

**Sustainability and Governance of Tsunami Early Warning System: Bureaucracy and System Theory Approach**

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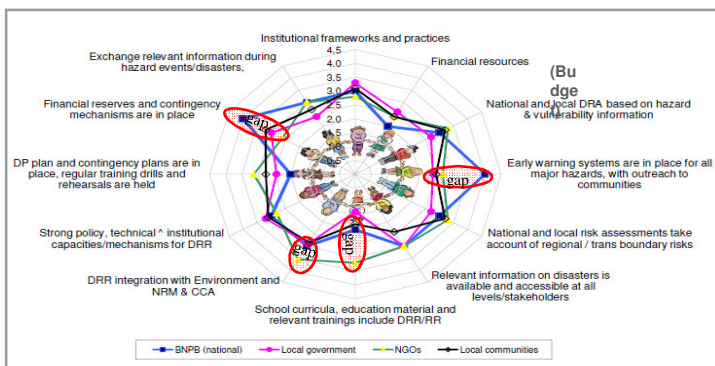
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**Introduction: Early Warning System as a Living Organism**

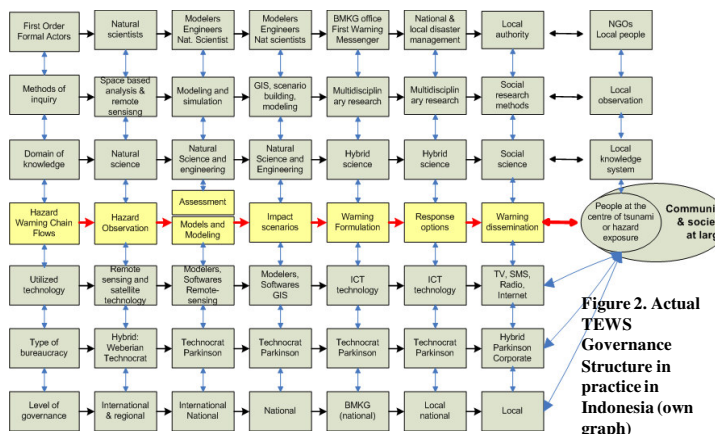
The metaphor "living organism" comprised of complex cells is chosen to represent the concept of polycentric governance and sustainability of tsunami early warning system (TEWS). Sustainability concept of TEWS recognizes the concept of polycentric and multi-level and multi-spheres of decision making. In a nutshell, a cell of TEWS may be best represented as a watch analogy that runs every seconds without stops with its own rigid rules of the game which is autonomous. Each cell has its own dynamics and attributes (i.e. specific actor, bureaucracy type, knowledge system, science domain and governance status – see Figure 2.) but is interdependent and constructive interplays at the same time to make it functions as a system. The metaphors may serve as a communication tool to highlight the sustainability concept in the debates contributing to the governance of TEWS and disaster risk reduction.

**Methods of Analysis:** As part of PhD research on disaster risk governance in Indonesia, this research mixes the second order cybernetics, multiple gap analysis, and governance concept to understand the real world situation of tsunami early warning system. It focuses on selected attributes embedded in most of hazard early warning chain, such as tsunami, but largely ignored by both natural scientists and social science research working in TEWS. The horizontal and vertical interplay of six selected attributes that are embedded along the chain of EWS: level of governance, types of bureaucracy, first and second order formal actors, domain of knowledge and methods of research. While TEWS chains from "end to end" are the common chain: i.e. tsunami hazard observation, assessment and modeling, impact scenarios, warning formulation, response options and warning dissemination to the people at risk.

**Methods of Data Collection :** Mix of formal reports, formal presentation, relevant formal regulations and laws, self-evaluation report of formal and informal stakeholders of InaTEWS and participant's observation on the ground and online.



**Figure 1. Stakeholder's self-evaluation in Indonesia (own graph).** Data derived from BNPB 2009, YEU's Views from the Frontline Report 2009. Note: Scoring scale 1-5, 5 is comprehensive achievement, with the commitment and capacities to sustain efforts at all levels. 4. Substantial achievement, but with some recognised deficiencies in commitment, financial resources or operational capacities. 3. There is some commitment and capacities to achieving DRR but progress is not substantial. 2. Achievements have been made but are relatively small or incomplete, and while improvements are planned, the commitment and capacities are limited and 1. Achievements are minor and there are few signs of planning or forward action to improve the situation.



**Figure 2. Actual TEWS Governance Structure in practice in Indonesia (own graph)**

**Preliminary Analysis**

**Gaps: National vs Local Stakeholders**

One of the attributes of EWS chain is the actors (i.e. formal organizations and groups of people at risk). Empirical data shows that each actor at different level of governance answered differently to the question whether "EWS are already in place for major hazard, with outreach to communities." National actor (see Fig. 1) favor to claim that there is a substantial achievement despite resources and operational capacity. While local stakeholders (i.e. NGOs, local governments and local communities) view the EWS is still relatively small and incomplete.

**Doing EWS in the bureaucracy context**

EWS bureaucracy is defined as form of mental model and rationality that shapes the structures and comprises a set of regulations put in place to control EWS chain management. Preliminary study of Indian Ocean bureaucracy confirms that TEWS is done in certain context of bureaucracy. Bureaucracy matters a lot as it can be disabling and enabling conditions for sustainability of innovativeness and overall EWS performance, quality of processes, risk knowledge production /dissemination and services to the people at risk. At least five type of mixed bureaucracy identified: such as Weberian (application of rational principles of organization through government administration). In the Indian Ocean context, there are types of bureaucracy such as: Weberian, Technocracy, Parkinson, Orwellian, Thai's Buddhist bureaucracy, Populist bureaucracy and lastly corporate bureaucracy that treat citizen as costumers which lack of vision of rights based approach to warning services.

**Science, Methods, Knowledge and Technology**

Science is linearly defined by its methods, but its success in knowledge production can not determine linearly the practical relevance. In certain bureaucracy model (e.g. technocracy), only certain science gets more access to resources. While little is understood how TEWS can be ergonomically fit to the need of local and broader societal needs and safety? Further social science research on tsunami risk and TEWS using polycentric governance framework and second order cybernetics approach may shed some lights on EWS ergonomicality in one hand and sustainability in broader sense at the other hand.

**Reference list:**

Lassa, J. and Changseng, D. (draft, to be published) "Preliminary Analysis of Bureaucracy of Tsunami Early Warning Systems in Indian Ocean Countries."  
Evers, Hans-Dieter, (1987), "The Bureaucratization of Southeast Asia." Comparative Studies in Society and History 29, 4 : 666-685  
Luhmann, Niklas 2005 "Risk: a sociological theory." Translated by Rhodes Barrett. Aldine Transaction.  
Measuring Sustainability of Tsunami Early Warning Systems: An Interdisciplinary Research Agenda. International Journal of GeorISK - Assessment and Management of Risk for Engineered Systems. Vol. 2, Issue 4: pp. 185 - 192.