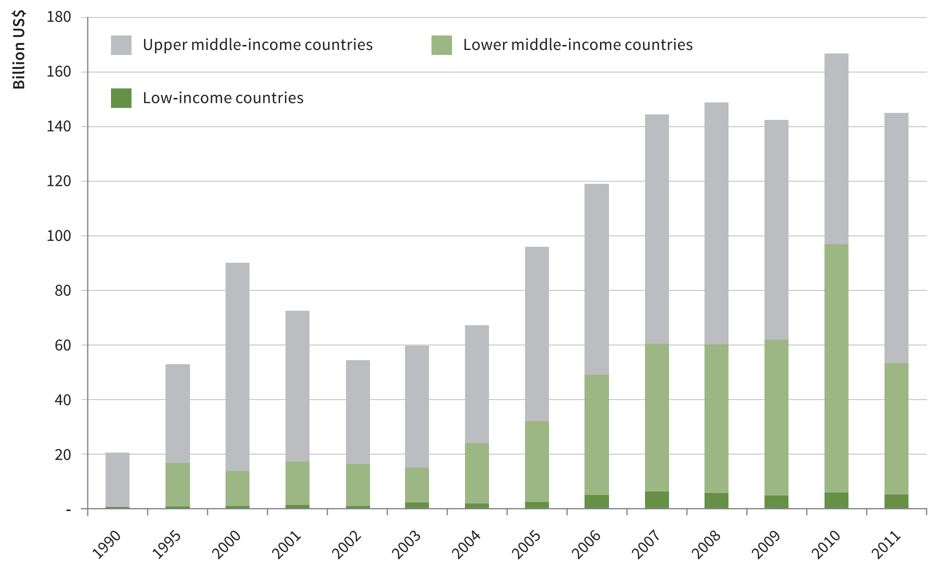
Figure 8.3 Private participation in infrastructure projects in low and middle-income countries, 1985–2011[viii]



(Source: UNIDR based on World Bank and PPIAF, PPI project database[ix])

holders in the urban development process and loop-holes in regulation itself, all conspire against an effective management of disaster risks.

8.5 Infrastructure development and risk transfer

Infrastructure investments at the scale required to meet sustainable economic and developmental goals will increasingly rely on private sector engagement, particularly in low-income countries.

The OECD estimates that by 2030, annual investment requirements for telecommunications, road, rail, electricity (transmission and distribution) and water are likely to total about US$53 trillion, an average of 2.5 percent of world GDP (OECD, 2007). When electricity generation and other energy-related infrastructure investments in oil, gas and coal are added, the total would be more than US$70 trillion or 3.5 percent of world GDP (Ibid.).

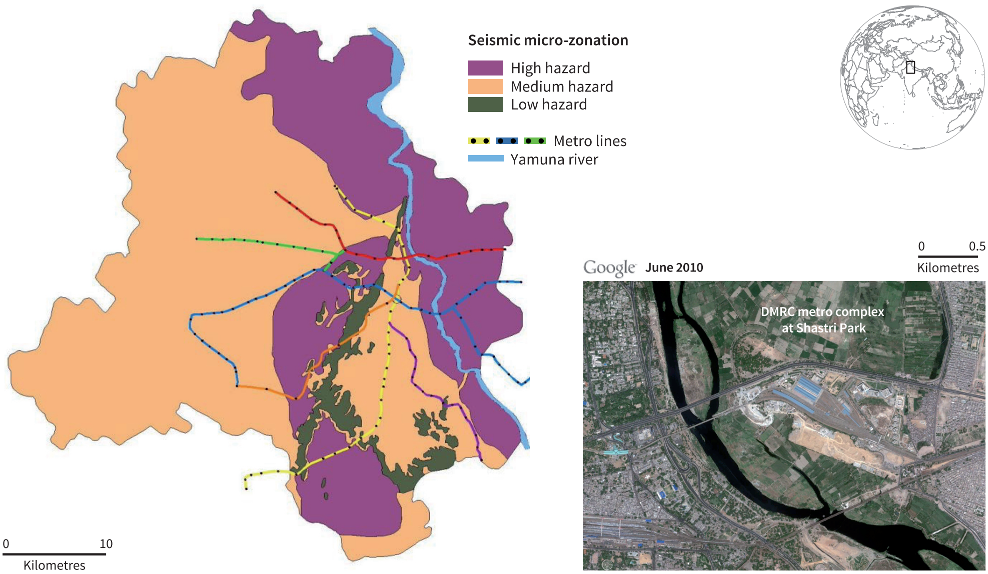
The need for such investment is particularly critical in low-income countries. For example, the World Bank estimates that African countries need to

Box 8.6 Delhi metro exposed to multiple risks

A metro line to connect Delhi, India, with a new suburb is one of the city's biggest recent infrastructure projects. This privately financed project, however, may contribute to increasing earthquake and flood risk in the city.

In terms of direct risks, more than 50 stations on this new line are located in areas of high earthquake hazard, exposing the line to earthquakes of up to a magnitude of 8 on the Richter scale (see Figure 8.4). One of the stations was also built in a high flood hazard area. In both cases, hazard information was available on municipal zoning maps. As a result, the metro line is exposed to high flood and earthquake risk even for short return periods of 1–10 years (IIHS, 2012).

Figure 8.4 Delhi metro lines overlaid on the seismic micro-zoning map, and location of Shastri Park metro station in flood-plains of the Yamuna riverbed

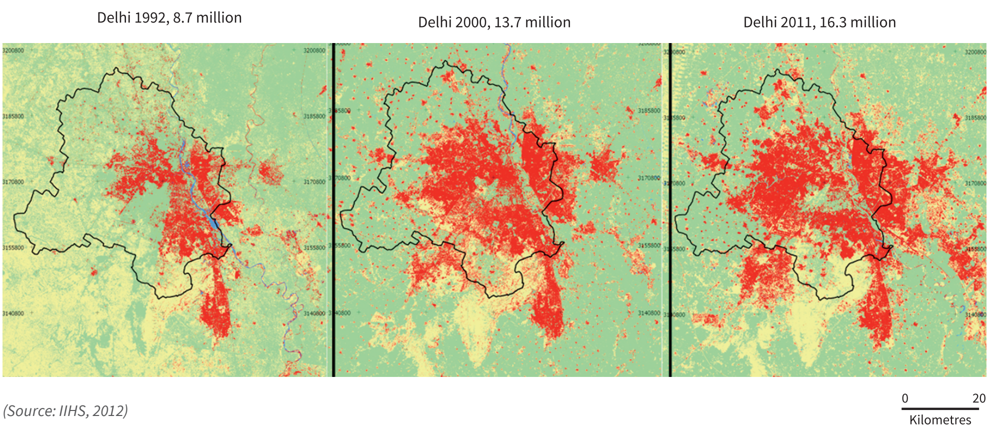


(Source: IIHS, 2012)

This direct risk to metro stations and rail line structures has been addressed and reduced owing to application of risk-sensitive building codes. However, this is not necessarily the case for new real estate developments surrounding the stations. For example, following construction of the station in the floodplains, further commercial expansion is planned in the area without consideration of risk (IIHS, 2012).

Decision-making for such large-scale infrastructure projects is a complex process in any country or city. But in planning and implementing such projects, disaster risks are constructed and then transferred to the ultimate users of the infrastructure, irrespective of zoning and risk maps (IIHS, 2012). Despite awareness of earthquake and flood risk, much of the expansion of Delhi (Figure 8.5) has taken place in highly hazard-prone areas.

Figure 8.5 Change in urban built-up area and land cover in Delhi, 1992–2011



(Source: IIHS, 2012)

(Source: IIHS, 2012)

spend about 9 percent of their GDP on new as well as on the operation, maintenance and expansion of existing infrastructure to reach the Millennium Development Goals by 2015 (World Bank, 2008a). However, this has not translated into actual spending, owing to budget constraints in many countries. Actual expenditure on infrastructure in Africa has been only half of the required 9 percent over the last 40 years (Ibid.).

Private participation in the development of infrastructure, including private financing, is thus sought to bridge the gap between needs and available public resources. The World Bank's database on private engagement in infrastructure projects[x] shows that despite fluctuations, this has been increasing in low-income and middle-countries since the mid-1980s (Figure 8.3).

Investment in major infrastructure projects structures how cities and their regions grow. If disaster risk considerations are not factored into their design, collapsed and damaged critical infrastructure can be a serious cause of business interruption and a source of indirect disaster loss for city regions. But even when the infrastructure itself is disaster proof, it can lead to other investments in hazard-prone areas that increase disaster risk. Infrastructure projects, therefore, have a major potential to generate shared risks and costs.

Major infrastructure projects are increasingly developed as public-private partnerships (PPPs), in which a varying proportion of the investment and risk is carried by the public sector and by private investors. Depending on how these PPPs are structured, who owns these risks may not be clearand part of

Box 8.7 Impact of dike rupture in Colombia, the Netherlands and Japan

Over the last 40 years, construction of dikes has been the principal strategy for flood hazard mitigation in the floodplains of Colombia, particularly on the Magdalena and Cauca Rivers that cross the country from south to north. Between 1970 and 1990, 715 km of dikes were constructed along the river and 626 km in lateral canals in the Cauca river basin alone (OSSO, 2012c). Although dikes provide flood protection, they explicitly or implicitly encourage development and increased exposure on areas where flood hazard has been reduced.

During the 2010/2011 ENSO episode in Colombia, dykes failed in at least 42 percent of the country's departments, and were responsible for a significant proportion of total flood losses (OSSO, 2012c). During and following the disaster, a significant proportion of resources invested in rehabilitation and reconstruction was used to rehabilitate or reinforce dykes (US$884 million by Colombia Humanitaria and US$21 million by the Adaptation Fund), potentially reproducing or aggravating the risks that existed before the disasters (Ibid.).

In contrast, the Netherlands, with two-thirds of its population and 60 percent of its land below sea level, had been investing in dyke construction for decades, turning floodplains into polders[xi] for agricultural and urban development (Orie and Stahel, 2012). A series of floods in the 1990s, associated with dyke failures, led to a new approach that effectively "depolderises" the country (Ibid.). By deepening riverbeds and moving dykes away from the river, rivers can expand into floodplains at almost 40 locations along the major rivers.[xii] Although costs for this strategic shift are an estimated €2.2 billion, the social and environmental benefits are expected to be even higher (Orie and Stahel, 2012).

In Japan, the 2011 tsunami triggered a review of design concepts for levees against possible tsunami impact. The main innovation was a classification of disaster risks into two categories: extensive and intensive risk. In the revised designs, levees are required to withstand extensive risks with a return period of 10 to about 100 years (Government of Japan, 2012b). In other words, levees have to be built to protect populations from high-frequency risk. For intensive risks, which are likely to happen with a return period of more than 100 years, building levees would usually neither be a guarantee for protection nor do they show positive cost-benefit ratios. Therefore, in addition to infrastructures, the government focuses on resident evacuation and other preparedness measures for such events.

(Source: UNISDR)

the risk may be transferred from the private to the public sector.

In India, the country's Eleventh Five Year Plan allocated more than US$500 billion for infrastructure investment up to 2012, of which a substantial portion was earmarked for the engineering and construction sectors (PwC, 2008). Increasingly, in India, PPPs are emerging where private investment finances publicly managed construction.

As Box 8.6 shows, these partnerships do not necessarily lead to improved disaster risk assessment and management, and may underplay disaster risks or lead to their transfer as shared costs to the public sector or to city residents.

The construction of infrastructure to control floods, such as dykes, may also generate shared risks and costs, as it facilitates real estate development in flood-prone areas that appear to be protected. The consequences of dyke failure may be worse than the risks that were supposed to be addressed by the infrastructure in the first place (Box 8.7).

Unless the ownership of the risks that can be generated by large infrastructure projects is made explicit and the responsibilities of both private and public partners clarified, there may be insufficient incentive for the private partners to invest in risk reduction. At the same time, the public partners are often unaware of how much new risk they are really taking on.

8.6 Towards a new incentive structure: disaster risk reduction as a value proposition in urban development

Through partnerships, businesses are able to reduce their own losses as well as support the public sector to more effectively manage and reduce disaster risks. Resilient infrastructure systems underpin resilient business and resilient business underpins prosperous cities and countries.

On 6 July 2011, businessman Donald Trump and Panama's President Ricardo Martinelli participated in the inauguration ceremony of Trump Ocean Club, Panama, a luxury international hotel and casino.[xiii]

Box 8.8 Addressing flood risk in Scotland – joint private and public action

Compared with other parts of the United Kingdom, Scotland has been comparatively successful in reducing its exposure to flood hazard. Since 1995, new construction in floodplains has been reduced to almost zero as a result of a national planning policy that prohibited the building of residential property in areas of high flood risk.

The Scottish success was the result of working closely with private real estate developers and insurers. Planners in local governments were legally obliged to set up Flood Liaison and Advice Groups (FLAG) (Crichton, 2012) as non-statutory advisory groups of public and private sector representatives with insurers playing a key role in their establishment. Between 2000 and 2003, the Association of British Insurers (ABI) was instrumental in helping to establish 19 FLAGs with 28 Scottish local authorities covering more than 90 percent of the Scottish population. These groups also brought together property developers, landowners, water departments and suppliers, emergency planners, hydrology consultants, representatives from the national rail network, the police, fire and rescue services and many more. With local government's land use planners, development control officers and neighbouring authorities, all issues related to water management were addressed on a catchment-wide basis, making available critical hydrological and flood risk information to all stakeholders. Many groups convened information sharing events and involved community groups.

The success of this initiative is undisputed. Only one local authority, Moray, did not engage and continued construction in floodplains. Consequently, it now has serious problems with flooding and access to flood insurance. In other parts of the United Kingdom (see Box 8.5 above), local communities are not directly involved in flood planning and there is no mechanism in place for planners to consult with developers, insurers and other key stakeholders across the catchment area.

(Source: Johnson et al., 2012)