to take adequate measurements, or implement mitigations. A key goal of the new G3W initiative is planned support for all WMO members in their efforts to lower climate temperatures. New and better resources for scientific and observational activities within the less wealthy nations are pledged. Carmichael stresses that the WMO intends to coordinate with other UN agencies and international programs outside the UN.

"The information provided will enable better decisions by cities, states and nations about what mitigation strategies to implement, and document the actual effects of these measures. With standardized reporting all nations will be able to globally coordinate efforts more effectively. They will be able to efficiently plan how to reduce greenhouse gas levels in the atmosphere arising from their nations, and choose better mitigation strategies. Because monitoring will be

reported to the WMO it will be possible to recognize effective efforts and be warned of any need for additional strategies, if the levels continue to not fall fast enough."

The private sector is also very interested in the G3W. Voluntary carbon footprint offsetting, for example by planting trees, is a widespread strategy for corporations and individuals to reduce their greenhouse gas emissions. At present there is no way of verifying whether these offsets really reduce greenhouse gas emissions. It is estimated that by 2030 the markets to support these offsets may reach $100 billion annually. The private sector sees the value in Global Greenhouse Gas Watch as a means to document the changes in emissions due to these offsets and to verify these assets.

725 climate scientists, government policy makers and NGOs from around the world unanimously supported the initiative during a symposium held January 30-February 1, 2022. Co-chairs Carmichael and Michel Jean, retired Director General of the Canadian Meteorological and Environmental Prediction Centre and current President of the WMO Commission for Observation, Infrastructure and Information Systems, led the exploratory workshop, which resulted in a proclamation outlining purpose and proposed operational scope. The proposal for the establishment of the new program, the Global Greenhouse Gas Watch, was presented to the World Meteorological Organization Congress, which governs all programs of the WMO on May 31, and the G3W unanimously approved on June 2, 2023.

"My colleagues at the WMO are encouraged by the readiness of so many member nations to set aside politics and take the next steps towards saving the planet with a speedy implementation of a practical plan to achieve our world wide goal of healing our climate and our planet for our next generations. The international Global Greenhouse Gas Watch is certain

to be a huge step forward in our race to reduce greenhouse gas emissions," said Carmichael, "It's a monumental moment. I am feeling optimistic."

Carmichael, an internationally renowned scholar in the field of air quality and its environmental impacts, has advised government organizations for China, India, Bangladesh, and the World Bank, among others. His modeling program for air quality, written when he was in his twenties to track acid rain, is still the root of many open source modeling applications for predicting air quality. He has graduated 44 PhDs, many of whom along with many postdocs have been the recipients of their country's top awards and posts in environmental science. He has current research projects on 4 continents and has helped design satellites with NASA and worked with the National Oceanic and Atmospheric Administration Department of Congress (NOAA) since 1985. He began to volunteer and bring his scientific expertise to the WMO in 1989, and has served on many committees. At present he is chair of the WMO Environmental Pollution and Atmospheric Chemistry Scientific Steering Committee of the Global Atmospheric Watch. He has published over 400 peer reviewed scientific papers in major publications, and is a fellow of the American Institute of Chemical Engineers, the United States Geophysical Union, and the American Meteorological Society.

Dr. Carmichael is the Karl Kammermyer Professor of Chemical and Bio-Chemical Engineering, holds dual appointments in Environmental Engineering and Applied Math, and is the co-director of the Center for Global and Regional Environmental Research (CGRER). He has been a highly engaged faculty member in the University of Iowa College of Engineering since 1978. At the University of Iowa he has created training for hundreds of engineers entering the private sector and through CGRER, opportunities for hundreds of undergraduate and graduate students to study and implement strategies against climate change in the state of Iowa. He

continues to be a teaching professor, offering 3 courses in the curriculum for undergraduate and graduate students, including a class on research ethics for Masters and PhD students. He served as department chair for 16 years, as Associate Dean for graduate studies and research in the College of Engineering for 12 years, and director of the Interdisciplinary Iowa Informatics Initiative.

Written by Margaret L. Eginton