Supplementary Material

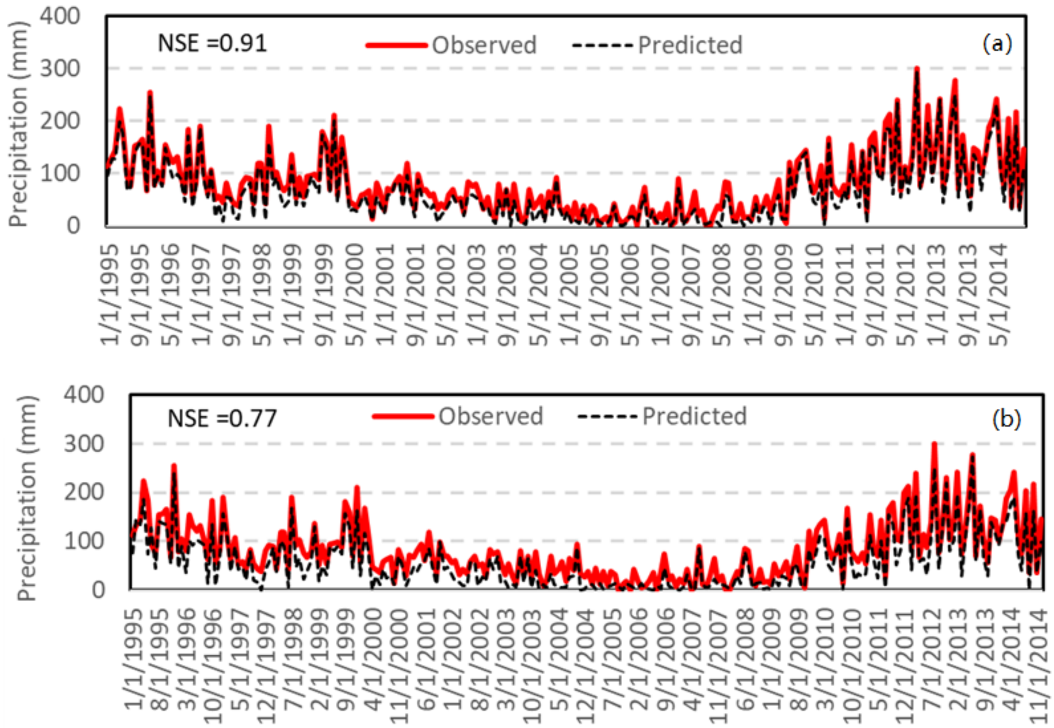

Figure S1. Observed and biased-corrected daily precipitation from the (a) MIROC6 and (b) CMCC-ESM2 models.

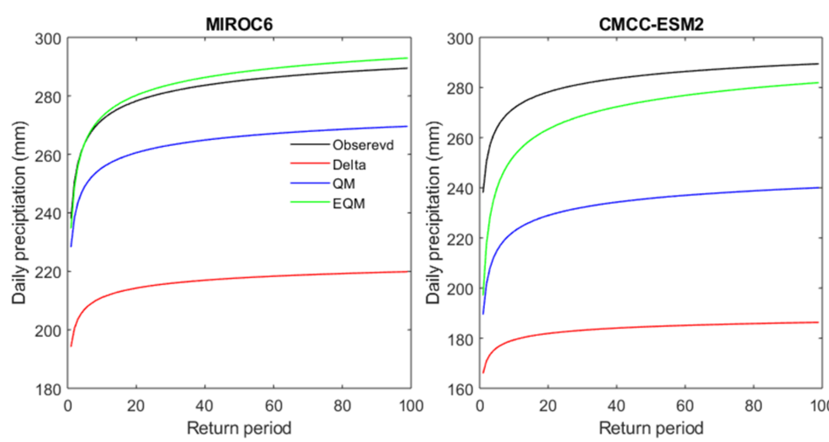

Figure S2. The intensity-duration-frequency IDF curves for observed and downscaled annual maximum daily precipitation using different downscaling methods for the MIROC6 and CMCC-ESM2 GCMs.

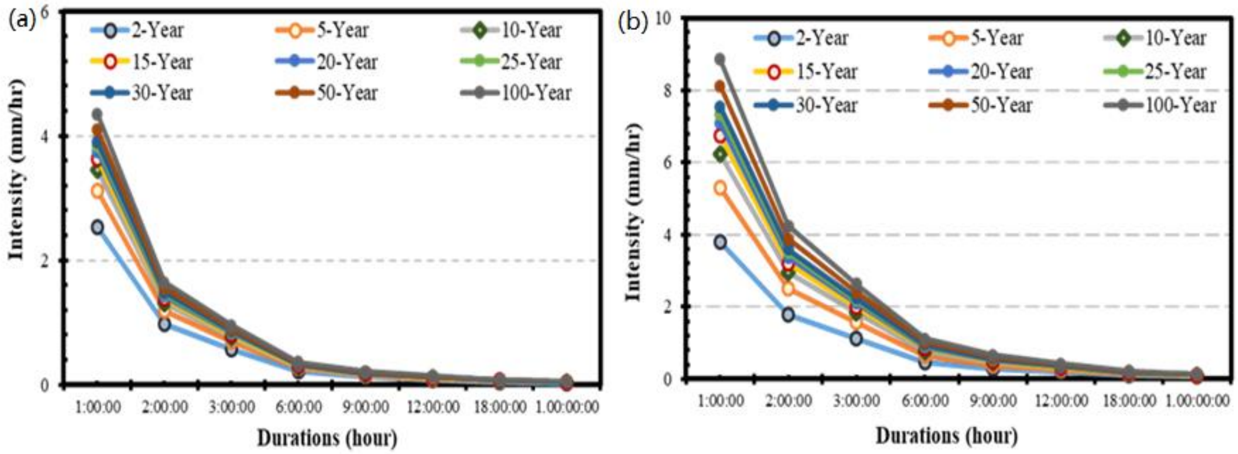

Figure S3. IDF curves for the historical (a) and future scenario (b) periods for the selected station.

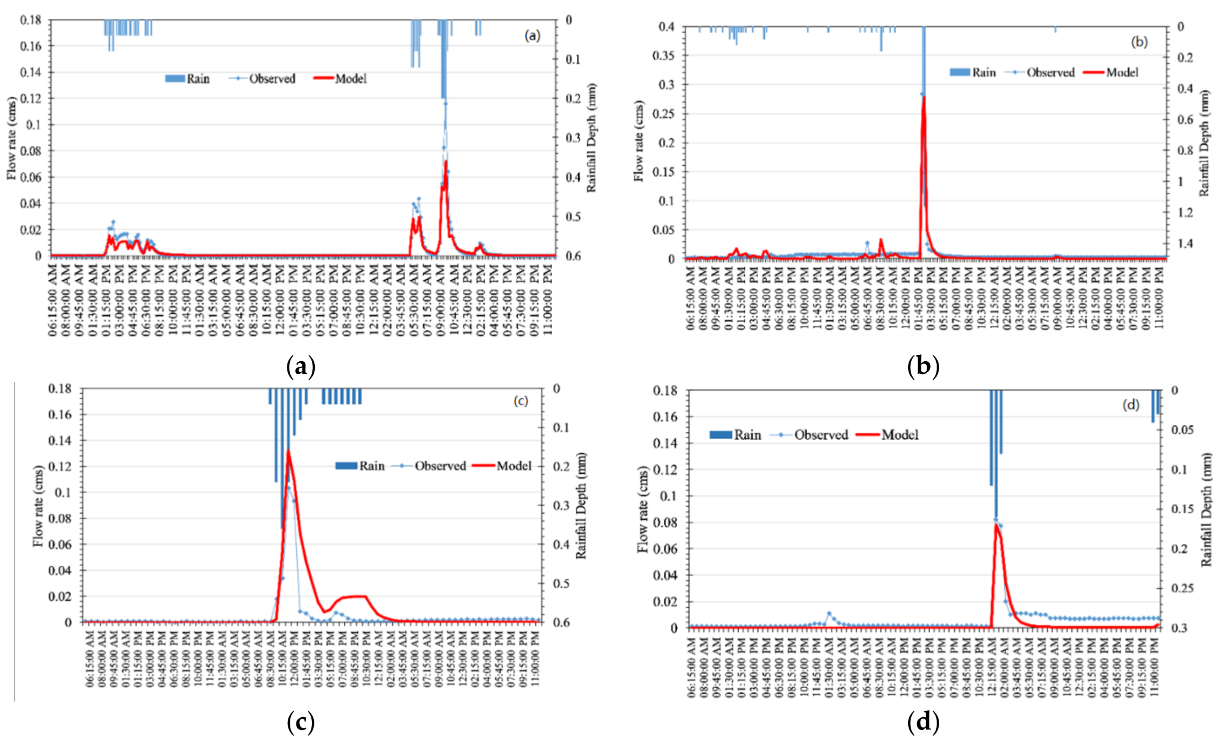

Figure S4. Graphs showings the flow rate Calibration period (a) 18-20 June 2019, (b) 7th October 2019 and Validation Periods (c) 08th Oct 2019 and (d) 21st August 2021.

Table S1. The different LIDs and soil zones used in the SWMM model.

LIDS Type	Infiltration trench (IT)				Rain barrels (RB)		Raingarden (RG)				Bioretention (BR)			Permeable Pavement (PP)	
LIDS adoption	ITSCZ1*	ITSCZ2	ITLZ1	ITLZ2	RBZ1	RBZ2	RGSZ1	RGSZ2	RGCLZ1	RGCLZ2	BRLZ1	BRLZ2	BRCSZ2	PPZ1	PPZ2
Houses	74	53	27	18	130	87	117	66	49	36	---	---	---	3	13
Parking lot	25	30	22	16	---	---	---	---	---	---	26	17	12	42	31
Commercial Building	45	18	26	---	13	24	---	---	---	---	19	36	26	13	62

* ITSCZ1 is Infiltration Trench (IT) on Sand Clay soil in runoff Zone 1 (check the acronyms table for the details).

Table S2. Decision variables and their feasible ranges.

Decision Variable	Explanation Decision Variables	Range
1, 2	The placement of PP in runoff zones 1 and 2	0 or 1
3, 4	The number of RB per property for sub-catchments in runoff zone s 1, and 2	0 – 4 Change by 1
5, 6	The placement of RG in runoff groups 1 and 2, considering all the soil types.	0 or 1
7, 8	The placement of IT in runoff zones 1 and 2, considering all the soi l types.	0 or 1
9, 10	Surface area (m2) of IT with underlying clay or sand in zones 1 an d 2.	215 – 3230 Change by 43
11, 12	Surface area (m2) of IT with underlying clay loam in zones 1and 2	215 – 3230 Change by 43
13, 14	Surface area (m2) RG with underlying sand in zones 1 and 2	43 – 301 Change by 43
15, 16	Surface area (m2) of BR with underlying sand or clay in zones 1 and 2	43 – 301 Change by 43

S1.0 Description of the terms used in the Genetic Algorithm

Genetic Algoritm

Genetic Algorithm (GA) is a heuristic global search optimization technique that uses evolutionary processes including inheritance, recombination, mutation, and selection that are inspired by biology. GAs are divided into two categories: sequential GAs and parallel GAs (PGAs) (SGAs). In SGA, the operators are successively applied to each population solution. The two subtypes of SGA are generational and steady-state. In steady-state algorithms, the new generation is assembled from both the old and the reproduced populations. The generational algorithms, on the other hand, choose the best person from the current population to generate the new population that succeeds the old one and forms the new generation. Thus, overlapping and non-overlapping population systems refer to the steady-state and generational algorithms, respectively.

Elitism

The fittest chromosomes are protected by elitism from crossover and mutation processes. The procedure of making sure that the elite member is not only chosen but also that a copy of it is not disrupted by crossover or mutation is known as elitism. The objective is to preserve a few of the most fit chromosomes for the following generation. The selection of a specific person, even the fittest, is not guaranteed by proportion-based selection. It cannot be chosen if the fittest person is not significantly more fit than the others. So, in the ratio-based selection, the best outcome can be routinely eliminated.

Initialization

The first step of GA is to create a set of possible solutions randomly as an initial population or generation to the problem. Each individual of the population is typically referred to as a set of chromosomes and represents a solution for the investigated problem.

Encoding

The mechanism by which specific genes on a chromosome are represented is called encoding. Any object, including bits, characters, and numbers, can be used to complete the process. The type of encoding is determined primarily by the problem.

Election

After encoding, the next step is to identify individuals in the population that will produce offspring for the next generation. The goal of selection is to ensure the survival of the fittest individuals in the population, hoping that their offspring will be even fitter. Weak selection means that the evolution will be too slow, while strong selection will lead to fast evolution with sub-optimal individuals in the population, reducing the required diversity for further progress and change.

Crossover

In order to create two offspring strings, the crossover operator initiates a partial bit exchange between the parent and child strings. According to the crossover hypothesis, a new chromosome will be superior to either parent if it combines the best traits from both parents. The core component of any crossover technique is the crossover probability Pc. It specifies how frequently crossover will be done and runs from

0% to 100%. The kids are exact copies of the parents if the crossover chance is 0% (no crossover); otherwise, the offspring is made up of some of the parent's chromosomes.

Mutation

Following crossover, the strings are mutated to change one or more parts of a chromosome from their initial state, resulting in entirely different gene values. The mutation operator allows new features to be introduced by occasionally flipping some of the gene values. Some good chromosomes in the genetic pool may be eliminated during crossover and selection, leading to locally optimal solutions.

Pareto Front

The Pareto Front, also known as the knee-of-curve, is defined as the point where the front suddenly changes (non-dominated solutions). The slopes at each point of the flow reduction vs the cost curve were estimated and compared to find it.