Dr. Kailash Nath Singh , Assistant Professor, Department of Geography ,YBN University, Ranchi

YBN University, Ranchi

Dr. Kailash Nath Singh , Assistant Professor, Department of Geography ,YBN University, Ranchi

Geography

EVALUATING THE COMPONENTS OF ENVIRONMENTAL FLOWS IN THE MENIK GANGA BASIN

As mentioned in the Introduction, flows of different magnitudes have different ecological/social significance. All these flows form components of an ecologically, and socially, acceptable flow regime (EF) and they all have to be scientifically evaluated through a process known as Environmental Flow Assessment (EFA). When major water resource developments are proposed, the EFA has to be detailed and involve a number of specialists concerned with various aspects of river and wetland ecology. No EFA has so far been conducted in the Menik Ganga and, therefore, the full range of Components of EF is not possible to ascertain. Therefore, for the purpose of this study, only several components have been used. Some of these components of EF are mentioned in the EIA. However, in this study, we use a broader than usual content for EF, which includes, apart from the requirements of aquatic ecology, the requirements for some traditional water uses as well as the needs of terrestrial ecosystems. The main components of EF in the Menik Ganga Basin, which are evaluated in economic terms in this section, include: • the in-stream water requirement for the Kataragama religious festival; • the requirement of the Yala National Park (primarily for the support of the large elephant population and other wildlife); • the requirement for the Pilinnawa Coastal Wetland (Figure 1); and • the requirement of the Yala Fishery Management Area (YFMA), including the needs of the Menik estuary. Requirements for the Religious Festival at Kataragama Kataragama is a sacred city for Sri Lanka's Buddhist and Hindu followers, in reverence to a god that believers of both religions worship. Each year, the Kataragama Festival attracts about 100,000 people per day over a 15-day period during July and August. The main event of the festival is the water cutting ceremony held in gratitude to God Kataragama. The water cutting ceremony ideally requires about 1.2 to 1.5 meters (m) of water in the river (USAID 2005). The minimum water depth required for the festival around Kataragama temple has been estimated as 0.6 m with the corresponding discharge at Kataragama gauging station of 2.0 cubic meters per second (m3 /s) (CECB 2004). However, over the last decade, the river did not carry this much flow at Kataragama during the months of the festival. Analysis of available flow records for a period of 1977-1998 shows that the long-term mean flow in a river during August, for example, is less than 0.6 m3 /s. Another cultural practice at the festival is the offering of pure water to gods and bathing in 'holy' water of the Menik Ganga prior to visiting God Kataragama to worship. Due to increasing levels of water pollution arising from low flows, festival officials have deemed the river water unsuitable for bathing. The 12 tube wells in the shrine premises alone cannot satisfy this requirement. The satisfaction of the "bathing requirement" is the absolute minimum during the festival. This also caters to the avoidance of water-borne diseases in the Kataragama area where large crowds gather during the festival season (CECB 2002). This requirement is currently satisfied by bowser water supply. During the 15-day festival, around 25 bowsers in total are used by the National Water Supply and Drainage Board (NWSDB), several NGOs, and the police to supply water to the migrant populations (M. G. Gunathilake, pers. comm. 2006). The approximate cost per bowser is the estimate provided by the NWSDB (US$33). The total expenditure to supply water by bowsers is, therefore, US$12,375. Thus, the provision of the equivalent minimum amount of clean water in the river could have satisfied the religious requirement and therefore the expenditure above can be used as a proxy for EF in this case. However, alternative bowser supplies are unlikely to provide the same satisfaction as that received from using the river. It may also be suggested that alternative water supply options for the Festival are possible, e.g., the rehabilitation of nearby tanks. Therefore, the estimate above underestimates the true value of this component of EF Requirements of the Yala National Park The Yala National Park requires water during a dry season to sustain its aquatic and terrestrial flora and fauna. However, according to the Department of Wildlife Conservation (DWLC), the stretches of the Menik Ganga that pass through the Yala National Park are completely dry throughout the months of July, August, and September (USAID 2005). This is reflected in the shape of the standardized flow duration curve at Kataragama, which shows that, on average, the Menik Ganga is dry for about 20 percent of the time throughout the year (Figure 2). The DWLC has to spend money to supplement for water shortages in the park, for animals and tourist bungalows, and must truck water into the park during these three months. The activities include bowser supplies and excavating the riverbed during severe drought periods (B. Vithana, pers. comm. 2006). The DWLC spends US$863 a month for maintenance of the Park. During a dry season, an additional allowance of US$490 a month is given to cope with the water shortages (B. V. R. Jayaratne, pers. comm. 2006). Maintaining EF in the Menik Ganga could avoid or reduce these costs and eliminate water shortages completely. Therefore, the additional allowance provided during the three dry months - US$1,470 in total - can be taken as a proxy for the benefits of EF to the Yala Park. However, the actual benefits to the park are much greater than this proxy value. The main attraction of the Yala Park is the elephant herds. Therefore, the requirements of water and fodder for elephants have to be assessed. Being heavy consumers of water, elephants crowd the areas nearest to rivers and other remaining water bodies during the dry season. The DWLC suggests a total of 250 elephants for the entire Yala Park (E. Wilson, pers. comm. 2006), of which a maximum of 200 are living in the Menik Ganga portion of the Yala Park (i.e., 594 km2). An elephant requires 200 - 255 liters of water per day for drinking and should spend 3-4 hours each day in the water for skin and general hygiene (http://www.elephantcare.org). Considering the maximum daily requirement of 0.255 cubic meters (m3) for 200 elephants, we arrive at the estimate of 51 m3 /day, which is relatively minor. However, the actual flow of water in a river has to be higher for an elephant to access it. It is further assumed here that all this water has to be supplied solely by the Menik Ganga due to the lack of other significant water bodies, which elephants could also use as pools. Therefore, the water requirements of elephants are treated as part of the EF in the Menik Ganga. The quantum of food required by an elephant daily ranges from 150 to 200 kilograms (kg) (an average of 175 kg) For 200 elephants this translates into an average fodder requirement of 35,000 kg. The host area for 200 elephants is 594 km2 and the vegetation is scrub jungle and grasslands. In the dry season only parched vegetation is available for elephants and is very much below the carrying capacity (B. V. R. Jayaratne, pers. comm. 2006). To ensure the long-term survival of this elephant population, it is important to maintain the vegetation in the park, during the rainless part of the year, by ensuring some flow in the river and thus some healthy riparian vegetation around it. The water flow together with other factors such as evapotranspiration and infiltration determine the stock of biomass (fodder). During the dry season, the elephants in Yala migrate to other areas in search of fodder and water. Continued water scarcity in the Park may force elephants to travel long distances to the north (USAID 2005). Elephants destroy crops, home gardens (including fruit trees), houses and basic infrastructure of local residents. Thus, an indirect effect of the lack of water and/or fodder in the Park is the destruction of property by elephants. Both human and elephant lives are also Bandara and Tisdell (2004) have found that in the southern region, the elephants are responsible for about US$117 worth of crop damage for a cropping season, on average, per farming family. Assuming that only one cropping season is affected due to the lack of water, the economic value of EF could be quantified if the number of families affected by the Yala elephant migration is established. Also, the DWLC pays compensation in the case of a loss of a life (approximately US$1,000) and damage to property (houses) up to a maximum of US$500 (B. V. R. Jayaratne, pers. comm. 2006). However, data on the exact number of families affected by elephant migration and whether they are affected by the Yala elephants are not available.. These losses, therefore, cannot be quantified at present without introducing great uncertainty. The DWLC is responsible for elephant conservation and mitigation of Human-Elephant Conflict (HEC) in Sri Lanka. At present, the DWLC spends an average of around 6 percent (US$1.6 million) of its annual budgetary allocation (http://www.dwlc.lk) to undertake on-site elephant management activities. The value of HEC mitigation measures for the Yala area should also be considered apart from the damage to crops and property. In Yala, approximately US$294 to US$392 a month is spent for mitigation measures over five months from June to October (E. Wilson, pers. comm. 2006). Therefore, it comes to a maximum of US$1,960 in the dry season. The value of crop damage, compensation paid for damages and the value of the HEC mitigation measures in Yala in the dry season could be used as proxy values for benefits derived by keeping the elephants in the park with the maintaining of EF in the river. Considering the attention given to elephant protection in Sri Lanka and the world, the expenditure for HEC mitigation used here is likely to be an underestimate of the benefits of EF. The reputation of Yala for providing good elephant observation sites, as well as the annual festival, ensures that Yala is the most visited national park in Sri Lanka (Buultjens et al. 2005). In 2000, for example, there were 153,661 tourists, of which 81 percent were Sri Lankan. The corresponding income from visitors in 2000 was US$468,629 (Buultjens et al. 2005). An approximate value of benefits from environmental water allocation could be derived from the fact that the Yala Park is closed from September to mid-October due to a lack of water. It is assumed that willingness to pay to visit the Park depends on the condition that water is available and hence the park is open. The loss in revenue from tourism during 1.5 months could be taken as a proxy for the value of benefits of maintaining EF in the Menik Ganga during the rainless season. Considering that the average monthly revenue from tourism in the Park is approximately US$44,632 (i.e., annual revenue of US$468,629 divided by 10.5 months), the benefits of environmental water allocation during the 1.5 months will be approximately US$66,948. However, the cost of entry to the park is only part of all costs associated with traveling to the Park, and it therefore underestimates the costs actually incurred. The user charges or fees are very small and does not reflect the value of an environmental asset. Therefore, it would be more appropriate to use the Travel Cost Method1 (TCM) to derive the value of the benefits of EF to the Yala National

Park. As cited and quoted in CECB (2004), Steel (1996) has estimated the recreational value of Yala Park as Sri Lanka Rupees Rs. 250/ha/year. The CECB has inflated this by 160 percent to bring it in line with the 2004 October prices, which resulted in Rs. 400/ha/year. Subsequently, we inflated this by 111 percent to obtain the current (April 2006) price of Rs. 443.50 (i.e., US$4.35). Therefore, the recreational value of entire Yale may be calculated by multiplying US$4.35 by 151,200 ha, which results in US$657,720 per year. Therefore, the forgone recreational value in 1.5 months is US$82,215.