

# IAWN communication workshop, September 2014

Finding: “Employing a common language to communicate about asteroid impact hazards across the different IAWN institutions could help the IAWN build its identity and credibility. Establishing mechanisms for routine communication could help increase NEO awareness. “

Finding: “Quantitative and probabilistic scales are of limited value when communicating with non-expert audiences. Qualitative measures of characterizing impact hazards and risks and describing potential impact effects may be more effective communication tools.

Recommendation:

“IAWN should develop and employ a new, non-probabilistic scale for characterizing asteroid impact hazards and impact effects. The Broomfield Hazard Scale is proposed for the IAWN’s consideration as an impact effects scale.”

# Common language

“The International Asteroid Warning Network ([www.iawn.net](http://www.iawn.net)) is an organization of asteroid observers, orbit computers, physical property specialists, radar astronomers, and other scientists and communication experts that study asteroids, specifically near-Earth objects (NEOs). The IAWN is a United Nations-endorsed organization for the detection and tracking of asteroid impact threats.

“A 1 percent probability for a predicted impact is the IAWN’s threshold for notifying the public of the risk for a future impact. Once a probability of impact for a Potentially Hazardous Asteroid (PHA) reaches 1 percent, the IAWN designates the object as an impact “threat.” Once an asteroid is deemed a threat, the IAWN will begin notifications to other entities so that the process of determining whether to plan for deflection of the asteroid or mitigation of an impact can begin.”

# Common language (continued)

“A near-Earth asteroid is an object whose orbit periodically brings it within approximately 195 million kilometers (121 million miles) of the Sun – that’s within 50 million kilometers, or 31 million miles, of Earth’s orbit. A “potentially hazardous asteroid” (PHA) is an asteroid whose orbit is predicted to bring it within 0.05 Astronomical Units (just under 8 million kilometers, or 5 million miles) of Earth; and of a size large enough to reach Earth’s surface – that is, greater than 30 to 50 meters.”

“The Space Missions Planning Advisory Group (<http://www.smpag.net>) is a UN- endorsed forum for the world’s space agencies involved in planning and preparation of an international response to an asteroid impact threat through the exchange of information, development of options for collaborative research and mission opportunities, and to conduct NEO threat mitigation planning activities.”

# Standardizing content of impact warnings

While NEO messaging cannot be completely standardized - as messages are scenario-dependent and each scenario is unique - the information provided by the different IAWN member organizations should be consistent. The group agreed that IAWN and its members could employ a standard checklist of information to be included in messages, as needed and available, in a consistent format.

Such a checklist could include:

- Asteroid name/designation.
- Asteroid characteristics – size (metric and standard), brightness/albedo, etc.
- Observational history.
- Who discovered the asteroid and why the observation could be made.
- Prediction of asteroid trajectory including closest distance to Earth (surface, not center) and date and time of close approach.
- A colloquial (non-statistical) qualifier of impact risk (none, unlikely, possible...).
- Hazard to space assets (none, some...).
- Future observations (including radar observations).
- Will amateur observers be able to see the object?
- Consistent terms of measurement: “size” rather than “diameter” of object, brightness/albedo of object, etc.
- Authoritative source(s) for more information.

# A proposed qualitative scale

“The proposed Broomfield scale is a six-step scale based on a NEO’s size and kinetic energy potential, in tons of TNT equivalent, with each step assigned a color. On the Broomfield scale, an example of a Class 3 object is the object that exploded over Tunguska in 1908.”

Broomfield Hazard Scale				
Class	Object size*	Energy potential <sup>†</sup>	Impact hazard	Color scale
1	<10 m	<50 kt	Visible fireball	Green
2	10 – 30 m	50 kt – 1 Mt	Localized damage possible	Yellow
3	20 – 80 m	1 – 20 Mt	City-wide damage	Orange
4	60 – 230 m	20 – 500 Mt	Regional damage	Red
5	160 – 800 m	500 Mt – 20 Gt	Country-wide destruction	Dark Purple
6	>600 m	>20 Gt	Global destruction	Black

*\*Sizes (in meters) are indications only: given size range is based on 3g/cc, the velocity range 15-25km*

*<sup>†</sup>Energy potential expressed in tons of TNT equivalent*

# Caveats/more work needed

“The Broomfield scale is non-statistical and does not address probability of impact.... blast radius information (distance plus severity of effects) should be added to each class on this scale.... descriptive terms included in this scale – such as “localized damage” – are highly subjective and thus subject to interpretation.

Identifying appropriate descriptive terms will require further work. It is important for IAWN to employ a scale that enables the disaster planning and emergency management community to determine thresholds for action.”

# ESA/ESRIN risk communication workshop

Some points of discussion:

In general, a cautious approach (up to a no-reaction attitude) appears to be more rewarding in counteracting false statements, which often are likely to disappear by their own.

Never forget that providing details in dismissing a fake news is likely to provide also additional ground for strengthen it;

A suggestion for improving impact simulation exercises: why not using “true” roles? (i.e. real civil protection officers, journalists etc.)

Impact corridors will be more and more available but possibly not publicly disseminated: how to deal with semi-public information without feeding conspiracy theories?

Is there the need of better energy and risk scales?

Is it possible to avoid using probabilities?

Is it really an advantage to try to be more “understandable” to the public at large or is it more liable of misunderstandings?

It could be useful to compile and share a dictionary of “forbidden” terms (e.g. lost, fear, death....)

# A new qualitative impact risk scale?

Developed by Detlef's student Felix Stadler ("The Asteroid Impact Threat: From Physical Parameters to Information," ESA-SSA-NEO-RP-0165)

"The scale consists of eleven stages representing zones. Each of these zones corresponds to a certain level of impact effect intensity. In the simplest case, the zones are circle-shaped and expand radially from the impact site in descending order of severity."

"The scale is split into two sections: land impacts and water impacts.... Since the actual distribution of the zones depends a lot on ground parameters and terrain which are highly specific to the impact site, the mapping key is only to be taken as a guideline. With the knowledge of the exact impact site, a more accurate zone map could be created using numerical models that incorporate the local conditions."

# The scale

11 steps, ranging from “green”/harmless to “black”/annihilating

Example step: “damaging” (dark orange)

- Land impact: Devastation. Firestorm. Roofs are severely damaged, wood frame buildings collapse. Saffir-Simpson category 2 winds (extremely dangerous winds, extensive damage).
- Water impact: Most people carried away. Most large vessels carried inland, vehicles overturned and displaced. Fires. Artificial dams destroyed, harbor wavebreakers damaged. Papadopoulos–Imamura stage X tsunami (very destructive).