Self-organising map rainfall-runoff multivariate modelling for runoff reconstruction in inadequately gauged basins

APPENDIX

Table A1 Details of the area-ratio scaling for runoff generation at Igbonla

Catchment area at Station 25	4,325.3 sq. km
Catchment area at Station 5	7,174.3 sq. km
Intervening area between Asejire dam and Igbonla (based on information by Osot Associates, the project's Engineers)	1,500 sq. km
Consequently, Catchment area at Igbonla (assuming only 1,000 sq. km of the 1,500 sq. km is between Station 5 and Igbonla)	8,174.3 sq. km
Runoff at Igbonla, assuming that Asejire captures all the upstream flow, including that for the Oba tributary catchment, and makes no compensation water release downstream (**Note A**)	$Q_{\text{igbonla}} = Q_{25} \times \left(\frac{8,174.3}{4,325.3} - \frac{(4,325.3 + 1,320.5)}{4,325.3}\right)$; where Q_{igbonla} is the monthly Igbonla runoff (MCM) and Q_{25} is the corresponding monthly runoff at station 25. It should be noted that 1,320.5 sq. km is the catchment area for the Oba tributary.
Runoff at Igbonla assuming Asejire dam makes a compensation release equal to 10% of the average monthly runoff. This runoff is termed the adjusted Igbonla runoff, $Q_{\text{igbonla-adj}}$ (**Notes B, C**)	$Q_{\text{igbonla-adj}} = Q_{\text{igbonla}} + 0.1 \times \frac{(1,179.52 + 172.9)}{12}$

Notes:

A. The above assumption that Asejire dam makes no downstream compensation releases is likely to be untrue, although the background document (the Document) provided by Osot stated that this was indeed the case. In any case, even when there are no statutory requirements in Nigeria to make downstream compensation releases, the dam will make involuntary releases during the wet season when the reservoir will spill over its spillway, as confirmed by the Document. However, apart from information about the design capacity of the Asejire dam's spillway, there is no information regarding the actual spills by this dam. It is very unlikely that spills will always be equal to the spillway capacity; hence, a much more realistic estimate of the release would have to be assumed (see Note B below).

B. The assumption made here is that the release is equivalent to 10% of the average annual runoff in conformity with established practice in countries where statutory compensation release exists. Additionally, and for lack of further information, this release will be assumed to be uniformly distributed throughout the year. Thus, a further adjustment is made to the Igbonla runoff by adding 10% of the combined average monthly runoff at stations 25 and 35 (see Figure 3(a) in the main text).

C. As a sensitivity study, runoff calculated using Q_{igbonla} and $Q_{\text{igbonla-adj}}$ were tested; however, the primary conclusion would be based on the use of the more realistic $Q_{\text{igbonla-adj}}$ runoff series.