Assessment of Flood Risk of Ergene River Basin

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1. Introduction

Ergene River Basin has an important place in the country due to its geographical location, topography, geological structure, soil properties and incorporating several different climates. The basin has been facing many problems related to land and water resources management, among which flooding is a significant issue. Flood events occurring often in the basin causes to serious damages.

The objective of this study is to detect the area of high flood risk in Ergene River Basin to prevent or reduce its damages.

2. Methodology

Among multicriterion decision analysis methods, Analytical Hierarchy Process (AHP) was used to determine the flood -sensitive region in Ergene River Basin. AHP is a process that uses hierarchical decomposition to deal with complex information in multicriterion decision making. It consists of three steps: i) developing the hierarchy of attributes related, ii) identifying the relative importance of the attributes and iii) scoring the alternatives' relative performance on each element of the hierarchy.

There are many factors affecting river flow. Here, six criteria were used in the determining the risk of flooding, namely runoff (**Figure 1**), elevation (**Figure 2**), slope (**Figure 3**), aspect (**Figure 4**), drainage density (**Figure 5**) and size of sub basin (**Figure 6**). To obtained these criteria, an altitude map with 5m resolution , soil map in the scale of 1/25000 and river layer map were used. Each criterion was formed into raster data with 10x10 resolution using the tool of GIS technology.

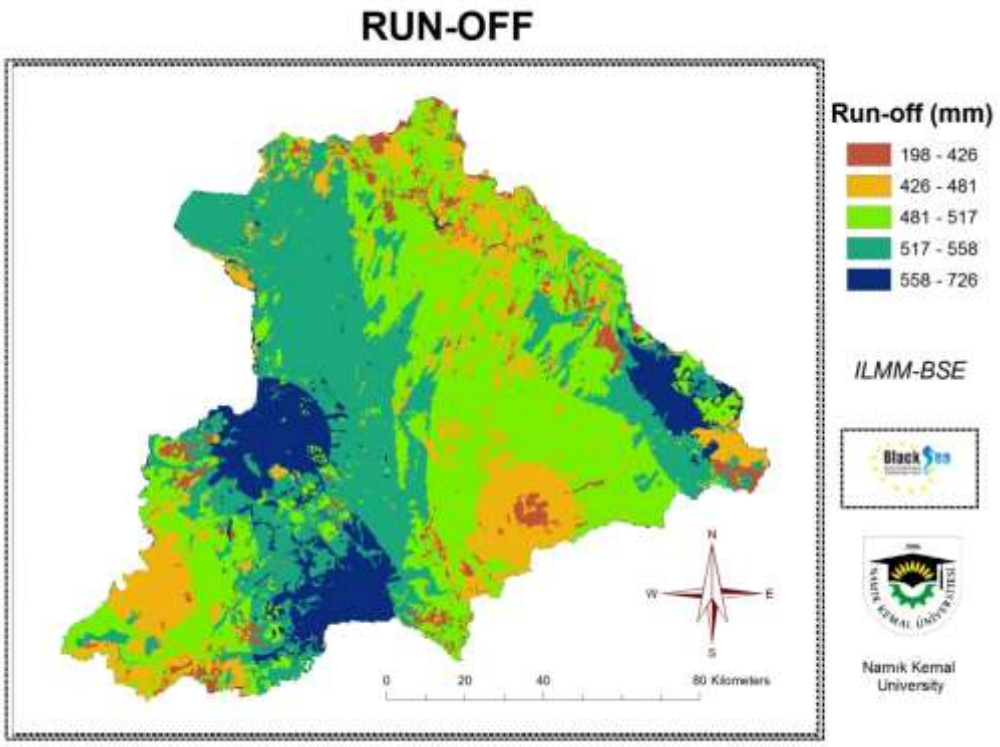

Figure 1. Runoff map of Ergene River Basin

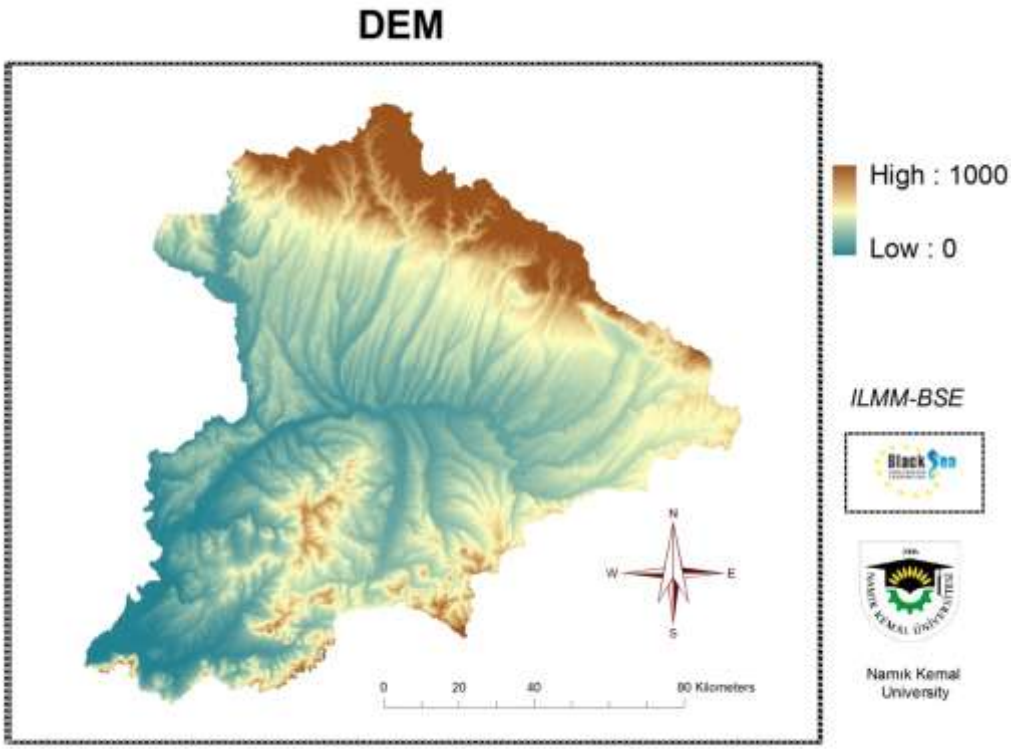

Figure 2. Digital elevation map of Ergene River Basin

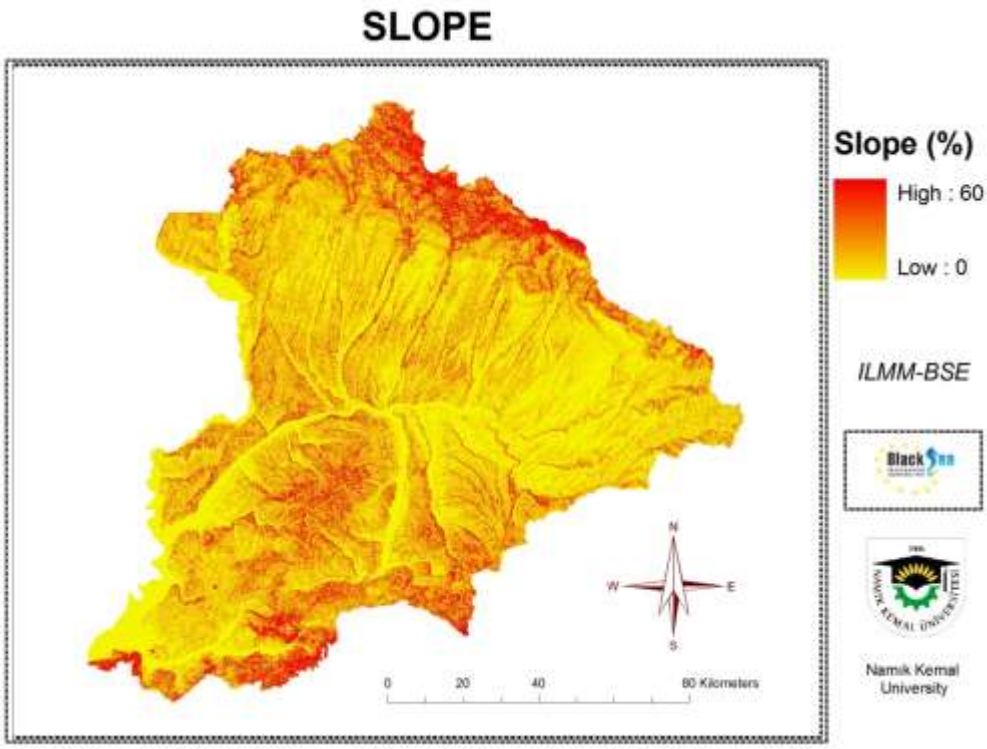

Figure 3. Slope map of Ergene River Basin

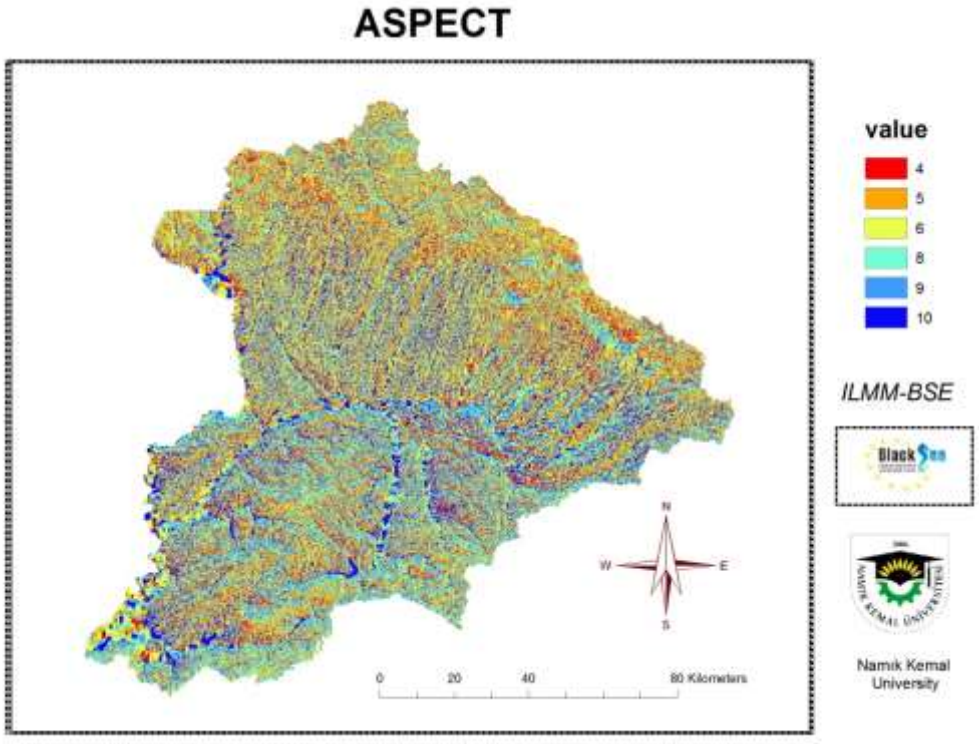

Figure 4. Aspect map of Ergene River Basin

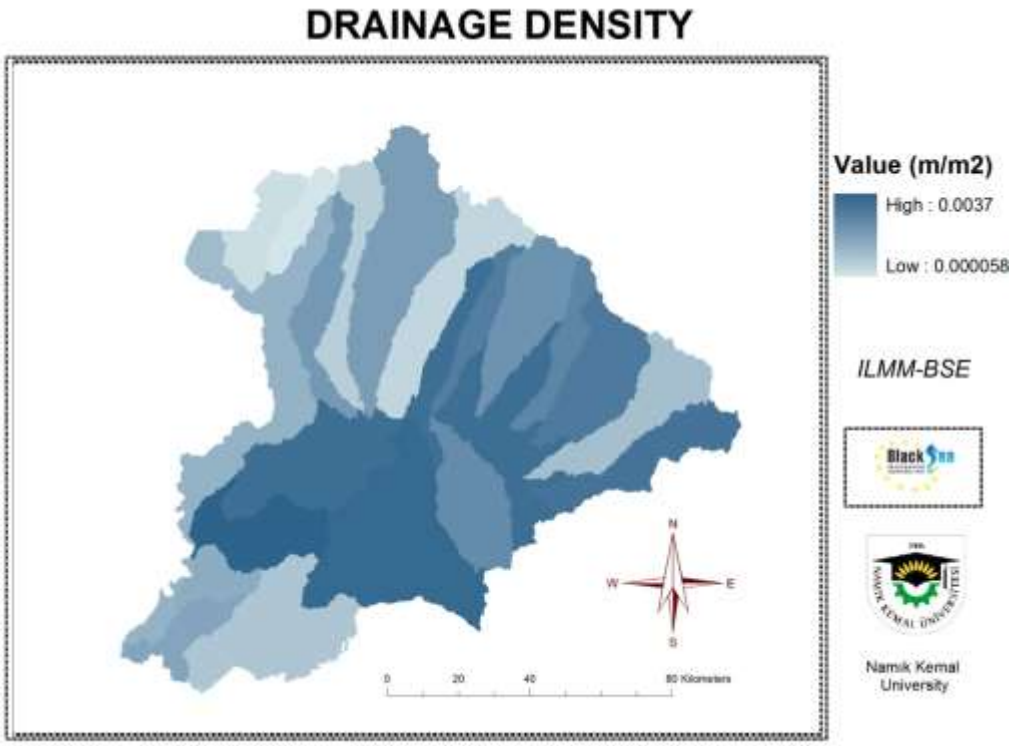

Figure 5. Drainage density map of Ergene River Basin

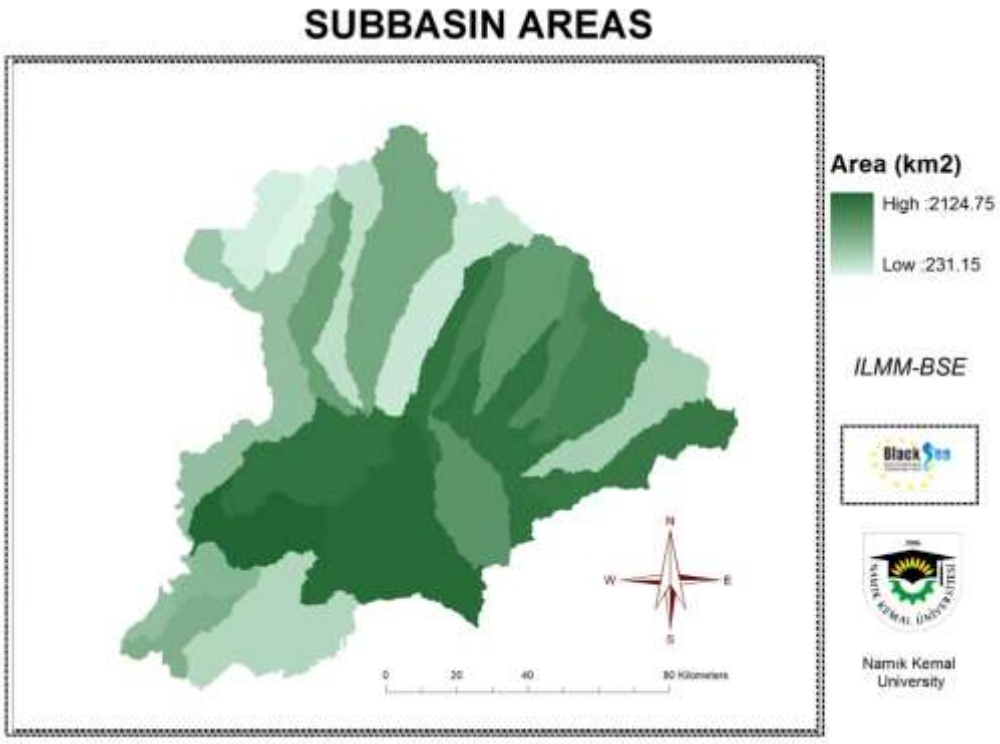

Figure 6. Size of subbasin map of Ergene River Basin

3. Results

Matrix of pairwise comparisons with the Analytic Hierarchy Process was created (**Table1**). As a result of pairwise comparisons, weight ratio of each criterion was calculated (**Table 2**). First this ratio was multiplied by the pixel values of each criterion. Then, maps were overlaid one on top of the other and finally flood risk map was formed (**Figure 7**). The results showed that junction points of Ergene River's branches, low lying areas with small slope are at high risk of flooding while the areas with high elevation and slope have less risk.

Table 1. Matrix of pairwise comparisons with the Analytic Hierarchy Process

Pairwise comparisons	**Runoff**	**Elevation**	**Slope**	**Aspect**	**Drainage density**	**Size of sub basin**
Runoff	1.0	3.0	3.0	4.0	3.0	2.0
Elevation	0,33	1.0	0,5	2.0	1,0	0.5
Slope	0,33	2.0	1,0	3.0	1,0	0.5
Aspect	0,25	0.5	0,33	1.0	0,5	0.33
Drainage density	0,33	1.0	1,0	2.0	1,0	0.5
Size of sub basin	0,5	2.0	2,0	3.0	2,0	1.0

Table 2. Calculated weight ratio of each criterion.

Layer of criterion	**Weight**
Runoff	0.35
Elevation	0.11
Slope	0.15
Aspect	0.06
Drainage density	0.12
Size of sub basin	0.21

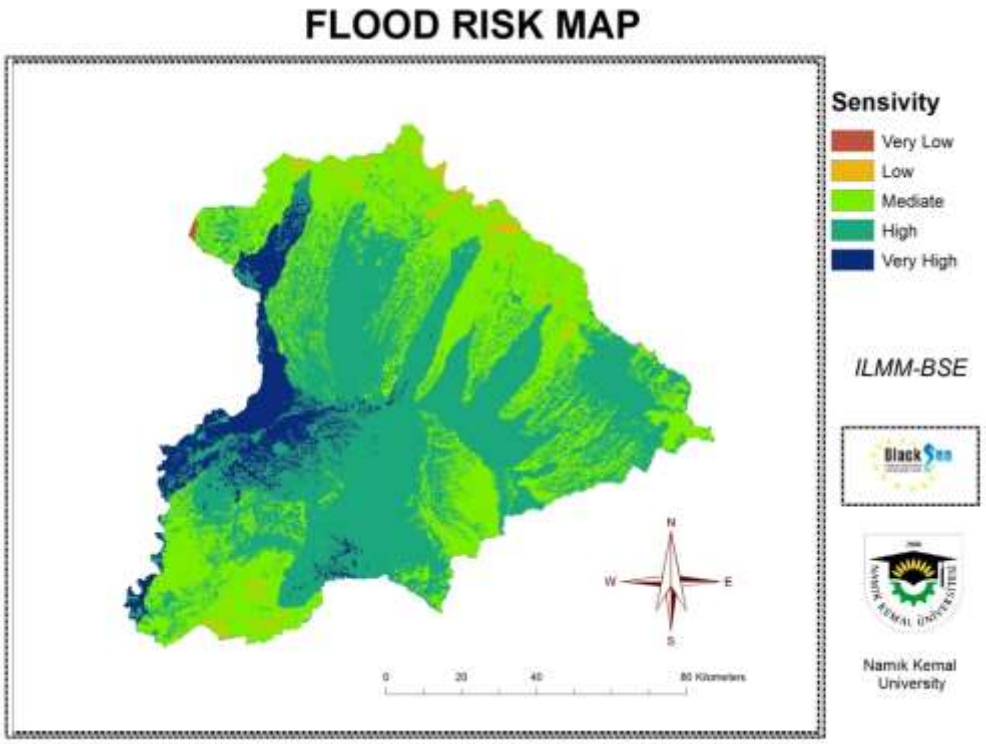

Figure 7. Flood risk map of Ergene River Basin