

COMPARISON STUDIES ON INTEGRATING OF DISASTER RISK REDUCTION (DDR) IN SPATIAL PLANNING SYSTEMS IN INDONESIA, JAPAN, AND EUROPEAN COUNTRIES

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Abstract

Rencana tata ruang merupakan satu dari sekian banyak cara pengurangan risiko bencana dalam manajemen kebencanaan, tetapi mempunyai peran sangat penting. Pengintegrasian pengurangan risiko bencana dalam rencana tata ruang sangat tergantung dari sistem rencana tata ruang suatu negara. Tulisan ini akan membandingkan pengintegrasian pengurangan risiko bencana dalam rencana tata ruang di Indonesia, Jepang dan negara-negara di Eropa, yang didasarkan pada kajian literatur, jurnal, prosiding dan tulisan ilmiah lainnya. Berdasarkan kajian mengenai pengintegrasian pengurangan risiko bencana dalam rencana tata ruang pada ketiga negara tersebut di atas, dapat disimpulkan bahwa terdapat dua karakteristik yang membedakan pengintegrasian pengurangan risiko bencana dalam tata ruang yaitu: 1) rencana tata ruang terkait langsung dengan pengurangan risiko bencana dan 2) rencana tata ruang tidak terkait langsung dengan pengurangan risiko bencana. Dalam hal ini pengurangan risiko bencana merupakan bagian dari rencana sektor.

Kata Kunci: Mengintegrasikan, pengurangan risiko bencana, perencanaan tata ruang.

I. INTRODUCTION

1.1. Background

Various impacts of major disasters in the world encourage and strengthened national government's commitment to change the paradigm of disaster risk management (hereinafter called DRM) from being responsive to preventive, from national government to local governments. National and local governments have an obligation to protect citizens from natural and technological hazards. DRM is a set of policies, legal arrangements, planning actions, and institutions set up to manage and eventually reduce the effects of hazardous on the human and physical assets of a community, and minimize the impacts of these hazards on the delivery of essential services to the people. DRM has three important activities: 1) DRR, 2) emergency response, and 3) recovery.

An awareness of DRR started in 1990 when the International Decade for Natural Disaster Reduction was declared. DRR is a broad approach that includes all actions that can reduce disaster risks. The DRR approach can be political, technical, social, and economical. DRR takes forms that are as varied as policy guidance, legislation, preparedness plans, agricultural projects, insurance schemes, or even a swimming lesson (ISDR, 2010). Spatial planning is especially important in disaster prone areas because it moves toward a reduction of damage to people, property, and resources before a disaster strikes, not afterwards (Fleischhauer M., 2008). Disasters need to be directly correlated with spatial development (Bendimerad, 2008). Spatial planning presumes to anticipate and prepare, make preparations, and plan for future land use development.

Systematic consideration of multiple

hazards in spatial planning is an important challenge for DRR. However, there are certain limitations to the spatial planning related to DRR, namely, a) spatial planning is only one of many actions for DRR; b) implementation of DRR policies and its programs is not a trivial matter; and c) spatial planning cannot reduce only one or two hazards because the planning is responsible for a particular spatial area, not a particular object (Fleischhauer M., 2008).

With regard to DRR, a spatial plan is the document that enables relevant governmental and administrative bodies to be able to play a decisive role for the protection of humans and resources against natural disasters (Burdy J., 1998). For example, DRR can be used to guide appropriate land uses for hazard prone areas by developing approaches to such hazard modification, as control of population density and expansion, and planning and implementing of transportation, power, water, and other critical facilities. DRR and spatial planning should also focus on anticipating upcoming needs and impacts, rather than simply responding to yesterday's event. Spatial planning systems in Indonesia, Japan, and the European countries will be compared here due to DRR in those country are a complex system.

II. METODOLOGI

2.1. Data Collection

This paper is based on the literature, including journals, proceedings, textbooks, and working papers with regard to integrating DRR in spatial planning system in Indonesia, Japan and the European countries.

2.2. Data Analysis

Spatial planning systems in Indonesia, Japan, and the European countries are compared here for risk assessment, risk reduction, hazards maps, risk maps, and vulnerability indicators as follows:

- a. Risk assessment: the combination of the probability of a disaster event occurring and its negative consequences.
- b. Risk reduction: the "consequence of

adjustment policies which intensify efforts to lower the potential for loss from future environmentally extreme events".

- c. Hazard map: a map that graphically provides detailed information about potential hazards.
- d. Risk map: a map that delivers the basis for identification of current high risk areas needing priority interventions, such as structural protection or adaptation measures. This map also enables a municipality to estimate the level of risk in potential development areas so as to avoid dangerous places and promote safer areas.
- e. Vulnerability indicators: ratings of the degree of vulnerability, i.e., DP=economic damage potential; PD=population density; OI= other indicators.

III. DISCUSION

A spatial planning system is defined as system of law and procedure that sets the ground rules for planning practice (Alfred Olfert, Stefan Greifing and Maria J. Batista, 2006). A spatial planning system is not an independent system, as it always connects to other policy systems. The role of DRR in spatial planning has been highlighted in recent years, as disasters have increased significantly. The term, spatial planning is often used as a synonym for; land planning (Italy), town and country planning (UK), spatial development (Poland), regional and development planning (France), and land use management (North America) (Fleischhauer M., 2008).

3.1. Spatial planning system for DRR in Indonesia

Indonesia is located in a disaster prone area because of its geographical, geological and demographic conditions. These have caused many major disasters, such as the tsunami in Aceh in 2004, the earthquake in Yogyakarta in 2006, the mudflows in Sidoarjo in 2006, the earthquake in Padang in 2009, and the Mt. Merapi Eruption in 2010. These disasters caused a large amount of damage,

many losses and victims.

The Indonesian spatial planning system is complex. It not only contains aspects of spatial development, but also economic, social, political, and environmental development aspects. The Indonesian spatial planning system is similar to land use management, because spatial development there is controlled by rigid zoning regulation (ZR) and codes.

Fig. 1 shows the outline of the Indonesian spatial planning system, which consists of two types of spatial plans: 1) the spatial plan issued by legislative (statutory planning) shown on the left side, and 2) the strategic plan issued by the ministry (non-statutory planning) shown on the right side of the visual. A strategic plan is then created to operate each spatial plan for each level of that plan as shown in the right portion of Fig. 1.

fire stations, hospital units within a residential area, and open space/public space services, infrastructure development, and spatial development. However, local governments do have limited resources for knowledge, expertise, information, funding, etc. These limitations may affect the quality of the spatial plan. A strategic plan is needed for this integrated-comprehensive approach because that focus has a broad objective. Indonesian spatial plans have to be published as law. Thereby, a law can bind the spatial plan to land uses. These national, provincial and municipal spatial plans are published as national law and local laws, respectively.

Table 1 shows the general content in the first column and the hierarchy structure of Indonesian spatial planning system in the first row. Spatial Planning Law Number 26, Year 2007 (SP 26/2007) Articles 19-32 require the contents

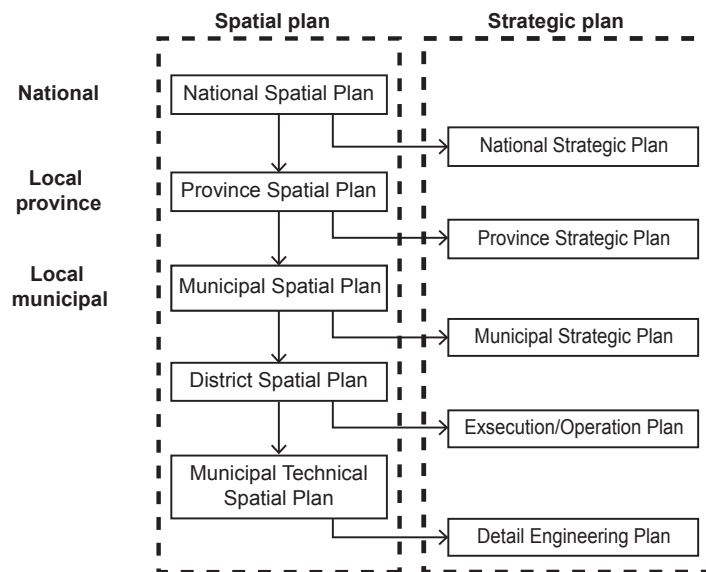


Fig 1. Outline of the Indonesian spatial planing system

Under Ministerial Home Affairs Regulation Number 1, Year 2008 Article 6, the Indonesian spatial planning system is an integrated and comprehensive approach. An integrated comprehensive plan is advantageous for DRR because it provides powerful tools for each municipality to use to facilitate and coordinate the locations of public service facilities, e.g.,

of 1) the goal, the policy, and the strategy for the spatial plan; 2) the spatial structure plan; 3) the spatial pattern plan; and 4) the control of spatial utilization within each spatial plan. The symbols “++”, “+”, “o”, and “-” represent the degree of contribution of the contents of the spatial plans according to SP 26/2007 Articles 19-32. The Symbol “++” means that the spatial

structure plan and the spatial pattern plan have important roles in DRR in the municipal spatial plan. While the control of spatial utilization in the municipal spatial plan with the symbol “o” does not make a large contribution and can be used, therefore, just as a guideline for ZR and building permission regulations, the actual ZR and building permission regulations are clearly stipulated in the district spatial plan.

As shown in the upper columns of Table 1, the spatial plan must follow a nationally set

locally protected areas (mangroves, rivers, river-banks, open spaces, and the seashore). In disaster prone areas, municipalities have to conduct disaster risk identification and disaster risk assessment; and design a hazard map according to Government Regulation Number 21, Year 2008 Articles 6-12. The determination of the spatial structure and the spatial pattern is a non-structural mitigation countermeasure of DRR because settlement restrictions, evacuation routes, and evacuation points are

Table 1. The hierarchical structure and general content of SP 26/2007 Articles 19-32

	National spatial plan	Provincial spatial plan	Municipal spatial plan	District spatial plan	Municipal technical spatial plan
Goal, policy and strategy	++	++	+	o	-
Spatial structure plan	+	++	++	+	o
Spatial pattern plan	o	+	++	++	+
Control of spatial utilization	-	-	o	+	++

++ = very strong, + = strong, o = moderate, - = low

policy framework and also the framework of a higher-level government. SP 26/2007 specifies that the municipal spatial plan must refer to the national plan and also the provincial spatial plan with regard to spatial development.

In the municipal spatial plan, the spatial structure plan and the spatial pattern plan both have the symbol “++”. In the spatial structure plan, residential centers and infrastructure network systems, such as roads, railways, and water supplies, are determined. Cultivation and conservation areas are spatially allocated in the spatial pattern plan and also classified into the following areas: Residential, agriculture, mining, industrial, tourism, and trading and service areas. Further, conservation areas are classified into land use categories, such as disaster prone areas, natural reserves (wildlife sanctuaries and cultural heritage sites), and

outlined in these plans according to SP 26/2007 Article 26.

As discussed above, the Indonesian spatial planning system contains the characteristics of an integrated-comprehensive planning approach and plays a major role in DRR under SP 26/2007, Ministerial Home Affairs Regulation Number 1, Year 2008 and Government Regulation Number 21, Year 2008. Altogether, the spatial plan looks to be an ambitious one due to its many aspects (infrastructure system, public facilities, land use, distribution of the population, etc) and has broad objectives for its implementation.

3.2. The spatial planning system for DRR in Japan

Japan is located in the circum-Pacific

mobile zone where seismic and volcanic activities frequently occur. Japan is one of the countries most prone to natural disasters, particularly those from earthquakes, typhoons, and floods. In Japan, the zoning system is considered one of the most important elements for city planning.

This section focuses on the city planning system for the spatial plan in Japan. Fundamental planning law there is the city planning law, first promulgated in 1968. Fig. 2 shows the outline of the spatial system for the city planning area in Japan. This city planning area is divided into two areas: The urban promotion area (UPA) and the urban control area (UCA). UPA is the area in which the local government can promote urbanization, and that urbanization is controlled by the UCA (Tokayuki Goto, 1999). Land use under the UPA is controlled in accordance with Land Use Districts, etc. for an orderly use of urban lands. In the UCA, land use is regulated by plans gathered from the agricultural side and land use districts that are not fully determined except for the quasi-city planning area. The Land Use District has three major use categories: Residential, commercial, and industrial, and these uses are further designated into twelve land use categories. The type of building is regulated by the zoning ordinance. The floor

area ratio and building coverage ratio are also designated by the zoning ordinance.

Hari Srinivas (2010) classifies the functions of the City Planning Law into three groups:

1. Group A: laws of the higher authorities.

Group A regulates the city planning system, including the planning of national highways and land use at the national level. For example, the alignments of roads approved in city planning are confirmed according to the plan for national roads.

2. Group B: related laws

Adjustment to land use outside urban areas is ensured by synchronizing the city plans with other laws. Formally, the jurisdiction for City Planning Law is decided by classifying agricultural land use and urban land use under the National Land Utilizations Planning Law.

3. Group C: individual laws

Individual laws separately regulate the contents of city plans, with respect to land use zoning, urban development projects, and urban facilities.

These different aspects demonstrate that Japanese City Planning Law does not directly relate to DRR. The DRR plan and initiatives are stipulated in sectoral plans. In the Japan

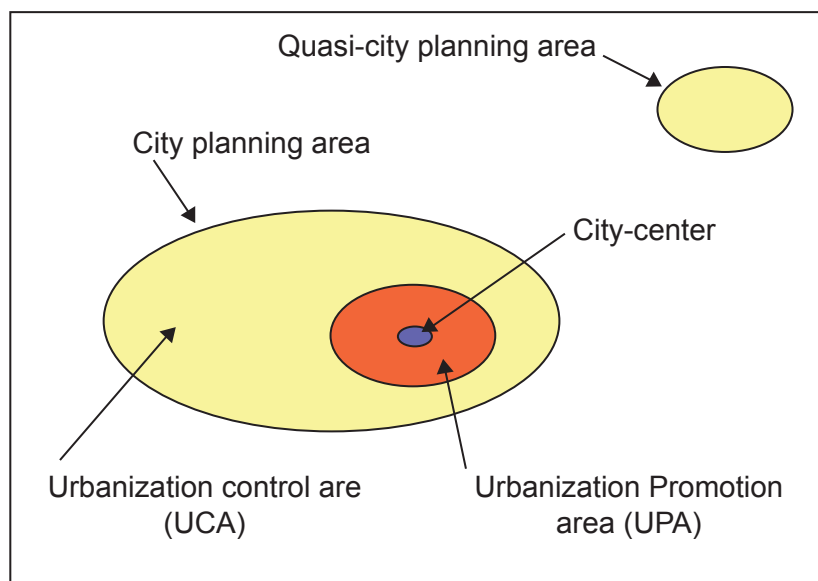


Fig. 2. The Spatial model for the city planning area in Japan

National Report of Disaster Reduction (2005), these sectoral plans of DRR in Japan were classified as follows:

1. Comprehensive National Development Plan (a provision of the nationwide spatial plan). "Making Japan a safe and comfortable place to live in"
 - a. Establishing a disaster- preparedness system to maximize safety by 1) Focusing on measures to limit the damage caused by disasters; 2) Understanding the importance of the roles of individuals and communities in creating "disaster-proof living zones"; 3) Responding to different types of disasters and improving risk management systems; and 4) Rebuilding devastated areas
 - b. Rebuilding the Hanshin-Awaji area
 - c. Providing better disaster control
2. Social Infrastructure Development Priority Plan (to provide social infrastructure), the aim of this plan is to ensure that social infrastructure development projects are implemented in a focused, effective, and efficient manner. The most important goals of the plan are the establishment of facilities to prevent flood damage, facilities and systems for real-time relaying of information on floods and other natural disasters, evacuation sites and evacuation routes, DRR facilities, and routes for the provision of aid in the event of disaster.
3. Long-Term Plan for Land Improvement, this plan works to mitigate disaster-related damage to the agriculture industry and increase safety in communities.
4. Forestry Maintenance and Conservation Project Plan (affects forestry), this plan addresses forest maintenance and those forestation projects aimed at maintaining and also conserving forests. Preventing landslide disasters through the regeneration of damaged forests and the prevention of further forest damage is specified as one of the Plan's main objectives.
5. Ministerial Ordinance Governing Technical Standards for Water Supply Facilities, this plan aims to minimize any suspension of the water supply and other adverse

effects on that water supply so as to ensure speedy disaster recovery when a disaster does occur.

Japan has carried out hazard mapping for tsunamis, tidal waves, flooding, volcanic eruptions, and earthquakes. Many of these hazard maps are drafted by agencies or local governments, including the Cabinet Office, the Ministry of Agriculture, Forestry and Fisheries of Japan, the Fisheries Agency, the Ministry of Land, Infrastructure and Transport, and other agencies. The scales of these maps range from 1:2,500 to 1:25,000.

As described above, the Japanese city planning system does not play a main role in DRR except for zoning regulation. The Disaster Counter-measures Basic Law 1991 required all levels of government to establish DRR plans for their respective areas for each sectoral plan (e.g. traffic, environmental heritage, forest, agriculture, etc.). This law provides good disaster countermeasures because Japanese sectoral plans are more detailed. However the sectoral plan does have weaknesses, including issues with effective coordination and conflicts among the different sectoral plans.

3.3. The spatial planning system for DRR in European countries

European countries are characterized by diverse geophysical and climatic settings that make them susceptible to a wide range of extreme natural events. Coastal areas, mainly in Northwest Europe, are threatened by winter storms, storm surges, and floods. Alpine areas are threatened by avalanches/landslides and floods, whereas the Mediterranean areas are mainly threatened by forest fires and droughts. Areas that are located above tectonic active zones in Central and Eastern Mediterranean areas are threatened by volcanic eruptions and earthquakes, tsunamis and landslides (Schmidt-Thome, 2005).

The European countries have a hierarchical planning structure in which local governments make key decisions within a basic national policy framework (Fleischhauer M., 2008). Risk assessment starts with the identification

Table 2. Overview of basic information in the spatial plans of European Countries dealing natural hazards

Country	Authority in charge of		Use of maps in the planning process		Vulnerability indicators used
	Risk assessment	Disaster risk reduction	Hazard maps	Risk maps	
Finland	SEP	SEP, SPP	medium important	low important	PD
France	SEP	SEP, SPP	Very important	medium important	PD
Germany	SEP	SEP, SPP	Very important	medium important	DP
Spain	SEP	SEP, SPP	Very important	medium important	PD, OL
UK	SEP	SEP, SPP	medium important	medium important	No data

SEP: sectoral planning, **SPP:** spatial planning, **PD:** population density, **DP:** economic damage potential, (OI) other indicator. Source: Fleischhauer et al., 2006

of hazards. In the European countries, risk assessment is the main task of the sectoral planning divisions. Spatial planning plays a minor role in this identification of hazards. Risk assessments are mainly done at higher levels and then downscaled for each municipality. Fleischhauer (2006) researched the assessment of these spatial planning approaches to natural hazards based on the spatial planning documents found in Finland, France, Germany, Spain and UK (hereinafter called "European countries") and obtained information on the policy used for dealing with natural hazards in the spatial plans of these European countries. Table 2 shows these research results.

As shown in the second column of Table 2, risk assessments are done for sectoral plans in these countries. As shown in the third column, DRR is accomplished by sectoral planning and spatial planning, whereas spatial planning plays only a minor role in hazard mitigation. Spatial planning in these European countries only needs hazard information, namely, risk and vulnerability, which is only important in a few extreme situations (e.g. where relocation

of existing development is being considered). Information on the nature and intensity of a hazard is very important for the production of hazard maps. The extent of a hazard can be illustrated by identifying and delineating all hazard zones on an appropriate scale.

As shown in the fourth column of Table 2, hazards maps are only of medium importance in Finland and the UK, but very important in France, Germany, and Spain. Thus, municipalities in France, Germany, and Spain have to take into account hazard identifications in their spatial planning. Utilization of risk maps in spatial planning is of medium importance except in Finland.

Finland and France use population density for vulnerability indicators in their spatial plans. Germany uses economic damage potential, while Spain uses population density and others indicator in its spatial plan as shown in the sixth column of Table 2. In this explanation, it is evident that DRR in the European countries is conducted via a combination of the authority given by sectoral planning and the actual spatial planning. Additionally, spatial planning

plays a minor role in DRR (Fleischhauer M., 2006). Spatial planning does provide careful identification, description, and assessment of the hazard potential. It has been shown that spatial planning does play a role, but just one of many roles when creating resilience due to the existence of the sectoral plans.

3.4. Comparison of the authorities in charge of risk assessment and DRR for spatial planning in Indonesia, Japan, and the European countries

As shown in the second row of Table 3, in Indonesia, the authorities in charge of risk assessment address sectoral planning and spatial planning, while the authority in charge of DRR identifies spatial planning. However, the municipalities that do have sectoral planning with regard to risk assessment are rare because an awareness of DRM started with the stipulation of SP 26/2007 and DM 24/2007. The Indonesian systems have strength of coordination because all spatial development aspects are analyzed

Table 3. Comparison of the authorities in charge of risk assessment and DRR for spatial planning in Indonesia, Japan, and the European Countries

Country	Authority in charge of		Strengths	Weaknesses
	Risk assessment	DRR		
Indonesia	SEP, SPP	SPP	<ul style="list-style-type: none"> • Coordination • Analysis of all municipal development aspects • Suitable for a long - term plan • Consistent with the objectives of the plan 	<ul style="list-style-type: none"> • Board objectives • Needs implementation plan/strategic plan due to very broad objectives • Limited resources for municipality knowledge, expertise, information, funding, etc • Ambitious plan due to need to have an analysis of all municipal development aspects
Japan	SEP	SEP	<ul style="list-style-type: none"> • Detailed plan, sectoral plan discusses each type of disaster • Problem solving oriented 	<ul style="list-style-type: none"> • Problem with coordination due to many sectoral plans • Short term plan • Partial, sectoral plan discusses each disaster type • Inconsistency of objectives for spatial plan and sectoral plan
Finland	SEP	SEP, SPP	<ul style="list-style-type: none"> • Focus on recent problem/responsive • Careful identification, description, and assessment of the hazard potential, and the integrated plan 	<ul style="list-style-type: none"> • Inconsistent, because the types of sectoral plans in European countries are only a medium-level plan (Fleischhauer, 2006). • Coordinated
France	SEP	SEP, SPP		
Germany	SEP	SEP, SPP		
Spain	SEP	SEP, SPP		
UK	SEP	SEP, SPP		

SEP: Sectoral planning, **SPP:** spatial planning.

Source: Fleischhauer et al., 2006 and Analysis, 2011.

through the spatial planning processes. This coordination is suitable for long-term planning and maintains the consistency of the plan objectives. However, this system has weaknesses as well, including broad objectives and looking like an ambitious plan, but having

only limited resources for knowledge, expertise, information, and funding in the municipality (Fig. 1). A strategic plan is thus needed to complement the spatial plan because the objective is indeed very broad and thus sometimes difficult to implement.

As shown in the third row of Table 3, in the Japanese city planning system, the authorities are in charge of risk assessment, and DRR is done in the sectoral planning. These systems have strengths in terms of the sectoral planning being a detailed plan, but when one plan has a problem, then the resolution method is only problem oriented. The weaknesses of these systems relate to coordination due to there being many sectoral plans in the municipality, only short-term plans, and an inconsistency in the objectives.

As shown in the fourth-eighth rows in Table 3, in the European countries, the authority in charge of risk assessment addresses sectoral planning. Risk assessment in sectoral planning should be readjusted in terms of spatial planning since the aims of the sectoral plan are not always the same for the spatial plan. European countries spatial planning systems have strengths in DRR, such as a focus on the recent problem, careful identification, and description and assessment of a specific hazard potential. However, the systems also have weaknesses due to their lack of consistency and problems with coordination caused by different objectives set for the spatial plan vs. the sectoral plan.

IV. Summary

This paper can be summarized as follows:

- 1) In an analysis of the legal framework for planning system, the Indonesian spatial planning system uses an integrated-comprehensive approach. Therefore, the municipal spatial plan plays an important

role in DRR.

- 2) The Japanese city planning system shows it is not directly related to DRR. In Japan the role of DRR is the task of the sectoral plan, such as transportation plan, agriculture plan, and infrastructure plan. This system has strengths of detail and responsiveness to DRR, but also weakness of coordination and inconsistency among the several types of sectoral plans that are related to DRR.
- 3) The European countries spatial planning systems, the authorities of DRR are the task forces for sectoral planning and spatial planning; however, spatial planning plays generally only a minor role for DRR. These systems have almost the same strengths and weaknesses as the Japanese city planning system.
- 4) The spatial planning systems in the European countries and Indonesia reveals that for the municipal spatial plan in Indonesia and the European countries the authority for risk assessment of DRR is the sectoral plan, it needs to be readjusted for further DRR in a spatial plan.

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