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Fact or Fiction: What Happens After An Asteroid Collides with Earth?

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While Hollywood's film industry has explored the possibility of a catastrophic asteroid or comet colliding with the Earth, off screen there are no plans in place for civil defense in case an unexpected impact occurs, no international agreements on how to respond if a threatening asteroid is found, and no current studies of deflection technology. Although the annual probability of a large impact is extremely small, the consequences would be so great that it is necessary to understand and establish realistic societal goals, scientists said today at the American Association for the Advancement of Science (AAAS) Annual Meeting.



The asteroid Ida. Image courtesy NASA and NSSDC.

About 90 percent of the potential Earth-impacting projectiles are near-Earth asteroids or short-period comets, called collectively Near Earth Objects (NEOs). Responding to a request from Congress, National Aeronautics and Space Administration started a 25-year Spaceguard Survey to track 90 percent of the NEOs larger than 1 km in diameter, which constitute the greatest hazard, by 2008. Monitoring a region of space that extends outward from the Earth's orbit at a distance of 200 million kilometers, the survey is now more than half completed.

About two thousand such objects are believed to exist in near-Earth space. Between a quarter and a half of them will eventually impact the Earth. But the average interval between such impacts is long — more than 100,000 years. One of the more noted impacts occurred in 1908, when a smaller asteroid struck Tunguska, Siberia, downing hundreds of kilometers of forest.

The hazard posed by the solar system's population of asteroids and comets, some which orbit the Earth and other planets, became more apparent when a 1980 paper written by Luis Alvarez and others proposed that a high impact asteroid and resulting global cloud of dust resulted in the mass extinction of life forms on Earth and ended the dinosaur age.

According to Geoffrey Sommer, Rand Corp., Santa Monica, Calif., while the survey works towards a series of technical goals, social goals must be considered and set simultaneously. How much time and money should be invested in a low probability, but high impact problem like a NEO collision should be placed into consideration. There is, however, no general policy framework for assessing the social benefit of impact hazard response programs.

Sommer has looked at establishing a system approach to the hazards posed by NEOs, considering the interactions between a passive physical threat, and a multitude of coupled social systems. His research identifies policy makers and interested parties, their likely valuations and sources of valuation, and operating constraints that will allow him to set a social goal.

The Spaceguard Survey may eventually expand their tracking to include smaller objects, increasing the warnings of a collision. Sommers said that there's a strong likelihood that the costs of multiple false warnings will dilute the significance of a true warning in a real event. He also takes the controversial stance of advocating silence and secrecy in the event that a warning would come too late and not make a difference to the outcome.

"When a problem arises with high uncertainty, there is an opportunity to spin the problem to avoid global panic," Sommer said. "If you can't do anything about a warning, then there is no point in issuing a warning at all. If an extinction-type impact is inevitable, then ignorance for the populous is bliss."

While there are sets of true hazards faced globally such as hurricanes, terrorism, earthquakes, and erupting volcanoes, there is no global answer to an extinction type of event. The social costs are difficult to quantify because they aren't intangible, as our collective experiences with post-Sept. 11 terror warnings demonstrate.

There is a common fear among high-level authorities that people react poorly to bad news and will panic in catastrophe, but public reactions to disaster vary enormously, according to Lee Clarke, Rutgers University. Clarke added that human nature shines in time of adversity. Instead of flying into a panic and looking to satisfy their own self-interest, human beings have proven to be most generous in times of trouble.

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