Effects of Pipeline Construction on Wetland Ecosystems: Russia–China Oil Pipeline Project (Mohe-Daqing Section)

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Although the multiple roles of wetland ecosystems and their value to humanity have been increasingly understood and documented in recent years (Getzner 2002; Hoehn et al. 2003), the efforts to conserve and restore wetlands are not in harmony with the press for high speed of economy growth. The degradation of wetlands is proceeding, especially in China (Cyranoski 2009). Russia–China Oil Pipeline Project (Mohe-Daqing Section) has already begun in May, 2009, and is ongoing. The pipeline runs through four riverine wetlands and two marshlands of Heilongjiang Province, Northeast China. Although the project has vital significance of mitigating the energy crisis as well as guaranteeing the energy security of China, it will bring a series of ecological and environmental problems, especially for wetland ecosystems.

The excavated spot of the Russia–China Oil Pipeline Project (Mohe-Daqing Section) is located at the south side of Amur-Heilong River, the Russia–China boundary river. The pipeline runs through four riverine wetlands and two marshlands of Heilongjiang Province, Northeast China. Although the project has vital significance of mitigating the energy crisis as well as guaranteeing the energy security of China, it will bring a series of ecological and environmental problems, especially for wetland ecosystems.

The excavated spot of the Russia–China Oil Pipeline Project (Mohe-Daqing Section) is located at the south side of Amur-Heilong River, the Russia–China boundary river. The pipeline passes Heilongjiang Province and Inner Mongolia Autonomous Region of China, and ends at Daqing City of Heilongjiang Province (Fig. 1). The whole line spans 972.6 km.

Riverine wetlands and marshlands are the two main types of wetlands where the pipeline passes through. The pipeline runs through four riverine wetlands (Huma River National Nature Reserve, Pangu River National Nature Reserve, Nemoer River Provincial Reserve, and Wuyuer River–Shuangyang River Provincial Nature Reserve) and two marshlands (Ta River Marshland and Duobukuer River Marshland) (Fig. 1). The total crossing length of Ta River Marshland and Duobukuer River Marshland is 50 km, which are permafrost marshlands (Fig. 1). The total crossing length of the riverine wetlands (nature reserves) is 204.79 km. The specific information of these nature reserves is shown in Table 1.

The pipeline construction occupies 1.56 ha open water and 96.83 ha the unutilized lands (mainly for freshwater marshlands) (PetroChina Planning & Engineering Institute 2007). The directly occupied wetland area is up to 4.77% of the entire construction area. The construction will alter the existing hydrologic regime of these wetland areas in two ways. It will block the surface water flows or change the flow directions because of the soil or spoil deposition, and block the shallow groundwater flows directly.

The entire pipeline runs through three large-scale rivers (Amur-Heilong River, Huma River, and Nenjiang River, total length 3.4 km) using the tunnel method, and cross eight moderate-scale rivers (Pangu River, Daxiergenqi River, Xilinixi River, Ta River, Duobukuer River (two times), Nemoer River, and Wuyuer River, total length 9.9 km) using open-cut method. For the groundwater depth of river beds usually shallow, the pipeline will cut off the hydraulic connection between the surface water and the...