

Introduction to the Tsunami Warning Center Reference Guide

In the aftermath of the Great Sumatra Earthquake and Indian Ocean Tsunami of December 26, 2004, countries of the Indian Ocean basin formed an Intergovernmental Coordination Group (ICG) for the development of an Indian Ocean Tsunami Warning System (IOTWS). An effective end-to-end tsunami early warning system could have saved thousands of lives that were lost in the devastating tsunami. The ICG/IOTWS was formed under the auspices of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Intergovernmental Oceanographic Commission (IOC). Subsequently, ICGs have also been established in the Caribbean, Atlantic, and Mediterranean basins to guide the development of tsunami warning centers in those areas. A tsunami warning system can only be successful if it spans the continuum of activities associated with an “end-to-end” approach. An end-to-end tsunami warning system begins with the rapid detection of a tsunami wave and ends with a well prepared community that is capable of responding appropriately to a warning (Figure 1-1).

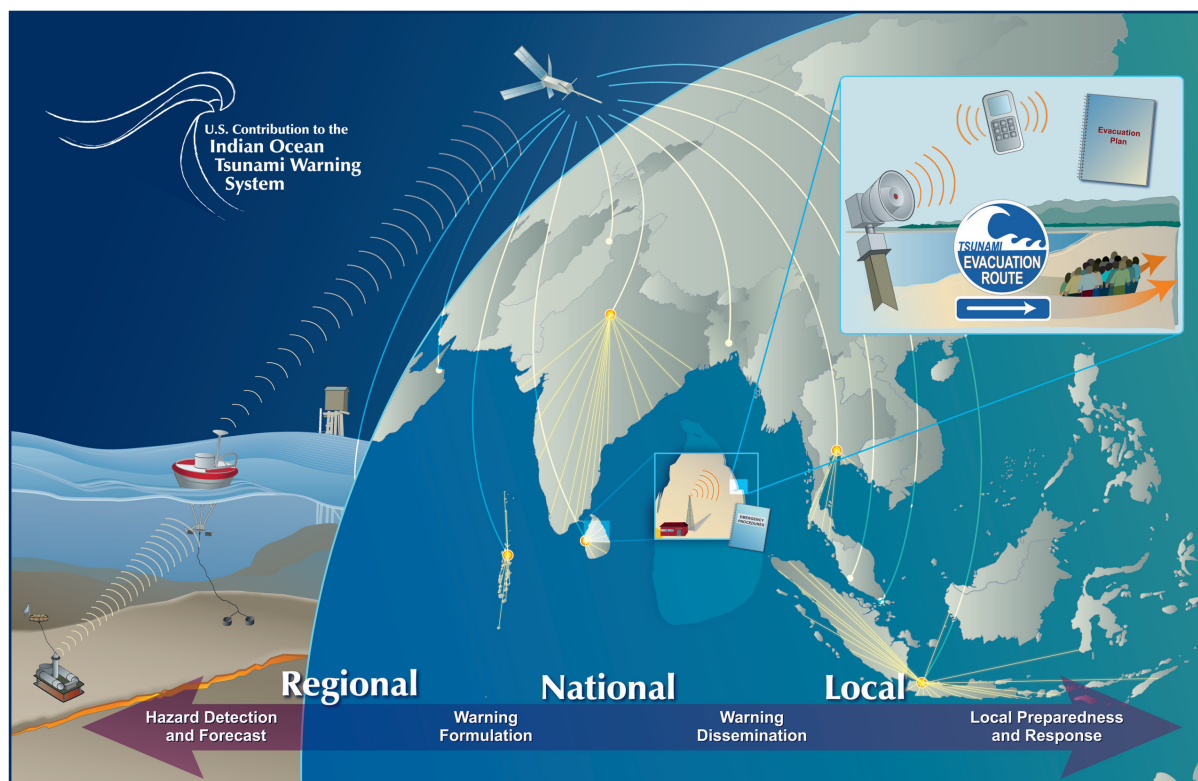


Figure 1-1. Overview of an End-to-End Tsunami Warning System

The operation of a tsunami warning center is a vital part of an end-to-end tsunami warning system. A tsunami warning center is not only involved in acquiring and processing data for detecting a tsunami, but also in formulating and disseminating tsunami warnings and connecting with communities at risk to ensure that they understand the warning and have the capacity to respond. Tsunami warning centers must develop partnerships with international organizations; national, subnational, and local agencies; community leaders and organizations; businesses; and local citizens to ensure warnings are received and understood by local communities.

Under a U.S. IOTWS Program supported by the United States Agency for International Development (USAID), the National Oceanic and Administration (NOAA) is contributing to this international effort to develop an end-to-end tsunami warning system through the transfer of appropriate technologies and operational procedures from its nearly 40-year involvement and leadership in the ICG for the Pacific Tsunami Warning and Mitigation System. This Tsunami Warning Center Reference Guide is one of NOAA's contributions to the development of an effective end-to-end tsunami warning system for the Indian Ocean.

Purpose of the Guide

The purpose of this Guide is to serve as a reference for countries that are establishing new or maintaining and enhancing existing tsunami warning centers as part of an overall end-to-end tsunami warning system. This document describes a concept of operations for a National Tsunami Warning Center (NTWC) or Regional Tsunami Watch Provider (RTWP) and also provides outreach and education resources for these centers. Additionally the Guide is designed to assist individuals, organizations, and governmental entities who operate or interact with a tsunami warning system. Some of the groups and individuals who will find the information contained in this document useful include, but are by no means limited to:

- International policy makers
- National government policy decision makers
- Government agency planners
- National and local government preparedness officials
- Disaster responders, including nongovernmental organizations (NGO)
- Television, radio, and newspaper reporters and editors
- Tsunami warning center staff members

This Guide describes the key operational components of a tsunami warning center and the relationship of each component within an end-to-end tsunami warning system. The document incorporates lessons learned from the two NOAA operational tsunami warning centers: the West Coast/Alaska Tsunami Warning Center (WC/ATWC) in Palmer, Alaska, and the Pacific Tsunami Warning Center (PTWC), based in Hawaii.

PTWC works closely with other regional and national centers, including those operated by France, Russia, and Japan, and NOAA's WC/ATWC. As a result, the Guide is a concept of operations (CONOPS) based on guidance established by the IOC.

This document is not an operations manual and does not provide step-by-step instructions for establishing a tsunami warning system. Furthermore, this Guide does not set forth warning system operational procedures and shift duties, sometimes referred to as Standard Operating Procedures (SOP). SOPs are unique to each tsunami warning center and are coordinated through the IOC for that respective basin ICG.

The Guide documents and communicates overall quantitative and qualitative aspects of a tsunami warning system, with a specific focus on NTWCs. The concept of operations for an RTWP is very similar to that of a national center, but the RTWP CONOPS must satisfy a broader multilateral legal framework and requires more extensive international cooperative agreements.

Organization of the Guide

This Guide is organized into chapters that provide an overview of the operational and organizational requirements of a tsunami warning center, followed by one chapter for each of the seven key operational components (Figure 1-2). Each chapter begins with a general overview of the component and its role in an end-to-end tsunami warning system. Sections within each chapter describe subcomponents essential for the operation of a tsunami warning center. Throughout the document, critical information and examples are highlighted in tip boxes.

Tip

Given the complexity of the information presented and the diversity of the audience, this Guide is designed to help the reader move smoothly through the text by providing visual clues wherever possible. These include figures and tables, summaries of key points, tip boxes, and examples or case studies.

Chapter 1 - Introduction

Chapter 1 is this introduction, which provides a description of the purpose and intended use of the Guide as well as some of its limitations. This chapter has introduced the meaning of an end-to-end tsunami warning system and the vital role of a tsunami warning center within that system.

Chapter 2 - Overview of the Operational and Organizational Requirements of a Tsunami Warning Center

Chapter 2 provides an overview of the key operational and organizational requirements of a tsunami warning center as they currently exist at the two NOAA tsunami warning centers and at the Japan Meteorological Agency (JMA). The operational requirements of a tsunami warning center are presented as a "systems description" in the context of a people-centered multi-hazard early warning system. The organizational requirements of a tsunami warning center include staffing,

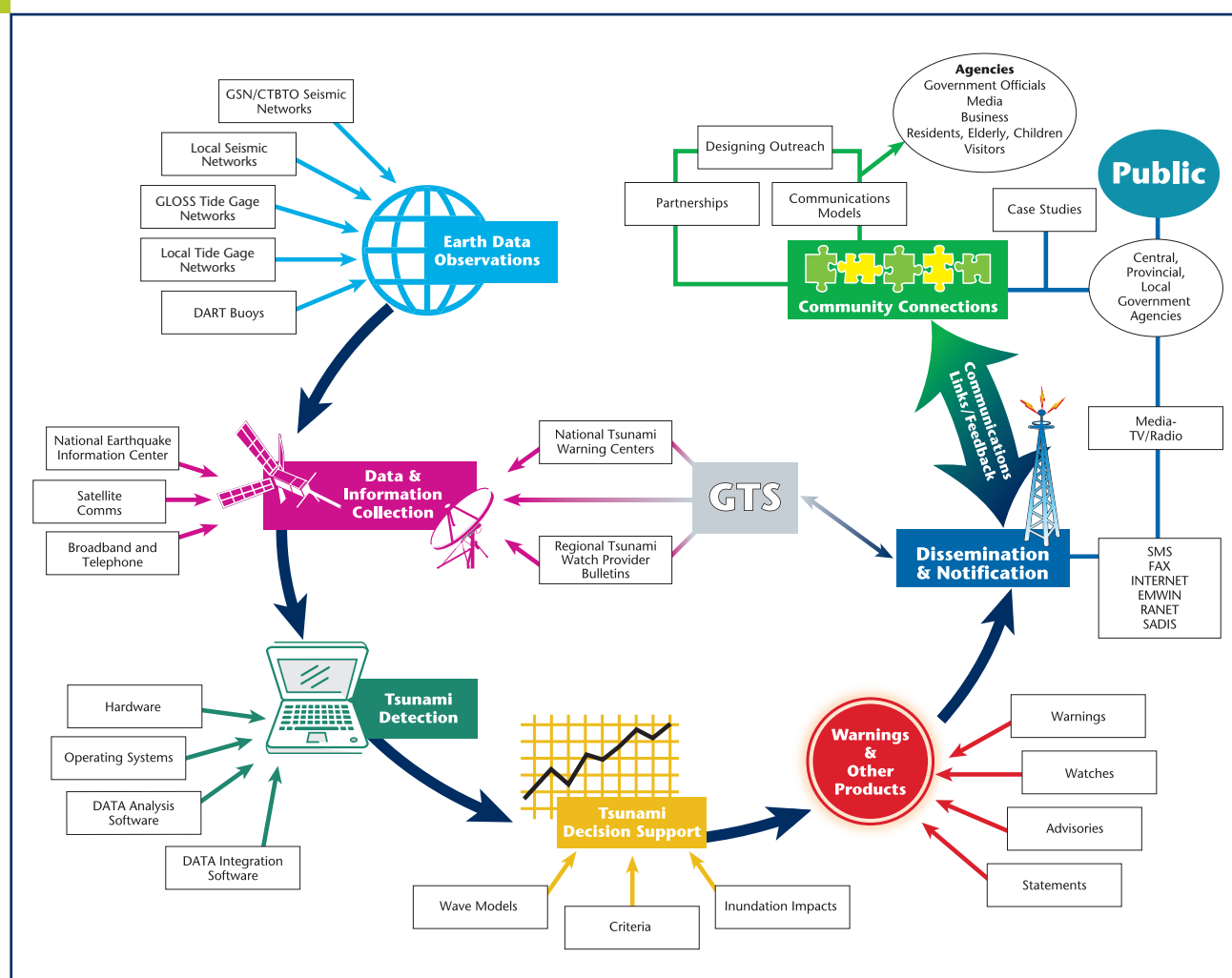


Figure 1-2. Key Operational Components of a Tsunami Warning Center

documentation, and interoperability requirements and performance measures. The chapter provides an overview of the various links in the end-to-end chain. These include data collection and monitoring, decision making and warning issuance, and working with partners to get warnings “all the way to the beach.” The chapter is a blueprint for the operation of a tsunami warning center and its contribution within a successful end-to-end tsunami warning system.

Chapters 3 to 9 - Descriptions of Each Operational Component

Chapters 3 through 9 present more detailed information on the key operational aspects and components of the various systems including data, equipment, products, telecommunications, outreach strategies and tools that comprise a full, people-centered tsunami warning system. The information in these chapters is derived from

various sources, including PTWC, WC/ATWC, JMA, UNESCO, World Meteorological Organization (WMO), U.S. Geological Survey, University of Hawaii, University of Washington, and Harvard University, just to name a few.

Appendices

The appendices consist of such resources as a list of acronyms (Appendix A), glossary of terms (Appendix B), position descriptions for tsunami warning center staff positions (Appendix C), a list of working documents a center should develop and maintain (Appendix D), and lists of references and additional resources for each chapter (Appendix E).

