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Notes from the Front Lines of the Climate Crisis - The Threat of Cyclonic Storms and Sea Level Rise in a Warming World

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The loss of life from natural hazards has decreased over the past century, due partly to much improved understanding and monitoring of hazards and partly to improvements in preparedness, communication, engineered infrastructure. This has happened at a time when human numbers have more than quadrupled and now approach 8 billion, and when populations in areas vulnerable to earthquakes and cyclones have greatly increased. Now, however, we may be on the doorstep of a 'tipping point' in human suffering and life loss due to the rapid changes in Earth's climate that we are experiencing. Human-induced climate change is increasingly amplifying dangerous meteorological processes, including severe storms, drought, wildfires, heat waves, and flooding. These changes have no precedent in the past 10,000 years and are blurring the distinction between 'natural hazards' and human-induced hazards. The threats posed by climate change are legion; in this presentation, I discuss a set of linked phenomena that represent an emerging threat to people and society over the remainder of this century and beyond – specifically sea-level rise and coincident stronger cyclonic storms, which, on occasion, inundate low-lying coastal areas. Hurricanes and typhoons are likely to become more intense in a warmer climate and will produce higher storm surges that move ashore on an elevated sea surface. The average level of Earth's oceans is currently rising at a rate of over 3 mm per year, which is nearly 50 percent higher than a century ago. The rate of sea-level rise is increasing due, in part, to increasing transfers of water into oceans from glaciers and ice sheets and, in part, to the warming and expansion of seawater. Scientists forecast that average global sea level will be about 1 m higher by the end of this century than today. Over 600 million people, nearly 10% of the human population, currently live less than 10 m above sea level, many in growing coastal megacities. That number will increase dramatically over the next 50 years, increasing the overall risk that people face from extreme storms. The number of people living at low elevations along coasts, and thus exposed to flooding from storm surges, is highest in Asia, particularly in China, India, Bangladesh, Indonesia, and Viet Nam, which are ill-equipped to deal with the emerging crisis. Within limits, humans can adapt to severe storms and higher sea levels, but few countries have the resources to adequately protect people and property from this threat. Thus, without urgent action on a global scale to limit the damage we are causing to Earth's climate and without a stabilization of human numbers, many populated low-lying coastal areas could become uninhabitable by the end of this century. The forced relocation of large numbers of people is likely to cause suffering and conflict that we do not appreciate and have not planned for. More generally, human suffering stemming from human-induced climate change will outstrip the progress we have made over the past century in reducing

life loss from 'natural hazards'.