

## Role of construction of major irrigation projects on emergence of zoonotic diseases

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### *Abstract*

Dams play a crucial role in providing water for agricultural purposes, but they can also have unintended consequences on the emergence of zoonotic diseases. Irrigation dams create new habitats for wildlife by altering the natural hydrology of rivers and streams. These new habitats can provide ideal breeding grounds for disease vectors such as mosquitoes and ticks, which can carry and transmit zoonotic pathogens. Another unintended consequence of irrigation dams is the displacement of wildlife and the destruction of natural habitats. Some major disease related to irrigation projects are Schistosomiasis, Malaria, Leptospirosis, Rift valley fever, Japanese encephalitis and etc.

### **Introduction**

Dams play a crucial role in providing water for agricultural purposes, but they can also have unintended consequences on the emergence of zoonotic diseases. Zoonotic diseases are infectious diseases that can be transmitted from animals to humans, and they pose a significant threat to global public health. The emergence of zoonotic diseases is influenced by several factors, including climate change, land-use change, and the construction of irrigation dams.

One of the unintended consequences of irrigation dams is the creation of new habitats for wildlife by altering the natural hydrology of rivers and streams. These new habitats can provide ideal breeding grounds for disease vectors such as mosquitoes and ticks, which can carry and transmit zoonotic pathogens. The construction of the Aswan High Dam in Egypt, for example, created an ideal habitat for schistosomiasis-transmitting snails, leading to a significant increase in the prevalence of the disease.



Another unintended consequence of irrigation dams is the displacement of wildlife and the destruction of natural habitats. This disruption can cause wildlife to migrate to new areas or come into closer contact with humans and domesticated animals, increasing the risk of zoonotic disease transmission. The construction of the Three Gorges Dam in China, for instance, resulted in the displacement of millions of people and the loss of critical habitat for wildlife, including bats that can carry zoonotic viruses such as SARS and Nipah.

Additionally, the water stored in irrigation dams can create ideal conditions for the growth of certain zoonotic pathogens. The water in irrigation canals and reservoirs can become contaminated with fecal matter from animals, providing a breeding ground for bacteria such as *E. coli* and *Salmonella*.

### **Other disease related to major irrigation projects**

There are several examples of zoonotic diseases that have been linked to the construction and use of irrigation dams. Here are a few:

**Schistosomiasis:** This is a parasitic disease caused by flatworms that live in freshwater snails. The disease is transmitted to humans through contact with contaminated water, such as that found in irrigation canals and reservoirs. Irrigation dams can create new habitats for the snails that carry the parasite, increasing the risk of transmission to humans (Hotez, 2009).

**Malaria:** This mosquito-borne disease is more common in areas with standing water, which can be created by irrigation dams. Irrigated agricultural fields can also provide breeding sites for mosquitoes, increasing the risk of malaria transmission to humans (Bouma & Dye 1997).

**Leptospirosis:** This bacterial disease is spread through contact with urine from infected animals, such as rodents. Irrigation dams can create new habitats for rodents, increasing the risk of transmission to humans (Bharti *et al.*, 2003).

**Rift Valley fever:** This viral disease is spread by mosquitoes and can be transmitted to humans through contact with infected animals, such as livestock. Irrigation dams can create new habitats for mosquitoes and increase the risk of transmission to humans and animals. (Woods *et al.*, 1997)

**Japanese encephalitis:** This viral disease is transmitted to humans through the bite of infected mosquitoes. Irrigation dams can create new habitats for the mosquitoes that carry the virus, increasing the risk of transmission to humans (World Health Organization 2015)



**Some examples of emerging zoonotic diseases that have been linked to dam construction:**

S.No	Name of disease	Dam and place	Reference
1	Schistosomiasis	Three gorges dam in China	Yang GJ, Vounatsou P, Zhou XN, Utzinger J, Tanner M. A review of geographic information system and remote sensing with applications to the epidemiology and control of schistosomiasis in China. <i>Acta Trop.</i> 2005;96(2-3):117-129.
2	Rift valley fever	Akaosombo dam in Ghana	Anyamba A, Chretien JP, Small J, Tucker CJ, Linthicum KJ. Developing global climate anomalies suggest potential disease risks for 2006-2007. <i>Int J Health Geogr.</i> 2006; 5:60.
3	Hanta virus	Three gorges dam in China	Li Y, Kang Y, Yu G, et al. Study on the correlation between hantavirus infection and construction of large-scale water conservancy project--take the Three Gorges Project as an example. <i>Wei Sheng Yan Jiu.</i> 2014; 43(4):587-591.
4	Malaria	Kariba dam in zimbabwe	Smith T, Killeen GF, Lengeler C, et al. Mathematical modeling of the impact of malaria vaccines on the clinical epidemiology and natural history of <i>Plasmodium falciparum</i> malaria: Overview. <i>Am J Trop Med Hyg.</i> 2006; 75(2_suppl):1-10.

**Socio economic impacts on indigenous tribes and other marginalized communities**

- Health impacts:** Indigenous tribes and other marginalized communities may be more vulnerable to zoonotic diseases due to factors such as poor sanitation, lack of access to healthcare, and traditional livelihoods that involve close contact with animals. The emergence of zoonotic diseases related to dam construction can therefore have a significant impact on the health of these communities, leading to increased morbidity and mortality.
- Livelihood impacts:** Many indigenous tribes and other marginalized communities rely on traditional livelihoods such as hunting, fishing, and agriculture for their subsistence. The emergence of zoonotic diseases related to dam construction can disrupt these livelihoods by reducing the availability of wild game or fish, or by making it unsafe to work in fields or other outdoor environments.



3. **Economic impacts:** The emergence of zoonotic diseases related to dam construction can also have broader economic impacts on indigenous tribes and other marginalized communities. For example, if tourism is an important source of income, an outbreak of disease could lead to a decline in visitors and a loss of revenue. Additionally, if the government or international aid agencies respond to the outbreak by implementing measures such as quarantine or culling of animals, this could further disrupt local economies.
4. **Cultural impacts:** Indigenous tribes and other marginalized communities often have close relationships with the natural environment, which can be disrupted by the construction of dams and the emergence of zoonotic diseases. The loss of traditional knowledge related to hunting or fishing, or the disruption of sacred sites or cultural practices, can have a profound impact on the cultural identity and well-being of these communities (Jobin, 2003 & World Health Organization, 2015)

### **Mitigation methods**

To mitigate the risk of zoonotic disease emergence associated with irrigation dams, several strategies can be employed. These include regular monitoring of water quality and the implementation of measures to control disease vectors. In addition, the management of water levels in irrigation reservoirs can be optimized to minimize the creation of ideal breeding grounds for disease vectors. Finally, conservation efforts to protect natural habitats and wildlife can help reduce the risk of zoonotic disease emergence associated with displacement and migration.

One important consideration is the need for interdisciplinary collaboration among different sectors such as public health, environmental conservation, and agriculture. By working together, these sectors can develop more effective strategies to address the complex challenges associated with zoonotic disease emergence. The One Health approach is an example of successful interdisciplinary collaboration that recognizes the interconnectedness of human, animal, and environmental health.

Another essential consideration is the potential impact of climate change on zoonotic disease emergence. Climate change can alter the distribution and behavior of disease vectors and increase the frequency and intensity of extreme weather events such as floods and droughts, which can create ideal conditions for zoonotic disease transmission. Therefore, it is essential to consider the potential impact of climate change when developing strategies to address zoonotic disease emergence associated with irrigation dams.

In conclusion, irrigation dams can have unintended consequences on the emergence of



zoonotic diseases by creating new habitats for disease vectors, displacing wildlife, and creating ideal conditions for the growth of certain pathogens. However, by understanding the risks associated with irrigation dams and implementing appropriate mitigation strategies, we can minimize the risk of zoonotic disease emergence and protect global public health. Interdisciplinary collaboration and consideration of the potential impact of climate change are essential to developing effective strategies to address this complex challenge.

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