SBAG Goal 2: Defend Planet Earth

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Small Bodies Assessment Group 20th Meeting,
LPI, Houston, Jan. 29-31, 2019
Goal 2: Defend Planet Earth

Understand the population of small bodies that may impact our planet and develop ways to defend the Earth against any potential hazards.

2.1. Identify and track potentially hazardous objects
2.2. Characterize the properties of near-Earth objects to advance both our understanding of the threats posed to our planet and how Earth impacts may be prevented in the future
2.3. Develop and maintain rigorous models to assess the risk to Earth from the wide-ranging potential impact conditions
2.4. Develop robust mitigation approaches to address potential impactor threats
2.5. Continue to develop coordination and civil defense strategies and procedures to enable emergency response and recovery actions
Current Planetary Defense Objectives - 1

1. Identify and track potentially hazardous objects
   – Maintain and improve surveying capabilities
   – Maintain and improve the process to identify imminent impactors

2. Characterize the properties of near-Earth objects to advance both our understanding of the threats posed to our planet and how Earth impacts may be prevented in the future
   – Determine physical properties of the NEO population
   – Determine chemical/compositional properties of the NEO population

3. Develop and maintain rigorous models to assess the risk to Earth from wide-ranging potential impact conditions
   – Better understand the impact effects and damage
   – Develop, maintain and exercise impact risk assessment tools
4. **Develop robust mitigation approaches to address potential impactor threats**
   - Ensure potential threats are identified and addressed early
   - Develop and demonstrate planetary defense approaches and missions
   - Develop a rapid response capability for in-situ characterization and mitigation

5. **Continue to develop coordination and civil defense strategies and procedures to enable emergency response and recovery actions**
   - Support the Planetary Defense Coordination Office
   - Continue to develop interagency cooperation and coordination
   - Continue to develop international cooperation efforts
Status of SBAG PD Goal

• Draft Planetary Defense section largely completed

• What’s new since last SBAG:

• **US NEO Preparedness Strategy and Action Plan** issued: June 2018
  – Enhance NEO Detection, Tracking and Characterization Capabilities
  – Improve NEO Modeling, Prediction and Information Integration
  – Develop Technologies for NEO Deflection and Disruption Missions
  – Increase International Cooperation on NEO Preparation
  – Strengthen and Routinely Exercise NEO Impact Emergency Procedures and Action Protocols

• **Planetary Defense Conference** hypothetical impact scenarios:
  – Asteroid impact scenario: warning time of 8 years
  – Long-Period Comet impact scenario: warning time of 22 months
Impact Hazard from LPCs

- LPC: Long-Period Comet (P \( \geq \) 200 yrs)
- LPC hazard still on the order of 1% of the PHA hazard
  - Propose further analysis of the statistical hazard from LPCs?
- LPC nuclei typically larger than 500 m
- LPCs typically not discovered until they becomes active: \( r \sim 6-10 \) au
- PDC comet impact scenario discovery occurs at \( \sim 8 \) au
  - [https://cneos.jpl.nasa.gov/pd/cs/pdc19c/](https://cneos.jpl.nasa.gov/pd/cs/pdc19c/)
- Warning time for potential LPC impact < \( \sim 2 \) yr
- Non-grav effects vary widely from one LPC to another, and cannot be quantified until \( r < \sim 2 \) au
- Warning time for certain impact < a few months
- PDC comet scenario demonstrates how extraordinarily difficult it is to mitigate an LPC hazard