Planning and Construction of Railway Relocation Route Avoiding Porong Mud Vulcano in East Java Province of Indonesia

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Abstract: Mud eruption in Porong, 40 km South of Surabaya frequently submerged existing railway track. Government of Indonesia planed to relocate the track to the safer route. Initial route positioned at 2.2 km west of the eruption centre, while the distance of the revised route to the eruption centre is 8 km. Construction of railways at existing defunct railway track Sidoarjo-Tarik and some facilities had been done in 2008 while the next 18 km targeted for 2010 still need land acquisition.

Key Words: mud vulcano, relocation, railway, Porong, East Java

1. BACKGROUND

Surabaya is the second economic centre of Indonesia with the second biggest port. Since 2006 a mud volcano disaster occurred in Porong, 40 km South of Surabaya. The mud flow buried a section of toll road permanently while several times overtopping the temporary dike causing the traffic break of the arterial road and also causing railway submerged and bended and break the train schedule (Figure 1 and 2). These cause financial and economic losses, especially for the Southern and Eastern district of East Java province.

The eastern railway network of East Java is connecting Surabaya with important districts of Malang, Jember and Banyuwangi. This network is important for transporting passenger and goods including gasoline. The passenger train to Bali (with ferry and bus connection) is also via this network. When the railway in Porong is submerged (and bended), the service is broken for several days.
2. PLAN FOR SAFER RELOCATION RAILWAY ROUTE

In 2007, the government of Indonesia planned to relocate the railway to the west. The process of decide the relocation route is discussed in DGR (2006). The initial plan is from Sidoarjo station to Gununggangsir area about 2.2 km west of the mud volcano eruption centre (Figure 3), which is a compromised route considering several stakeholders (DGR, 2007). The idea of the initial route is to make land acquisition process easier, by making a very wide right of way for toll road, arterial road, railway track, gas pipe and high voltage electrical transmission. The initial route comprises of Section 1, Section 2, Section 3 and Section 4, with the Section 1 using right of way of now defunct railway Sidoarjo-Tarik. The length is 18 km with 10 km located between toll road and arterial road (Section 3).

The initial plan face difficulties since the Right of Way is only 20 meters while the elevation is high (so does the toll road) to overpass the cross road. The problem occurred since in another side the arterial road position is at grade. It produces a high 9 meters embankment on a soft clay soil which is difficult to cope with 20 meters Right of Way. Elevated construction
is not the solution since there is a limited budget. Other difficulty is about the railway station planned in this section. There is a difficult solution to get a safe access to the station from the fast lane of the arterial road.

The initial plan is currently under revision. The section 1 is extended to Tulangan station, while the rest is new sections via Krembung, Japanan and Gununggangsir (DGR, 2009). The total length of the revised plan is 26 km, longer than the initial 18 km; however, the revised plan is more compatible with the other plan to make the Sidoarjo-Tarik alive. The switch is located at Tulangan station. The revised plan is also neglecting the problem occurred at initial plan. The most important is the revised route is farther; 8 km from the eruption centre (also in Figure 3).

![Figure 3 Existing railway (yellow), initial proposed new route (red) and revised proposed new route (blue)](image-url)
Relocating railway track 8 km to the west ensure that the new track is safer than the initial proposed track if the 12 m high temporary dikes is overtopped or sliding. The new proposed track is also far from gas bubbles which are currently occurred about 100 m from the initial proposed track. The revised track also makes the design of the railway bridge over the Porong river shorter (by a half) than the initial proposed route. The design is based on Indonesian Railway regulation (PJKA, 1986).

3. CURRENT CONSTRUCTION DEVELOPMENT

While the route is revised, section 1 remains the same, and the extension of the section 1 is using right of way of the existing defunct railway which is neglecting the difficulties of land acquisition problems. These conditions give way to the constructions since 2008 of the new railway (Figure 4) at section 1, sleeper distribution at extension of section 1 (Figure 5) over the irrigation, construction over existing gas pipeline, slab track crossing under a toll road box construction, and shelter extension at Sidoarjo station (Figure 6 and 7 show before and after). The shelter is on the 4th track since the existing defunct railway Sidoarjo-Tarik is started from this track, which was then without shelter.

![Figure 4 Construction of new railway (section 1)](image1)

![Figure 5 Distributing sleeper (extension of section 1)](image2)
Figure 6 Sidoarjo station during construction the new shelter

Figure 7 Sidoarjo after construction the new shelter
4. RECENT CONDITION OF RAILWAY NETWORK

During the planning and construction process, the existing track is still used. The mud eruption volume is still high, about 100,000 cubic meters daily. While the dike is always risen up, it is overtopped temporarily and makes disruption of the highway and railway traffic. When the highway stakeholder is rising up the arterial road, the railway stakeholder is also rising up the railway elevation (Figure 8). It is a temporary solution during the planning and construction of the railway relocation is in developing.

![Figure 8 Rising elevation of existing railway 1.5 m. higher](image)

5. PLAN FOR THE NEXT STAGES

For the next stages, detail engineering design for the revised route should be finished by the end of 2009. Land acquisition will be done in early 2010, followed by construction which includes 18 km of embankment and single track, Porong river bridge, 9 overpasses, 4 underpasses, bridges and box culverts.
REFERENCES


