

# **GIS/RS APPLICATION TO CIVIL ENGINEERING (lab)**

## **MINI PROJECT**

### **Spatial Distribution of Wind Speed & Direction through GIS**



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Section: B

Department: Civil Engineering

# 1) INTRODUCTION

## 1.1) Why wind speed and direction

- a) For monitoring and predicting weather patterns and global climate.
- b) Both variables have numerous impacts on surface water.
- c) These parameters affect rates of evaporation and mixing of surface waters.
- d) These are important for the development of cyclones and storm surges.

# 2) OBJECTIVES

- To map spatial distribution of wind speed and direction from ground station data for KP.
- To evaluate GIS based geostatistical method “Kriging” for spatial distribution.

### **3) METHODOLOGY**

#### **3.1) Site selection**

The selected site for the project is KP.

#### **3.2) Data collection**

The wind data i.e. speed and direction was available from ground based **Meteorological Stations**.

#### **3.3) Data Analysis**

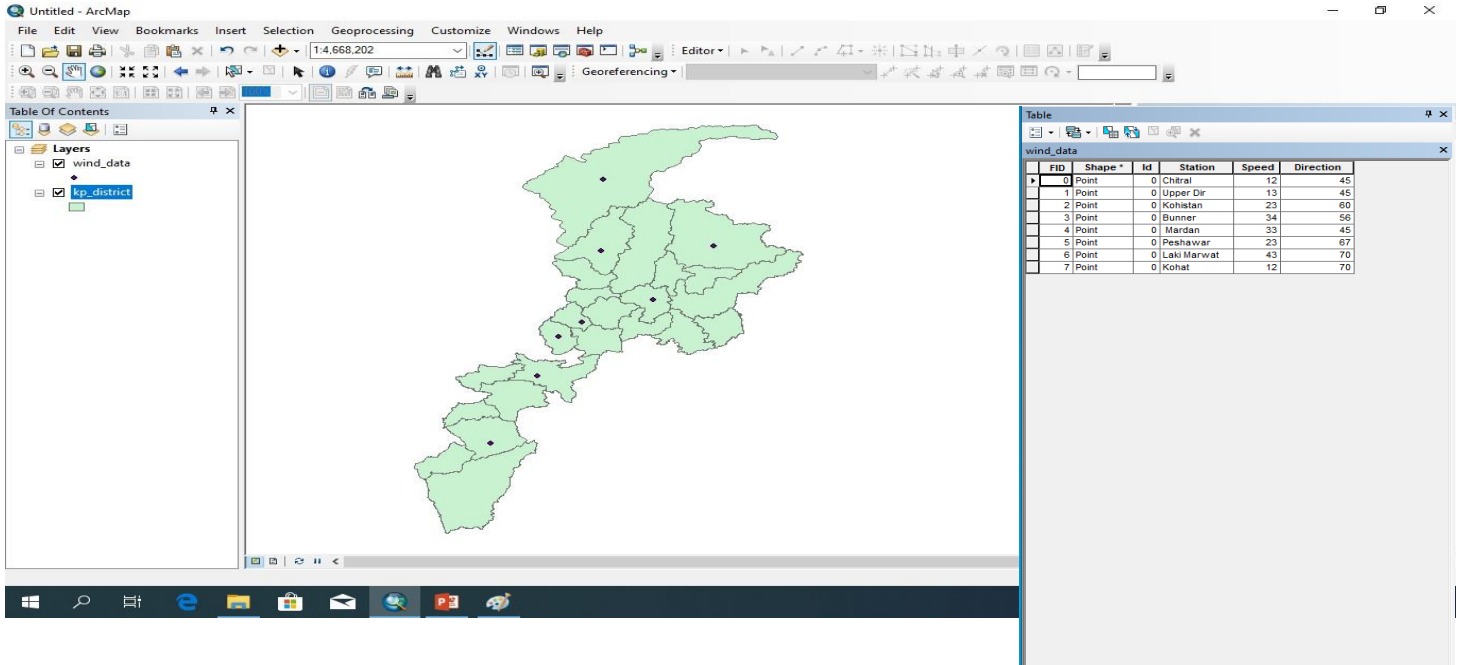
Wind data of KP was analyzed (spatial distribution) using GIS based geostatistical method “Kriging”.

#### **3.4) Results**

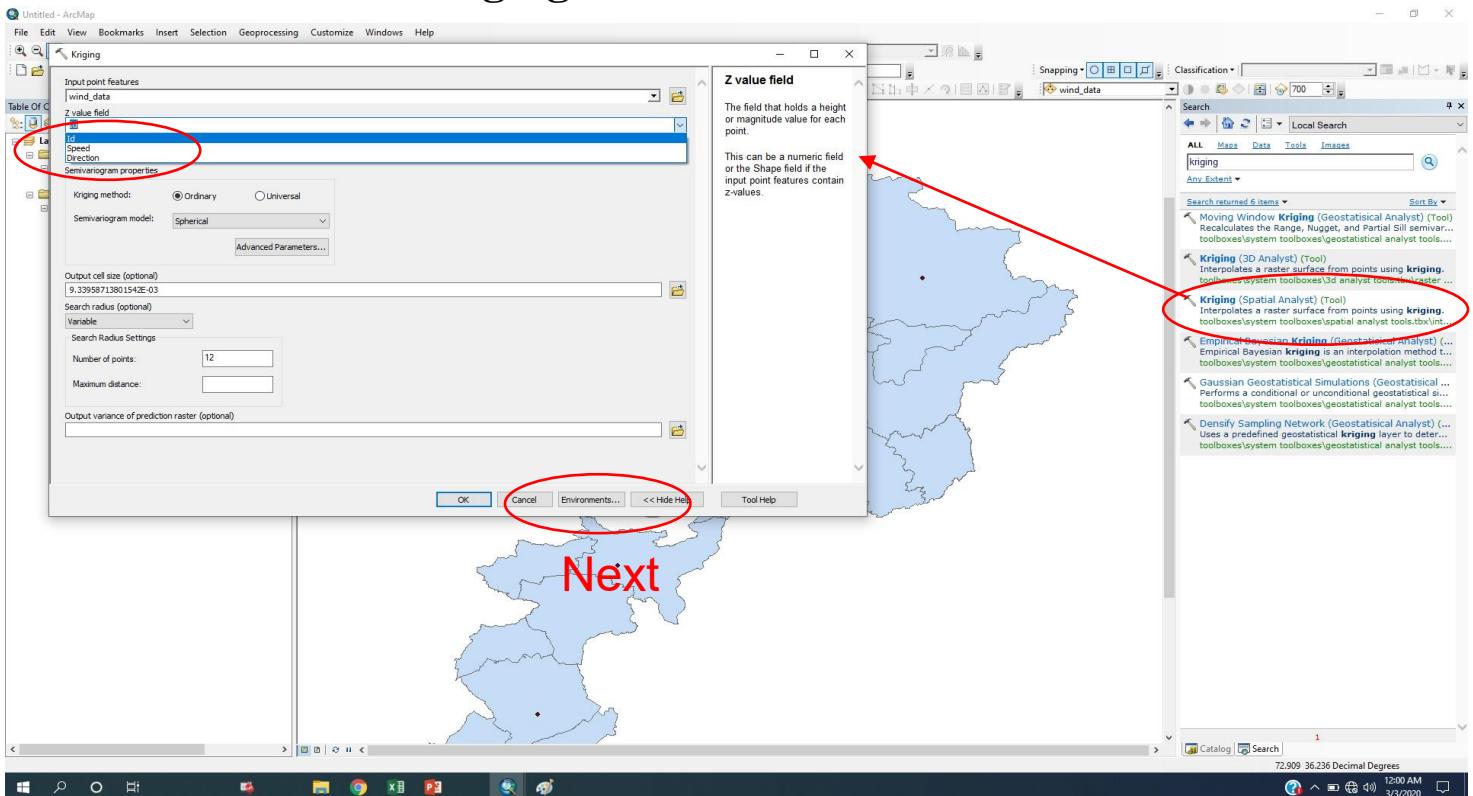
The process applied on data and obtained results are shown in detail via figures.

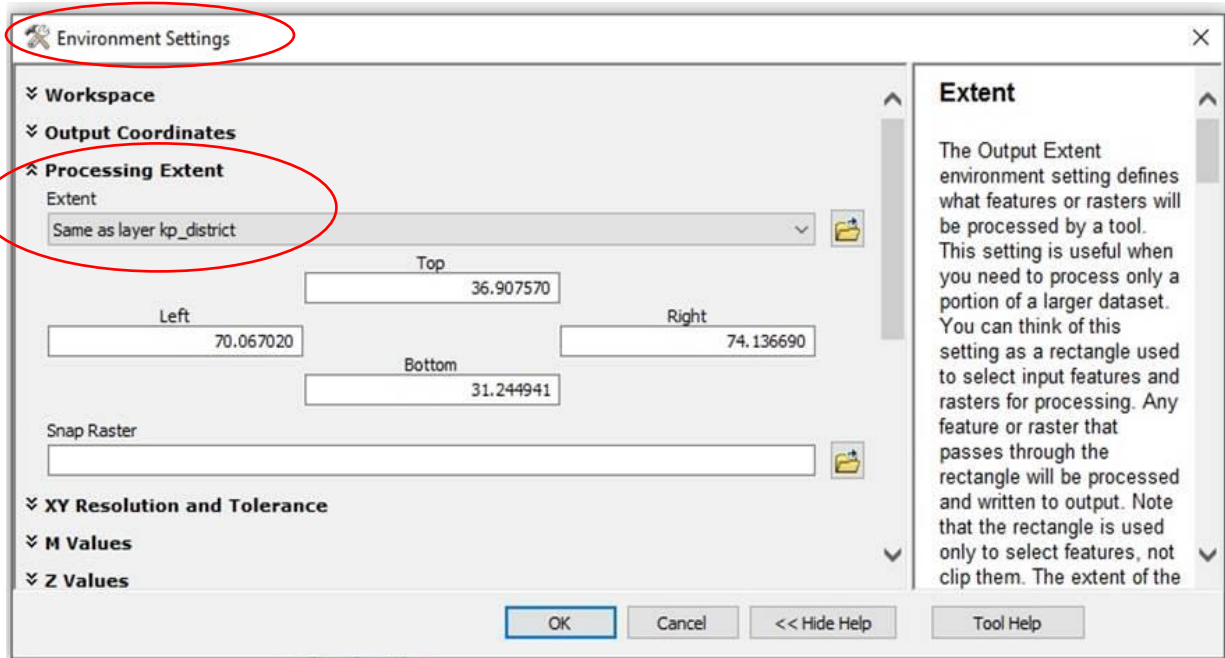
# 4) Data Analysis

## ➤ KP Districts Map and Wind's Direction and Speed

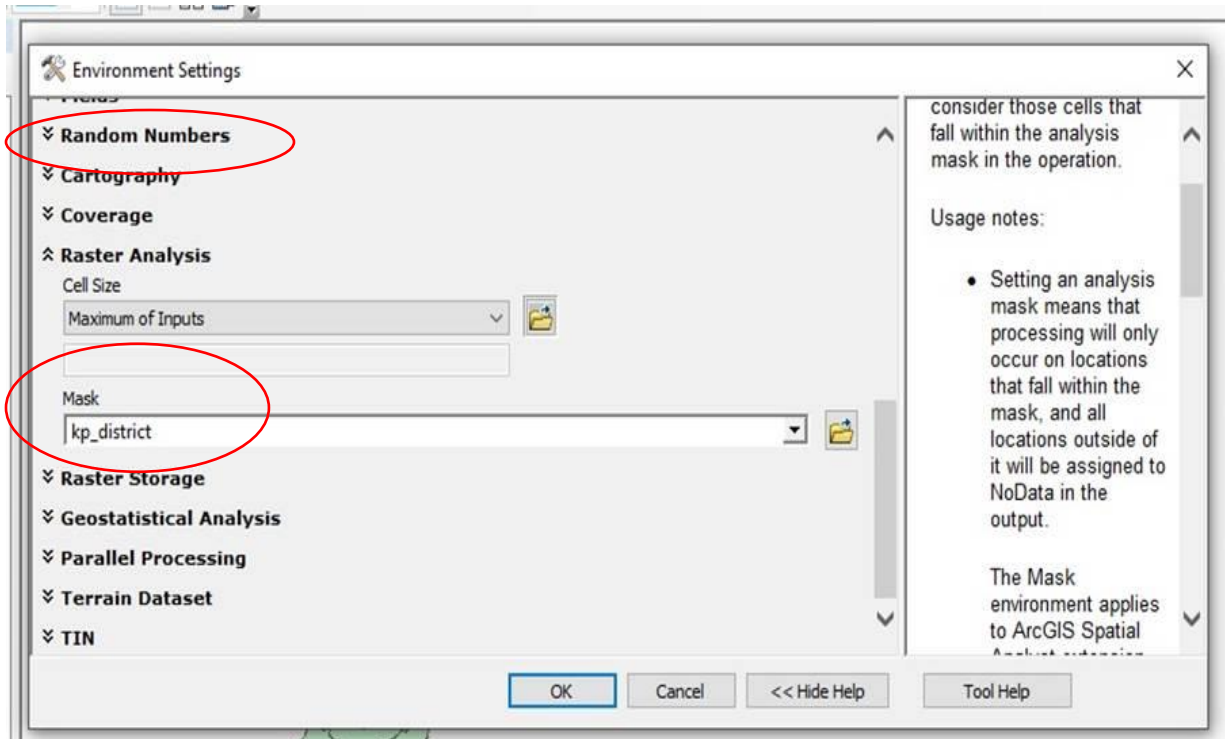


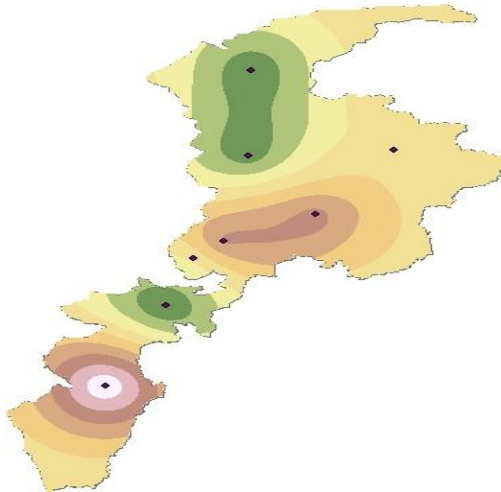
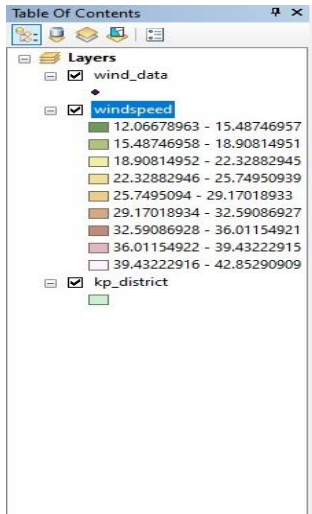
## ➤ Kriging



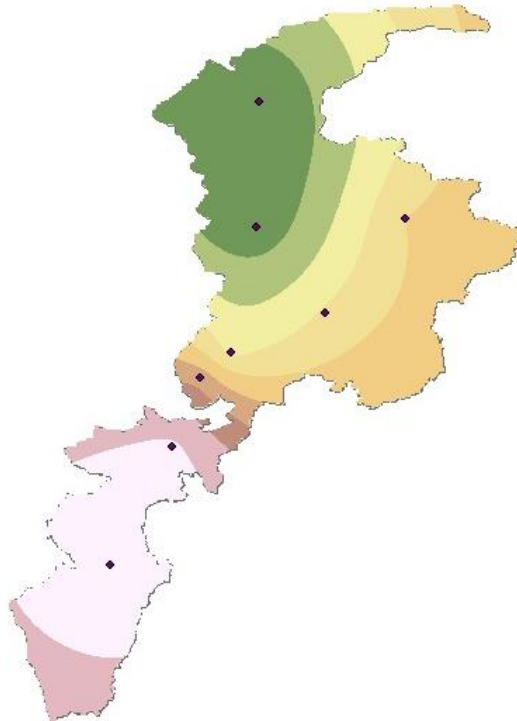
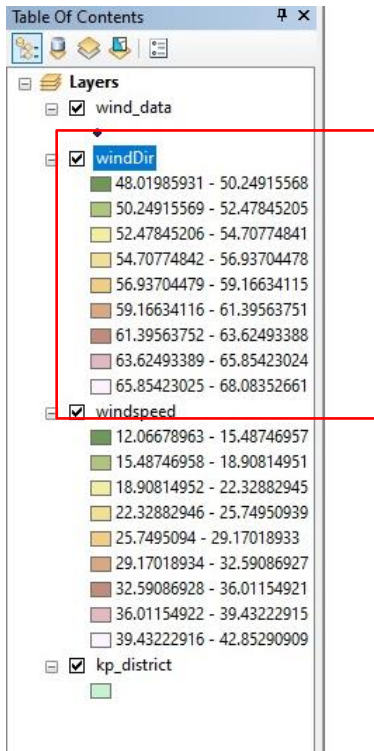


**No need to use extract by Mask separately. It can be applied inside the Environment setting**

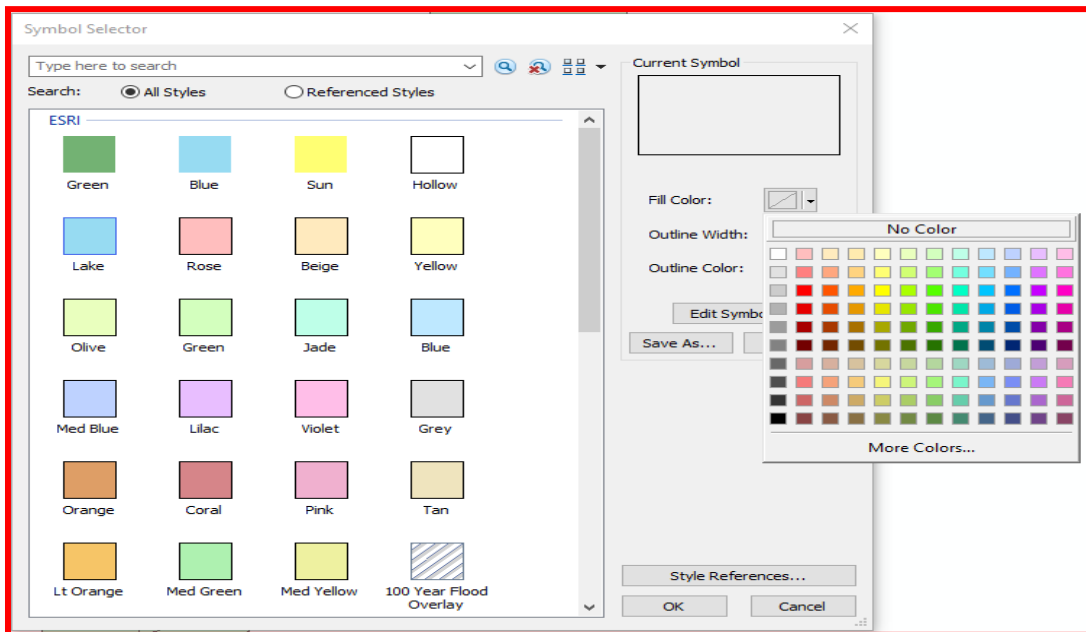
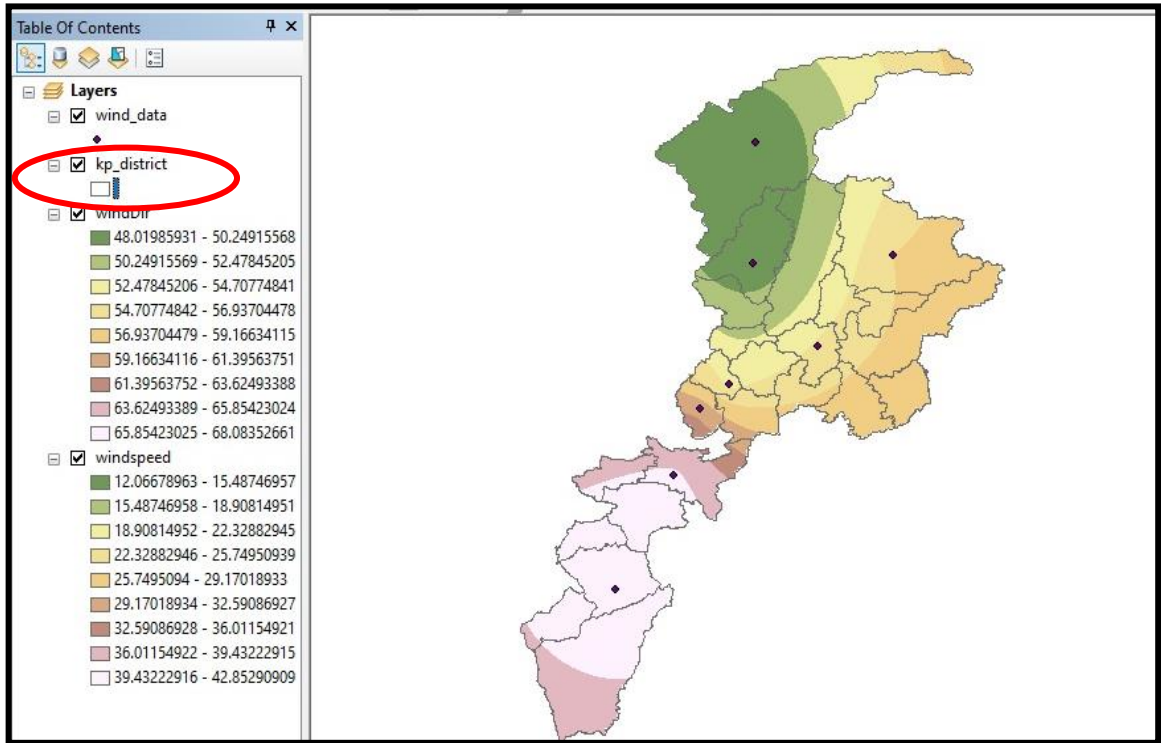




## Interpolated Wind Speed Map



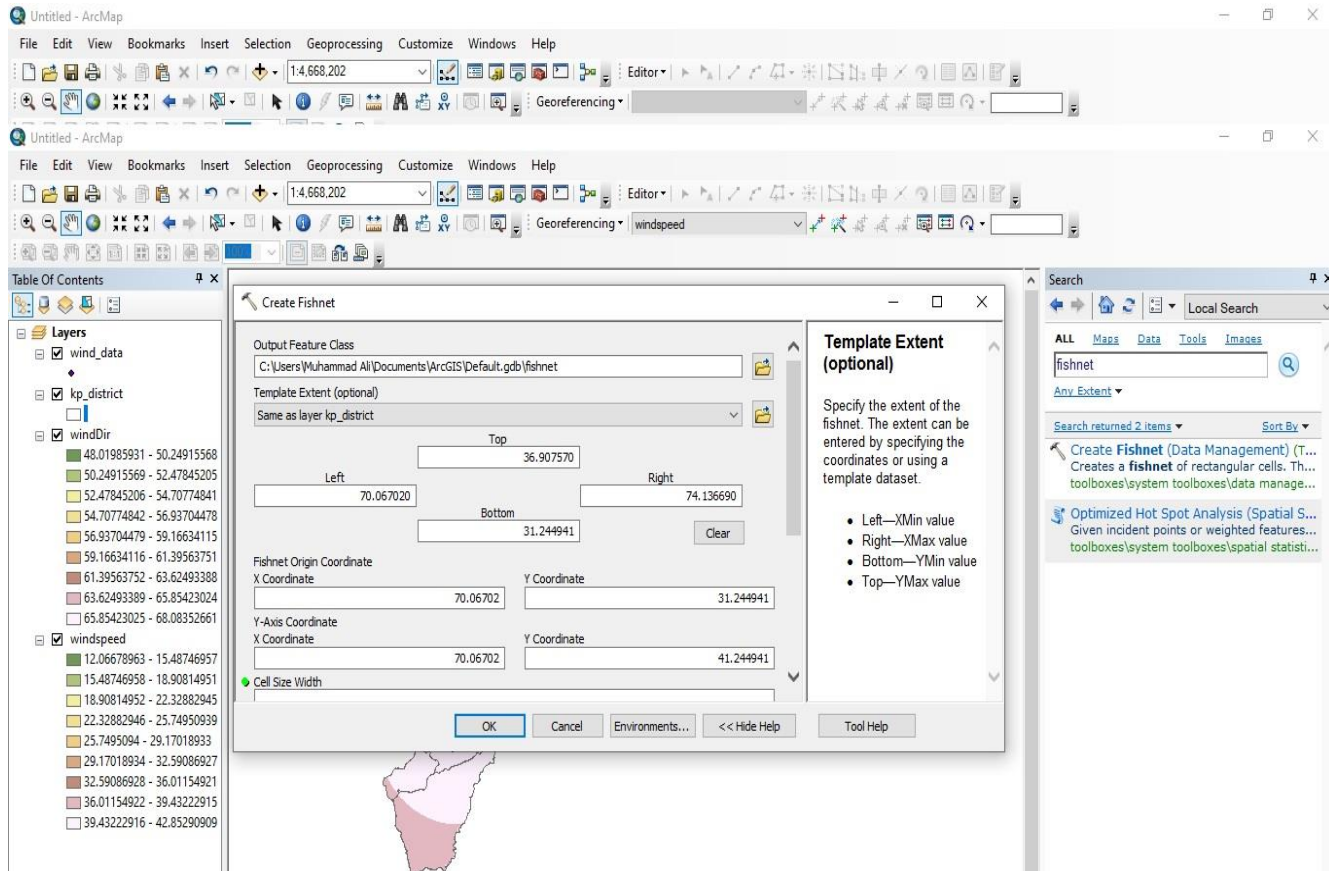
➤ **District-wise Distribution To evaluate wind speed & direction with respect to individual District.**





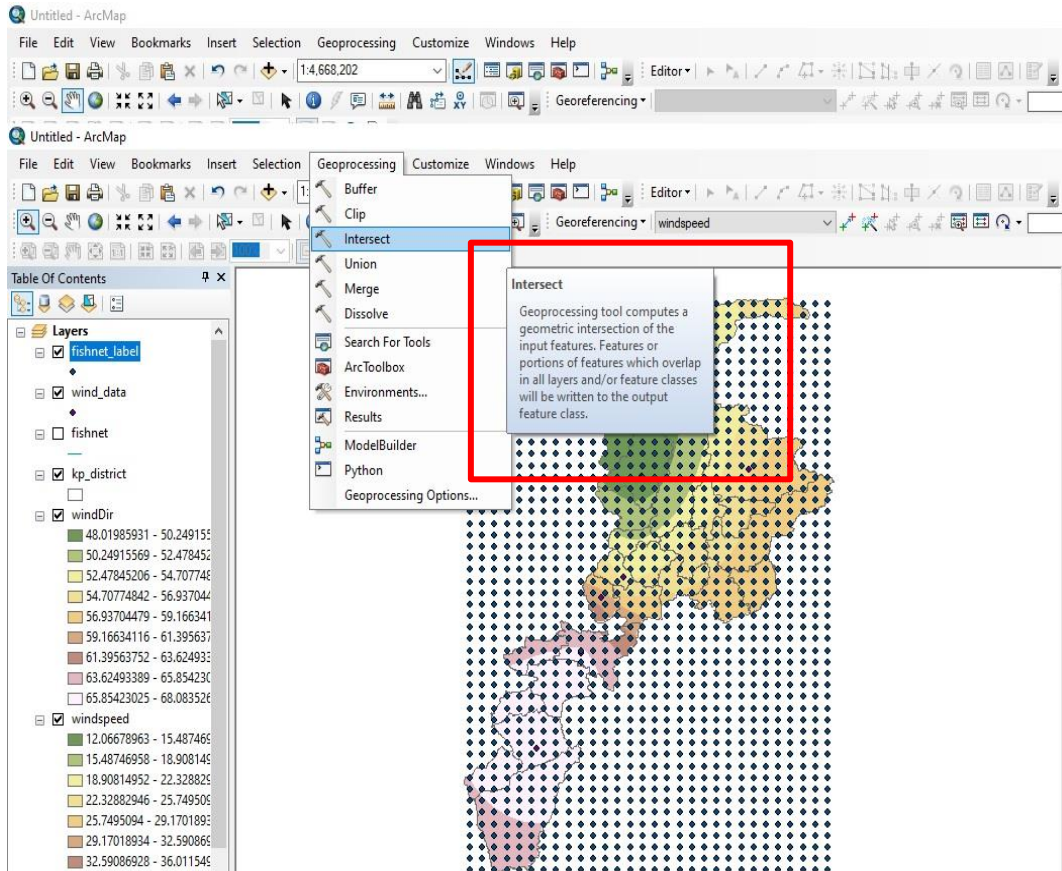
## ➤ Creation of Fishnet

To create a regular grid of points for showing spatial variability of wind speed & direction

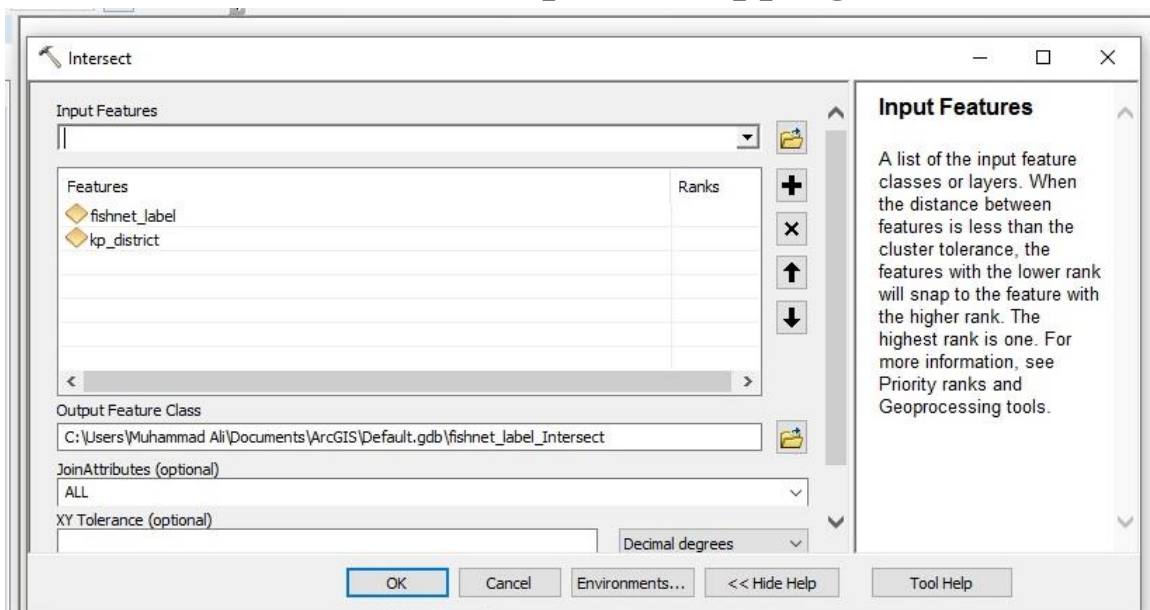


➤ **Fishnet** is created, but “Intersect” tool is utilized to get Fishnet within the Area of Interest

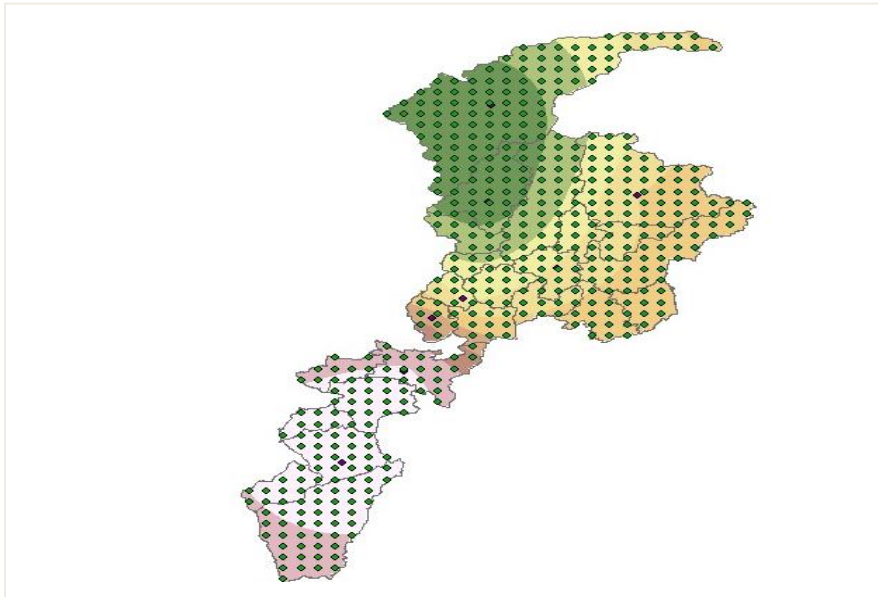




➤ **Intersect command will replace “clipping”**



## Fishnet points grid will be intersected With the Area of Interest (KP map)



## Extract Multi Value to Point (data transfer from “raster map” to “point map” )

Table Of Contents

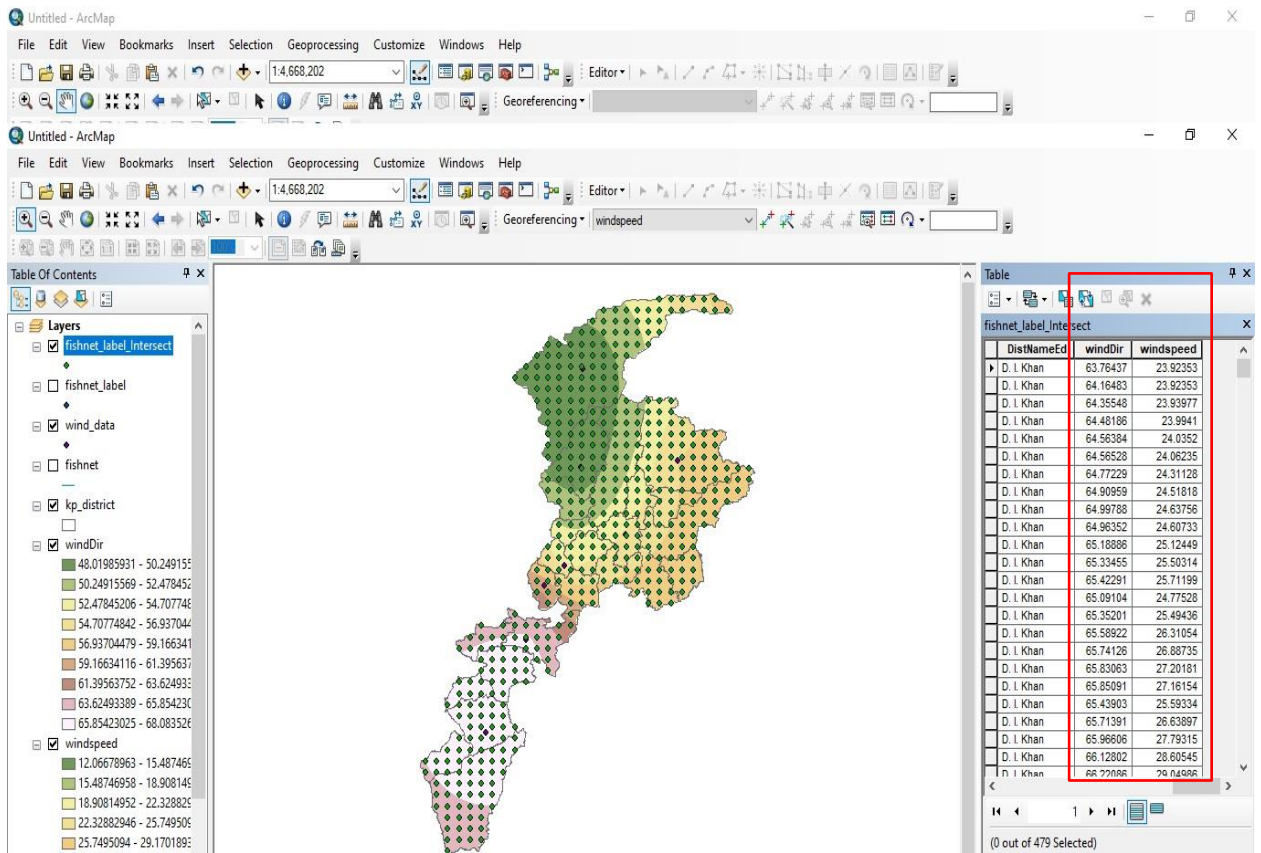
- fishnet\_label\_intersect
- fishnet\_label
- wind\_data
- fishnet
- kp\_district
- windDir
  - 48.01985931 - 50.249155
  - 50.24915569 - 52.478452
  - 52.47845206 - 54.707746
  - 54.70774842 - 56.937044
  - 56.93704479 - 59.166341
  - 59.16634116 - 61.395637
  - 61.39563752 - 63.624933
  - 63.62493389 - 65.854230
  - 65.85423025 - 68.083526
- windspeed
  - 12.06678963 - 15.487466
  - 15.48746958 - 18.908146
  - 18.90814952 - 22.328825
  - 22.32882946 - 25.749505
  - 25.7495094 - 29.170189

Search

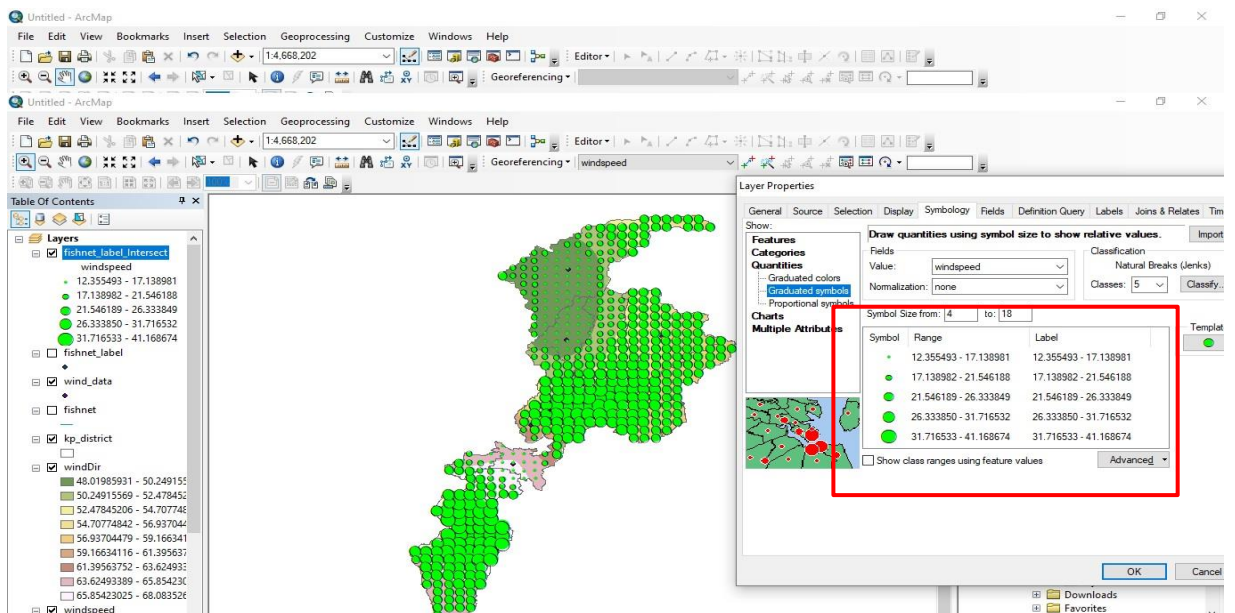
extract multi value to point

Extract Multi Values to Points (Spatial...  
Extracts cell values at locations specific...  
toolboxes/system toolboxes/spatial analy...

➤ Final point map with imported wind speed & direction data from interpolated raster maps

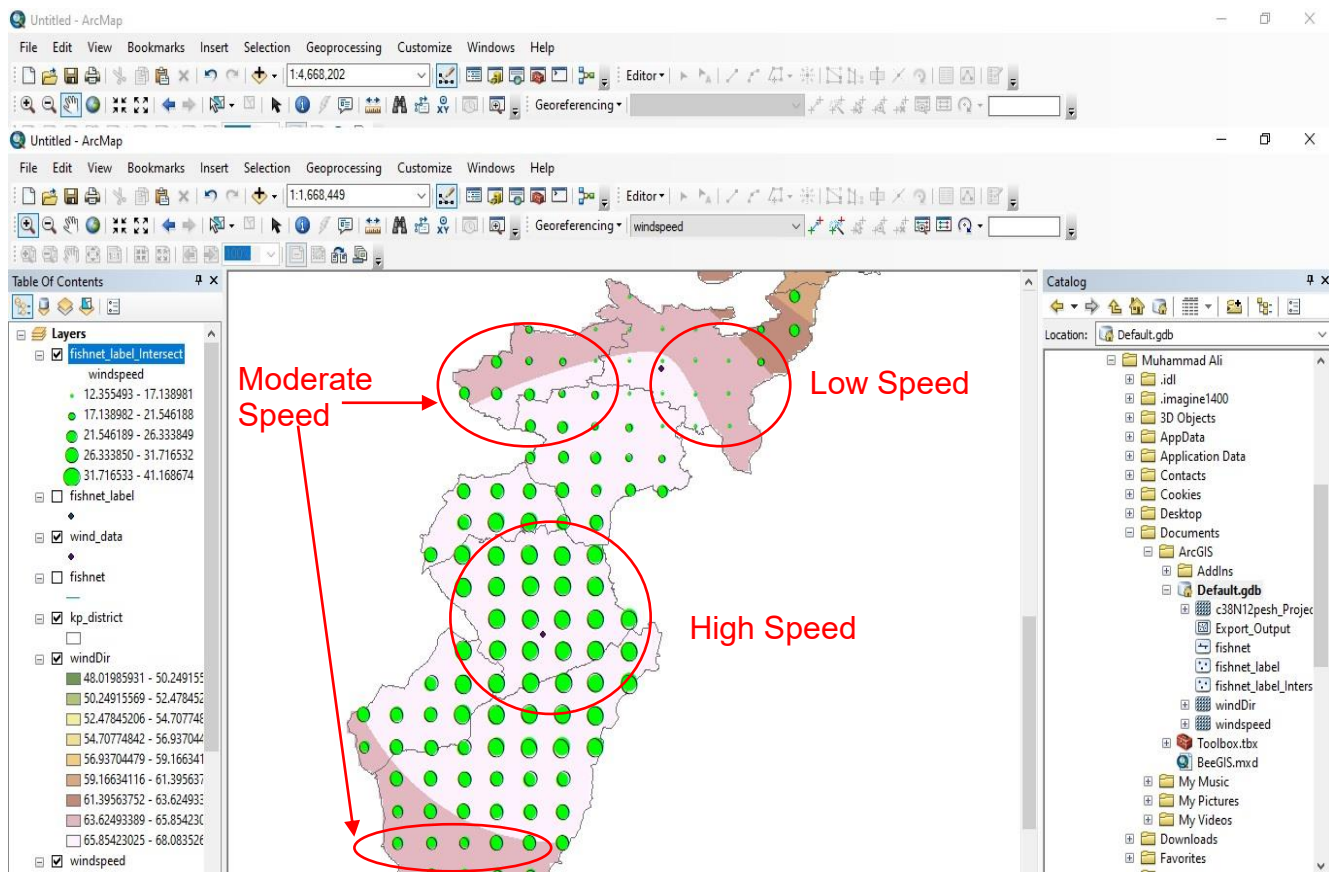


➤ Usage of special Symbols to highlight the spatial variability in Wind Speed





# ➤ Zoomed in view to show the spatial variability in Wind Speed



## ➤ Usage of special Symbols to highlight the spatial variability in Wind Direction

Arrow selection

Layer Properties

General Source Selection Display Symbology Fields Definition Query Labels Joins & Relations Time HTML Popup

Show: fishnet\_label\_Intersect

Draw quantities using symbol size to show relative values.

Fields Value: windspeed

Classification Natural Breaks (Jenks) Classes: 5 Classify...

Normalization: none

Symbol Size from: 4 to: 18

Symbol	Range	Label
•	12.355493 - 17.138981	12.355493 - 17.138981
↑	17.474386 - 21.546188	17.474386 - 21.546188
↑↑	21.613945 - 26.333849	21.613945 - 26.333849
↑↑↑	26.469213 - 31.716532	26.469213 - 31.716532
↑↑↑↑	31.813482 - 41.168674	31.813482 - 41.168674

Advanced

Rotate

Rotate Points by Angle in this field: windDir

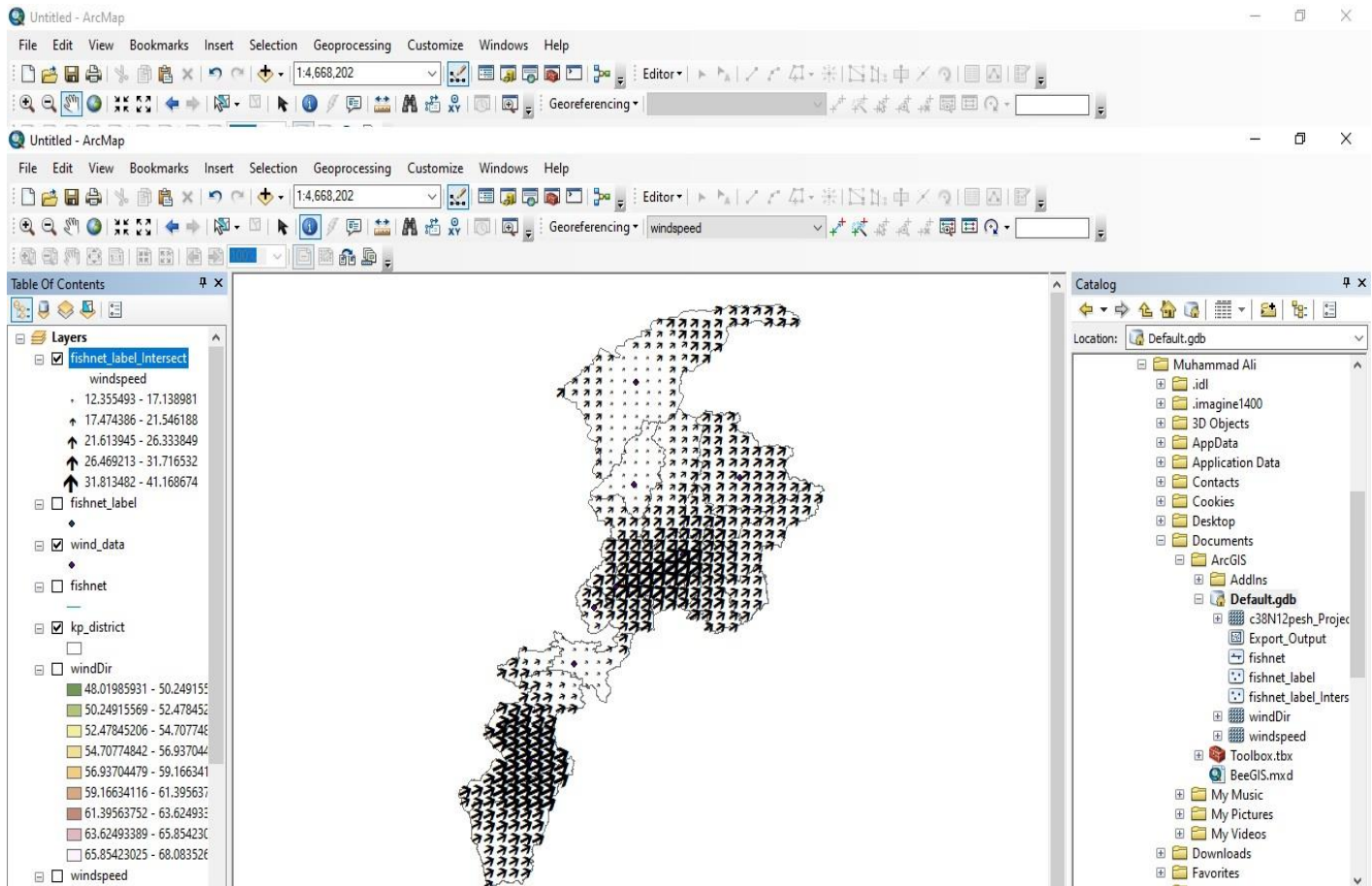
Rotation Style:

Geographic  Arithmetic

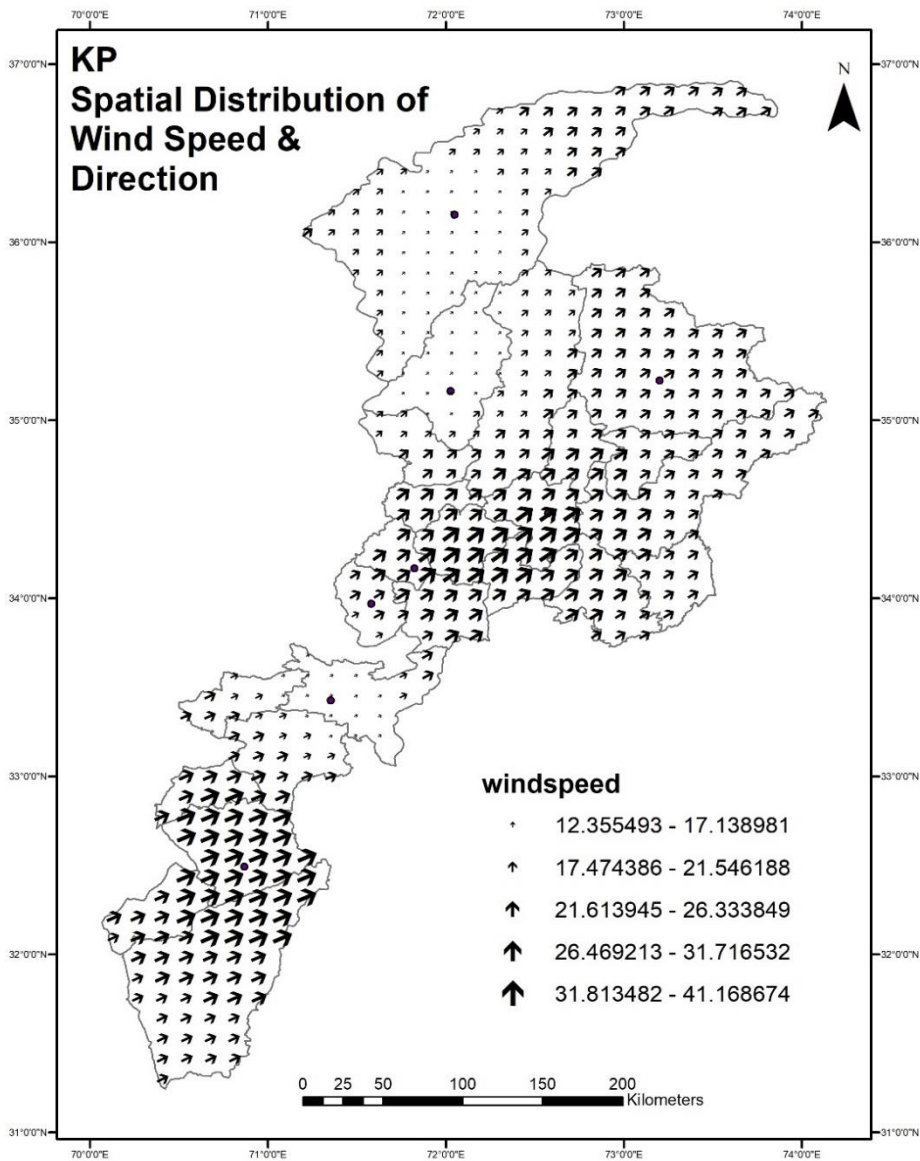
Random Minimum: 0.00 Maximum: 360.00

OK Cancel

# ➤ Spatial variability in Wind Speed & Direction



# ➤ Final Layout for Spatial variability in Wind Speed & Direction.





## **5) CONCLUSION**

District map of KP and Wind data of direction and Speed was loaded in GIS. For the spatial distribution of wind data GIS based geostatistical method “Kriging” was applied. Spatial variability in wind speed and direction was also studied. At last final layout of spatial distribution of KP wind direction and speed was determined.