

**MINI PROJECT**  
**Wind Analysis of Malakand Division**

***TAUSEEF ALI***

***7701***

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# INTRODUCTION

- **Wind Analysis in Urban Planning** : Wind Velocity i.e. speed and direction is an important factor in planning of an area or a city. The transportation network and the building groups with various functions affect the air quality in urban areas. Also the air pollution caused by different elements, such like industrial areas, waste disposal areas, roads with heavy traffic and other building groups. Therefore, the design and plan of the city should be according to the direction and speed of the wind. The speed and direction of the wind effects the following things in an urban area:
  - Location of Industrial Zone.
  - Location of waste disposal area or dumping site.
  - Form and shape, height and position of the buildings.
  - The transportation network i.e. roads with heavy traffic.
  - Location of Residential area or Settlements.
  - Position and width of the streets.
  - Location of open spaces (Parks etc.).

# PROBLEM STATEMENT

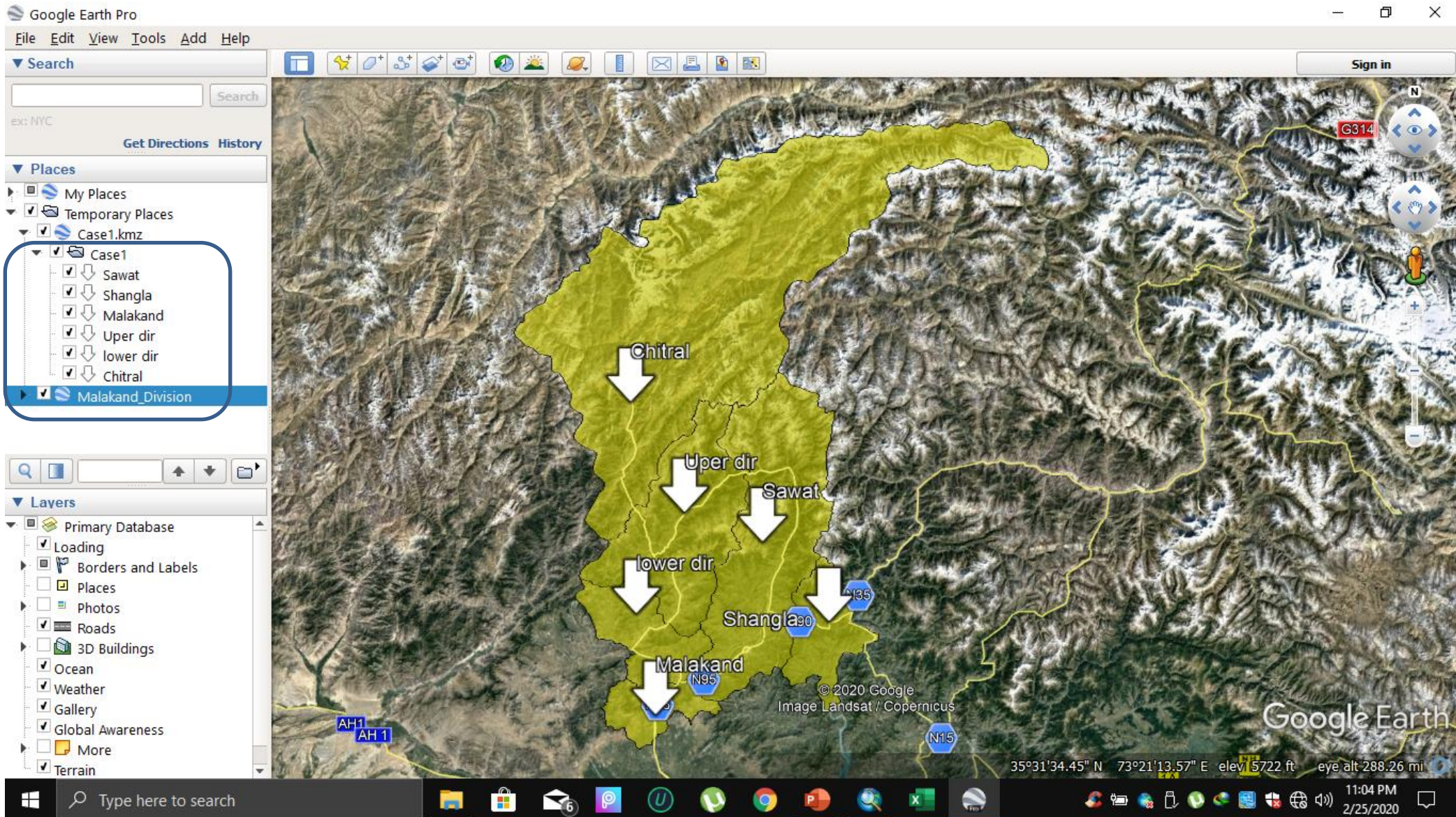
- Now let suppose we are planning an industrial zone in Malakand Division. The industrial zone should be located in such area that the pollutants should not be transferred to the residential area which is harmful for the human health. For this purpose we have to do wind analysis and find it's velocity i.e. speed and direction.

# TOOLS

- Data Acquisition
- Area of Interest ( Malakand Division )
- (IDW) Inverse Distance Weighted Technique
- Extract By Mask
- Creating Fishnet Technique
- Clipping
- (Extract Multi Values to Point) Tool
- Symbology
- Final Layout

# **METHODOLOGY**

# Taking Coordinates from Google Earth



# Excel (CSV) FORMAT

The screenshot displays the Microsoft Excel interface with a CSV file named "Wind data" open. The ribbon is set to "Home", and the active cell is A1. The data table is as follows:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	x	y	gid	Name	Speed	Direction										
2	72.4346	35.2064	1	Sawat	3	15										
3	72.7605	34.8833	2	Shangla	9	205										
4	71.9057	34.4987	3	Malakand	6	205										
5	72.0467	35.3216	4	Uper dir	4	150										
6	71.8107	34.9109	5	lower dir	5	195										
7	71.7747	35.7651	6	Chitral	4	100										
8																
9																
10																
11																
12																
13																
14																
15																
16																

At the bottom of the Excel window, the status bar shows: Average: 52.177301, Count: 42, Sum: 1565.31905, and a zoom level of 130%. The Windows taskbar at the very bottom shows the time as 11:07 PM on 2/25/2020.

# Adding that CSV File into GISMap

The screenshot displays the ArcMap interface with the following components:

- Title Bar:** Untitled - ArcMap
- Menu Bar:** File, Edit, View, Bookmarks, Insert, Selection, Geoprocessing, Customize, Windows, Help
- Toolbars:** Standard toolbar, Editor toolbar, Classification toolbar, Georeferencing toolbar
- Table Of Contents:** Shows a folder named "E:\PGD-GIS 2019\2nd Semeste" containing a file named "Wind data.csv". A context menu is open over this file, with "Display XY Data..." selected. A tooltip for this option reads: "Display XY Data: Adds a new map layer based on XY events from a table."
- Attributes Panel:** Located on the right side, currently empty.
- Status Bar:** Shows "70.23 36.041 Decimal Degrees".
- Taskbar:** Windows taskbar at the bottom with search, file explorer, and other application icons. System tray shows the time "10:26 PM" and date "2/25/2020".



# Converting that CSV File into Shapefile

The screenshot displays the ArcMap interface with the following components:

- Table Of Contents:** Shows a layer named "Wind\_data.csv Events" with a green dot symbol.
- Layers Panel:** A context menu is open over the "Wind\_data.csv Events" layer, with the "Data" option selected. The "Data" submenu is also open, showing "Export Data..." as the chosen option.
- Main Map Area:** Displays a map with four green circular markers representing data points.
- Attributes Panel:** Located on the right side, currently empty.
- Toolbar:** Contains various GIS tools such as pan, zoom, and selection.
- Status Bar:** Shows the coordinates "70.976 35.564 Decimal Degrees".
- Taskbar:** At the bottom, showing the Windows taskbar with the search bar and several application icons.

The "Export Data" dialog box is open, with the following text visible:

**Export Data**  
Save this layer's data as a shapefile or geodatabase feature class

# Adding Malakand Division Shapefile

The screenshot displays the ArcMap interface with the following components:

- Table Of Contents:** Shows a list of layers including "Winddata" and "Malakand\_Division".
- Map View:** Displays a map of the Malakand Division with a red boundary. The map includes labels for "Chitral", "Upper Dir", "Lower Dir", "Malakand PA", "Swat", and "Shaklgia". Green circular markers are placed at various locations within the division.
- Attributes Panel:** Located on the right side, currently empty.
- Toolbar:** Includes standard GIS tools such as pan, zoom, and edit, along with a scale of 1:2,500,000.
- Bottom Panel:** Shows the drawing toolbar with a font set to Arial and size 10. The status bar at the bottom right indicates coordinates: 71.152 35.95 Decimal Degrees.

# Showing Attribute Table

The screenshot displays the ArcMap interface. The main map area shows a red outline of a region with several green circular markers. The markers are labeled: Chitral, Upper Dir, Swat, Lower Dir, Shangla, and Malakand PA. The 'Table Of Contents' on the left shows two layers: 'Winddata' (green circle) and 'Malakand\_Division' (red square). The 'Table' window on the right shows the attribute table for the 'Winddata' layer. The table has columns for FID, Shape, x, y, gid, Name, Speed, and Direction. The data rows are as follows:

FID	Shape *	x	y	gid	Name	Speed	Direction
0	Point	72.434593	35.206412	1	Sawat	3	15
1	Point	72.760526	34.883327	2	Shangla	9	205
2	Point	71.905741	34.498679	3	Malakand	6	205
3	Point	72.0467	35.321649	4	Uper dir	4	150
4	Point	71.810712	34.910906	5	lower dir	5	195
5	Point	71.774698	35.765111	6	Chitral	4	100

The status bar at the bottom indicates the coordinates 74.811 35.861 Decimal Degrees. The Windows taskbar at the very bottom shows the time as 9:06 PM on 2/25/2020.

# Interpolation of a raster

The screenshot displays the ArcMap interface. The main map area shows a red outline of the Malakand Division with several green circular points labeled: Chitral, Upper Dir, Swat, Lower Dir, Shangha, and Malakand PA. The 'Layers' panel on the left shows 'Winddata' and 'Malakand\_Division'. The 'Search' panel on the right is open, showing search results for 'idw'. The 'IDW (Spatial Analyst) (Tool)' is circled in blue. The status bar at the bottom indicates '76.25 36.236 Decimal Degrees'.

Untitled - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

1:2,500,000

Classification Georeferencing

Table Of Contents

Layers

- Winddata
- Malakand\_Division

Chitral

Upper Dir

Swat

Lower Dir

Shangha

Malakand PA

Search

Local Search

ALL Maps Data Tools Images

idw

Any Extent

Search returned 3 items Sort By

- IDW (3D Analyst) (Tool)  
Interpolates a raster surface from points ...  
toolboxes\system toolboxes\3d\_analyst to...
- IDW (Spatial Analyst) (Tool)**  
Interpolates a raster surface from points ...  
toolboxes\system toolboxes\spatial analys...
- IDW (Geostatistical Analyst) (Tool)  
Uses the measured values surrounding th...  
toolboxes\system toolboxes\geostatistical ...

Drawing Arial 10 B I U A

76.25 36.236 Decimal Degrees



Type here to search

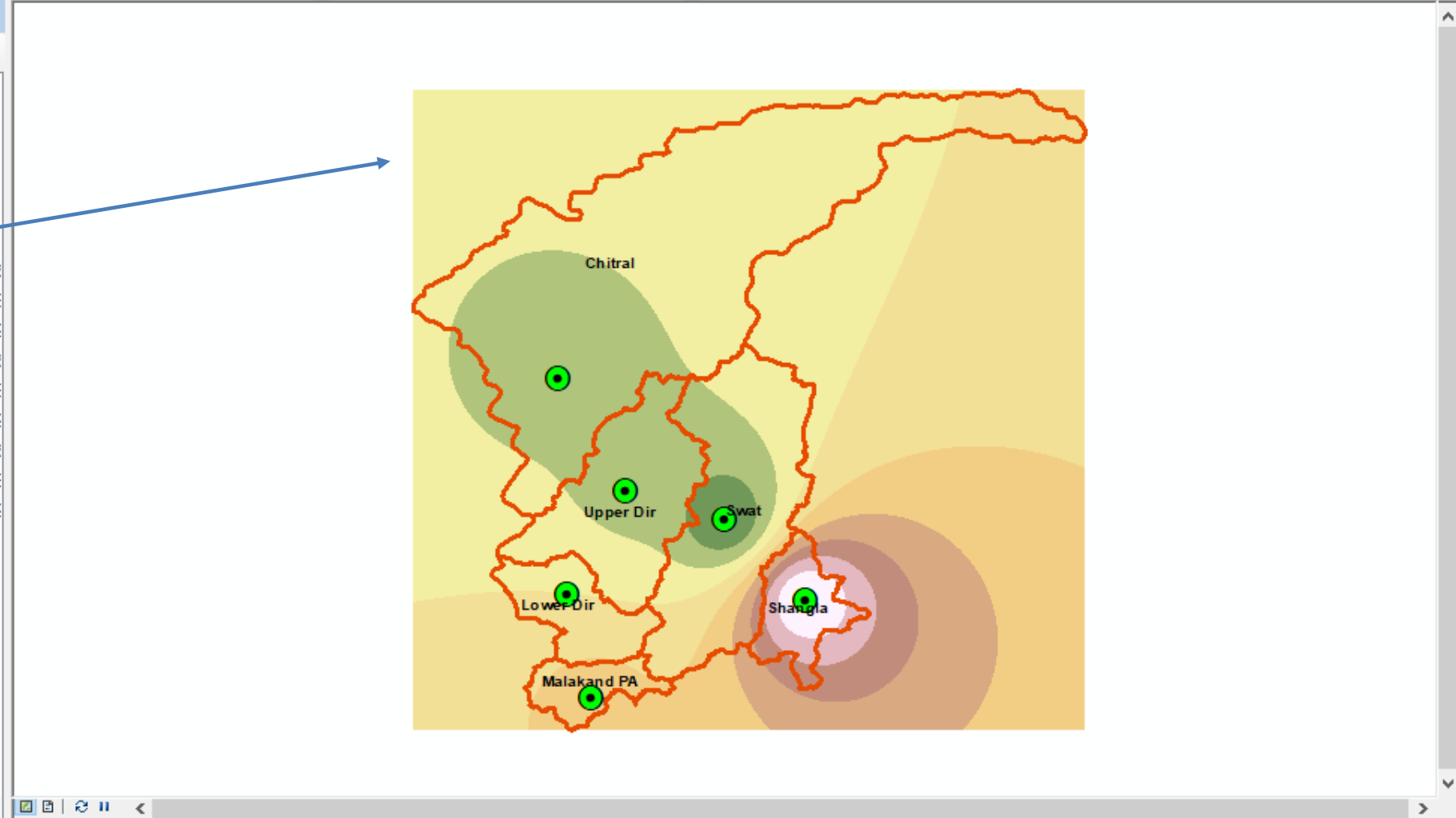


9:07 PM  
2/25/2020

Table Of Contents

Layers

- Winndata
- Malakand\_Division
- SpeedIDW**
  - 3.000107288 - 3.666686271
  - 3.666686271 - 4.333265253
  - 4.333265253 - 4.999844234
  - 4.999844234 - 5.666423216
  - 5.666423216 - 6.333002197
  - 6.333002197 - 6.999581179
  - 6.999581179 - 7.666160161
  - 7.666160161 - 8.332739142
  - 8.332739142 - 8.999318124



Attributes

Attributes panel showing a table with columns for Name, Value, and Area. The table is currently empty.

1:2,500,000

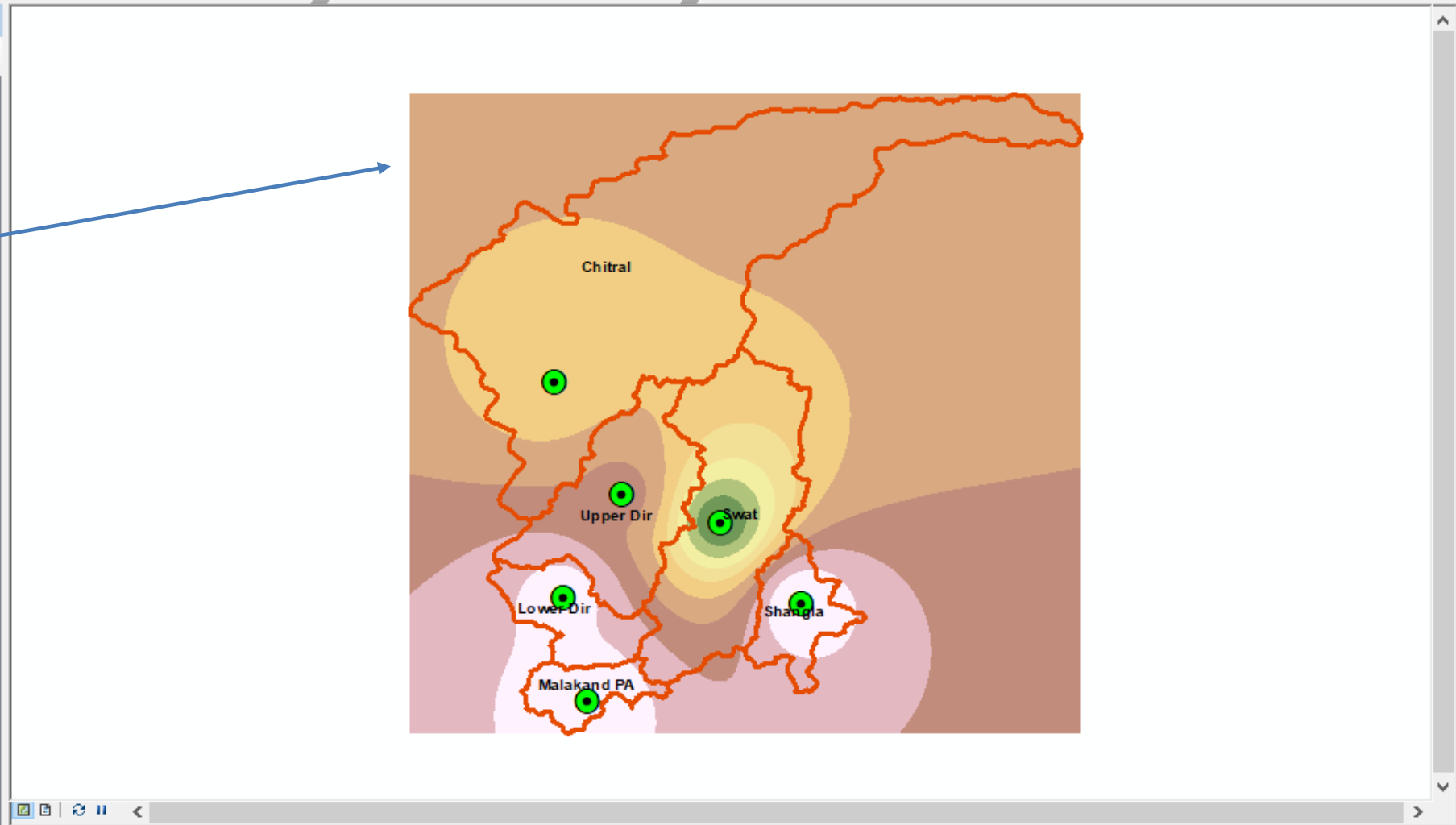
Editor

Classification | SpeedIDW | Georeferencing | SpeedIDW

Table Of Contents

Layers

- Winddata
- Malakand\_Division
- DirectionIDW**
  - 15.00599957 - 36.1152488
  - 36.1152488 - 57.22449802
  - 57.22449802 - 78.33374724
  - 78.33374724 - 99.44299646
  - 99.44299646 - 120.5522458
  - 120.5522458 - 141.661495
  - 141.661495 - 162.7707442
  - 162.7707442 - 183.8799934
- SpeedIDW
  - 3.000107288 - 3.666686271
  - 3.666686271 - 4.333265253
  - 4.333265253 - 4.999844234
  - 4.999844234 - 5.666423216
  - 5.666423216 - 6.333002197
  - 6.333002197 - 6.999581179
  - 6.999581179 - 7.666160161



Attributes

Attributes Create F...

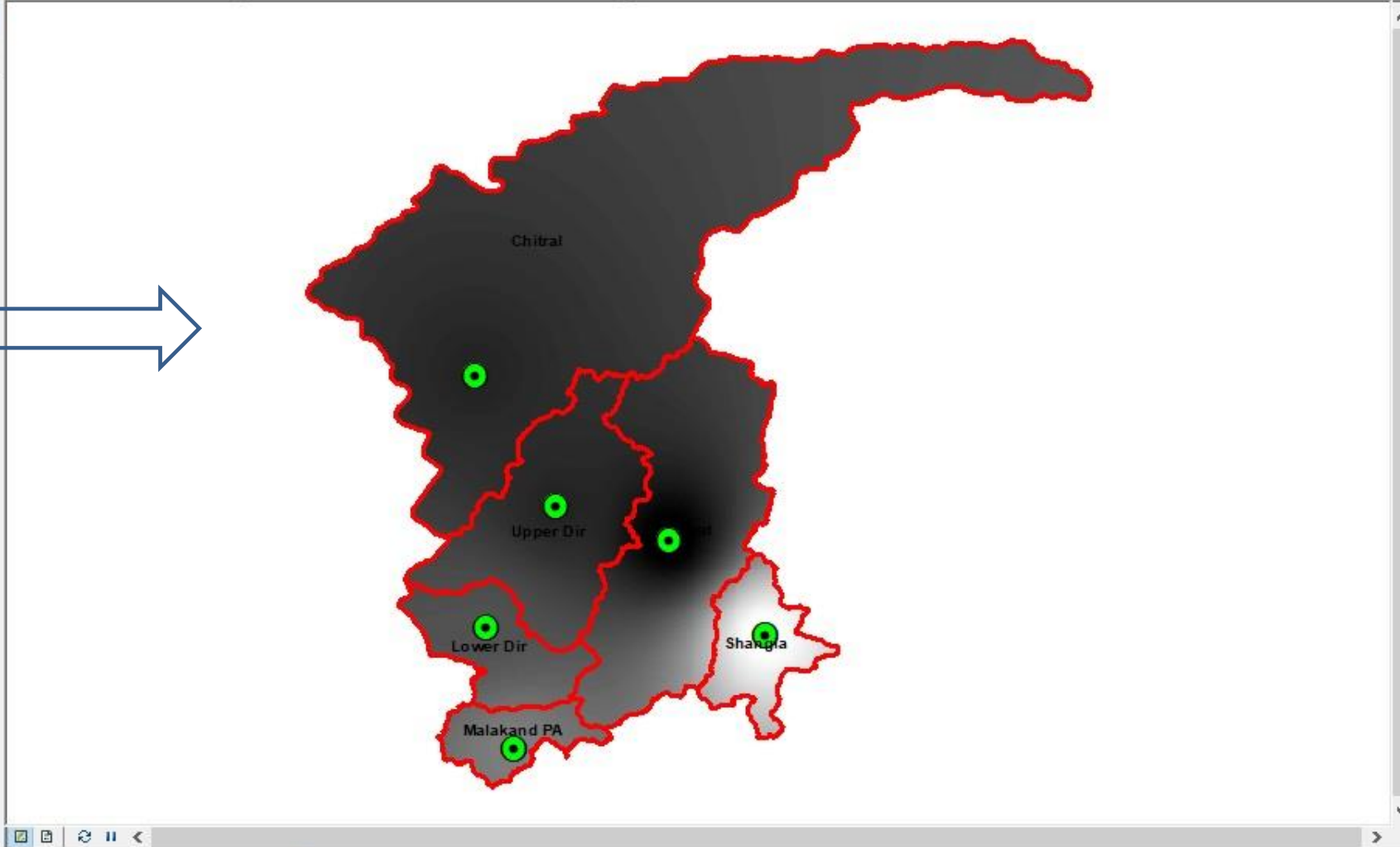
# Extract by Mask

The screenshot displays the ArcMap interface with the following components:

- Table of Contents:** Lists layers including 'Grid', 'Malakand\_Division', and 'DirectionIDW'. The 'DirectionIDW' layer is expanded to show a legend with 10 color-coded value ranges.
- Map View:** Shows a map of Malakand Division with districts labeled: Chitral, Upper Dir, Lower Dir, Swat, Shabkda, and Malakand PA. A red outline indicates the division boundary.
- Search Window:** Located on the right, it shows search results for 'Extract By Mask'. The first result, 'Extract by Mask (Spatial Analyst) (Tool)', is circled in blue. The second result is 'Clip (Data Management) (Tool)'.
- Bottom Status Bar:** Displays '74.951 36.401 Decimal Degrees'.
- Taskbar:** Shows the Windows taskbar at the bottom with various application icons and the system clock showing 9:32 PM on 2/25/2020.

Table Of Contents

- Winddata
  - Grid
- Malakand\_Division
  - ExSpeed
    - Value
    - High : 8.99932
    - Low : 3.00011
  - ExDirection
    - Value
    - High : 204.989
    - Low : 15.006
- SpeedIDW
  - 3.000107288 - 3.6666862
  - 3.666686271 - 4.3332652
  - 4.333265253 - 4.9998442
  - 4.999844234 - 5.6664232
  - 5.666423216 - 6.3330021



Attributes

Attributes Create F...



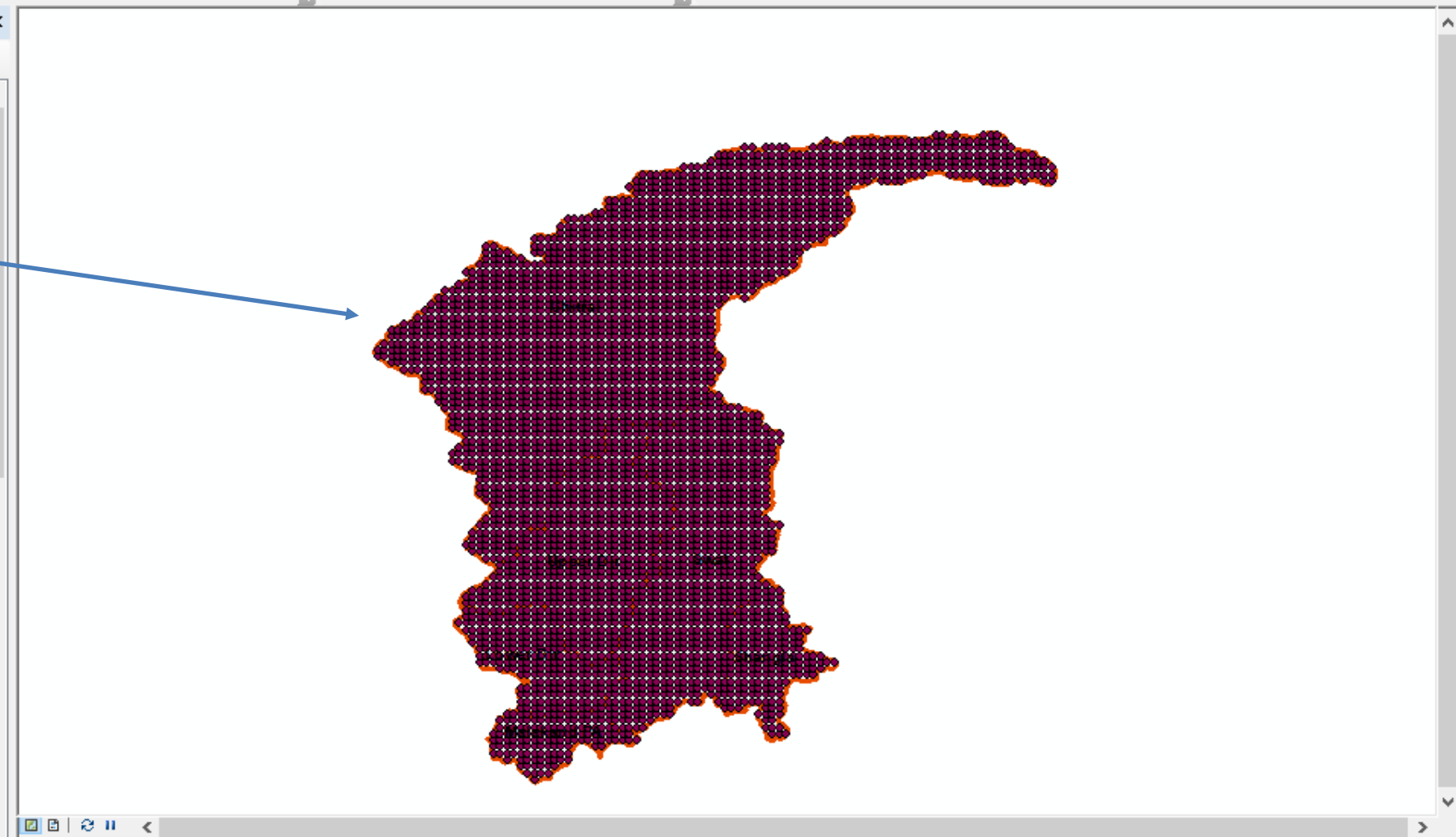
# Showing Fishnet (100 Rows /100 Columns )

The screenshot displays the ArcMap interface with the following components:

- Table of Contents:** Lists several layers including 'Grid\_label', 'Winddata', 'Grid', 'Malakand\_Division', 'DirectionIDW', and 'SpeedIDW'. A blue arrow points from the 'Grid' layer to the fishnet grid on the map.
- Main Map Area:** Shows a green fishnet grid overlaid on a map. The grid is composed of 100 rows and 100 columns of small squares.
- Attributes Panel:** Located on the right side, it is currently empty.
- Toolbar:** Contains various GIS tools such as pan, zoom, and selection tools.
- Scale:** The scale is set to 1:2,220,755.
- Bottom Panel:** Shows the 'Create Fishnet' tool with a green checkmark and the text '70.43136.189 Decimal Degrees'.

**Layers**

- Wind
- Grid\_Label
- Winddata
- Grid
- Malakand\_Division
- ExSpeed
  - Value
  - High : 8.99932
  - Low : 3.00011
- ExDirection
  - Value
  - High : 204.989
  - Low : 15.006
- SpeedIDW



**Attributes**

Attributes panel showing a table with columns and rows, currently empty.

# Now Extracting the Multi Values form both Speed and Direction by Using (Extract Multi Values to Point) Tool

The screenshot displays the ArcMap interface with the 'Extract Multi Values to Points' tool dialog box open. The dialog box has the following fields and options:

- Input point features:** A dropdown menu.
- Input rasters:** A dropdown menu.
- Raster Output field name table:**

Raster	Output field name
- Bilinear interpolation of values at point locations (optional)

Buttons at the bottom of the dialog include OK, Cancel, Environments..., << Hide Help, and Tool Help.

On the right side, a search window is open with the search term 'Extract By values'. The search results list several tools, with 'Extract Multi Values to Points (Spatial Analyst)' highlighted in a blue box. An arrow points from this search result to the title of the dialog box.

The background map shows several layers: Grid\_label, Winddata, Grid, Malakand\_Division, ExSpeed (Value: High: 8.99932, Low: 3.00011), ExDirection (Value: High: 204.989, Low: 15.006), and SpeedIDW (Value: 3.000107288 - 3.6666686271).

The Windows taskbar at the bottom shows the system clock as 9:37 PM on 2/25/2020.

1:2,500,000

Classification SpeedIDW Georeferencing SpeedIDW

Table Of Contents

Layers

- Grid\_label
- Winddata
- Grid
- Malakand\_Division
- ExSpeed  
Value  
High : 8.99932  
Low : 3.00011
- ExDirection  
Value  
High : 204.989  
Low : 15.006
- SpeedIDW  
3.000107288 - 3.6  
3.666686271 - 4.3

### Extract Multi Values to Points

Input point features: Grid\_label

Input rasters:

Raster	Output field name
ExDirection	ExDirection
ExSpeed	ExSpeed

Bilinear interpolation of values at point locations (optional)

OK Cancel Environments... << Hide Help Tool Help

### Attributes

The input raster (or rasters) values you want to extract based on the input point feature location.

Optionally, you can supply the name for the field to store the raster value. By default, a unique field name will be created based on the input raster dataset name.

Attributes Create F...

# The Extracted Values as Shown Below

The screenshot displays the ArcMap interface with a map of the Chitral, Swat, and Malakand regions. A data table is overlaid on the map, showing extracted values for a grid. The table has the following columns: OID, Shape, ExDirection, and ExSpeed. A blue box highlights the ExDirection and ExSpeed columns. The map shows several green points representing the grid locations, labeled with region names: Chitral, Upper Dir, Swat, Lower Dir, Malakand PA, and Shargha.

OID *	Shape *	ExDirection	ExSpeed
1430	Point	183.1889	5.341553
1431	Point	181.6925	5.344135
1432	Point	179.1196	5.343699
1433	Point	176.1962	5.340113
1434	Point	174.0869	5.337289
1435	Point	170.7492	5.334529
1436	Point	167.2968	5.336151
1437	Point	164.9895	5.34112
1438	Point	161.614	5.356586
1439	Point	159.4779	5.373515
1440	Point	156.5462	5.411037
1441	Point	154.0632	5.465796
1442	Point	152.7237	5.513376
1443	Point	151.2831	5.603594
1444	Point	150.6278	5.718986
1445	Point	150.6765	5.811172
1446	Point	151.5325	5.973794
1447	Point	152.6434	6.098886
1448	Point	155.1203	6.311288
1449	Point	158.5191	6.551234
1450	Point	161.2382	6.7241
1451	Point	165.8529	6.996883
1452	Point	169.1733	7.183078
1453	Point	174.2843	7.459115
1454	Point	179.2369	7.718144
1455	Point	182.2768	7.874123
1456	Point	186.2154	8.07356

# Now Applying Symbology Through Graduated Symbols

Layer Properties

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

Show:

**Features**

**Categories**

**Quantities**

- Graduated colors
- Graduated symbols**
- Proportional symbols

**Charts**

**Multiple Attributes**

Draw quantities using symbol size to show relative values. Import...

Fields

Value: ExSpeed

Classification

Natural Breaks (Jenks)

Classes: 4 Classify...

Normalization: none

Symbol Size from: 4 to: 18

Symbol	Range	Label
↓	3.003282 - 4.482337	3.003282 - 4.482337
↑	4.482338 - 5.264813	4.482338 - 5.264813
↑	5.264814 - 6.882757	5.264814 - 6.882757
↑	6.882758 - 8.997933	6.882758 - 8.997933

Show class ranges using feature values Advanced

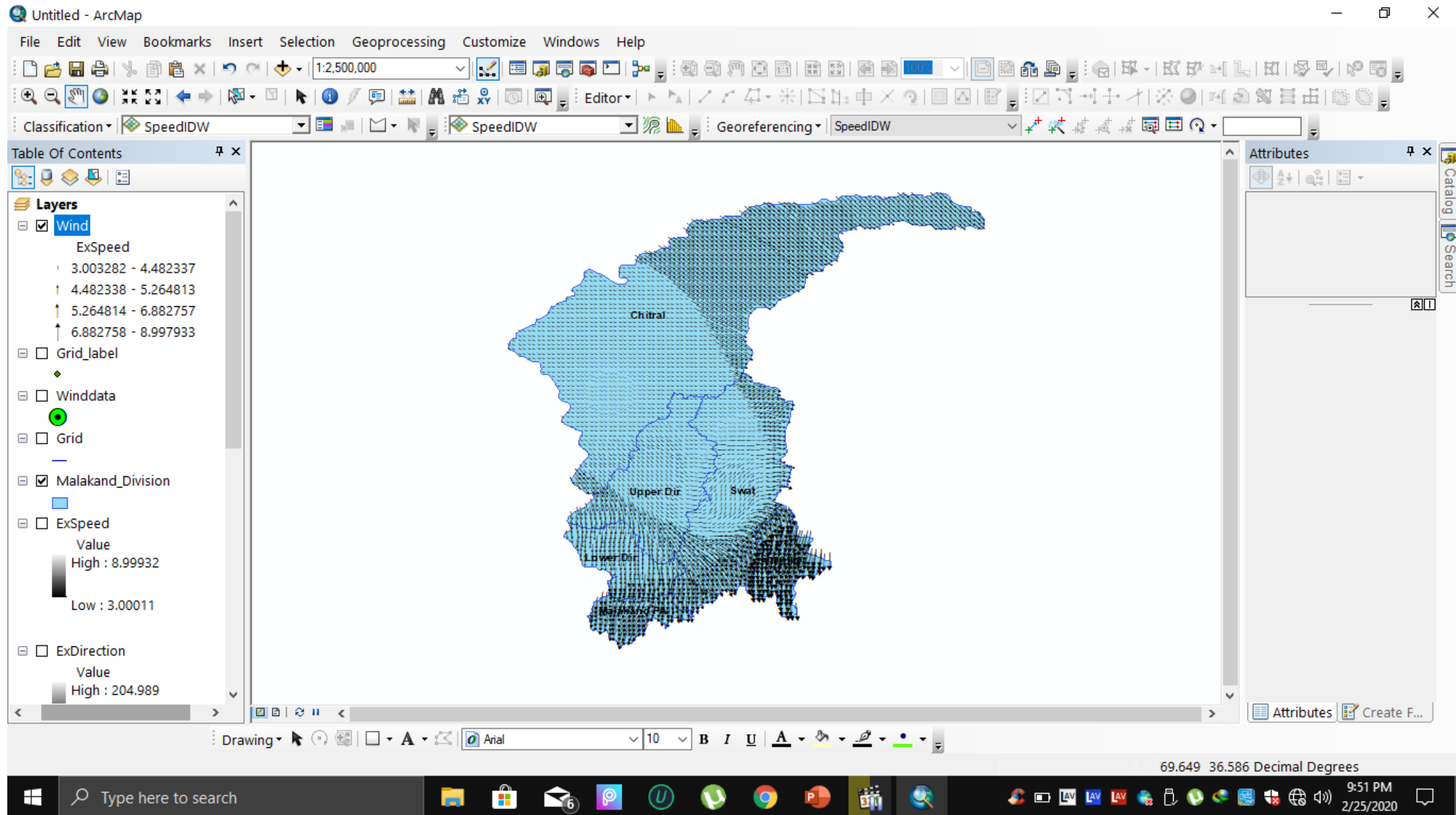
Template

OK Cancel Apply

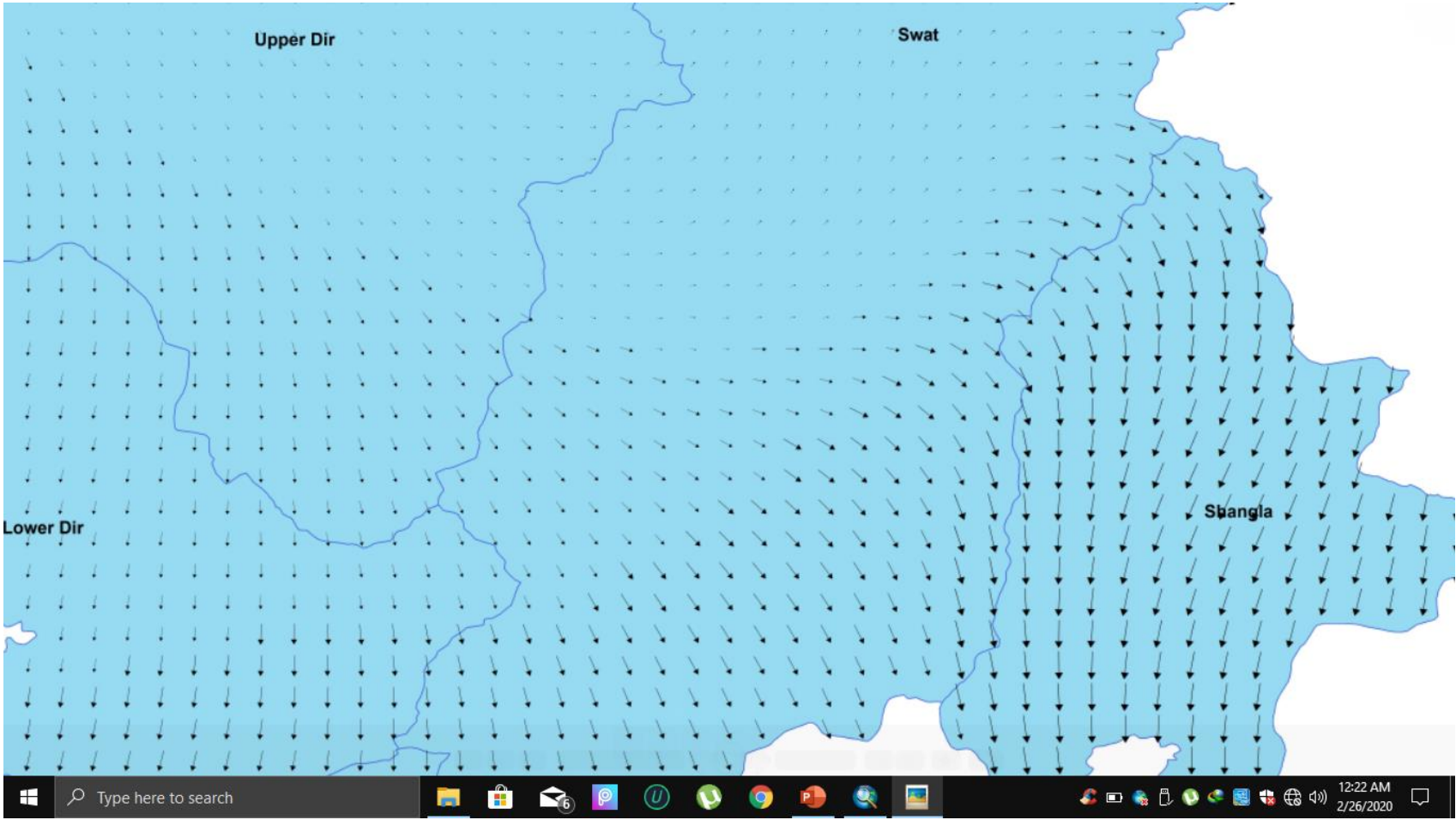
70.998 35.701 Decimal Degrees

9:49 PM  
2/25/2020

# The Results Showing Wind Direction and also Its Speed



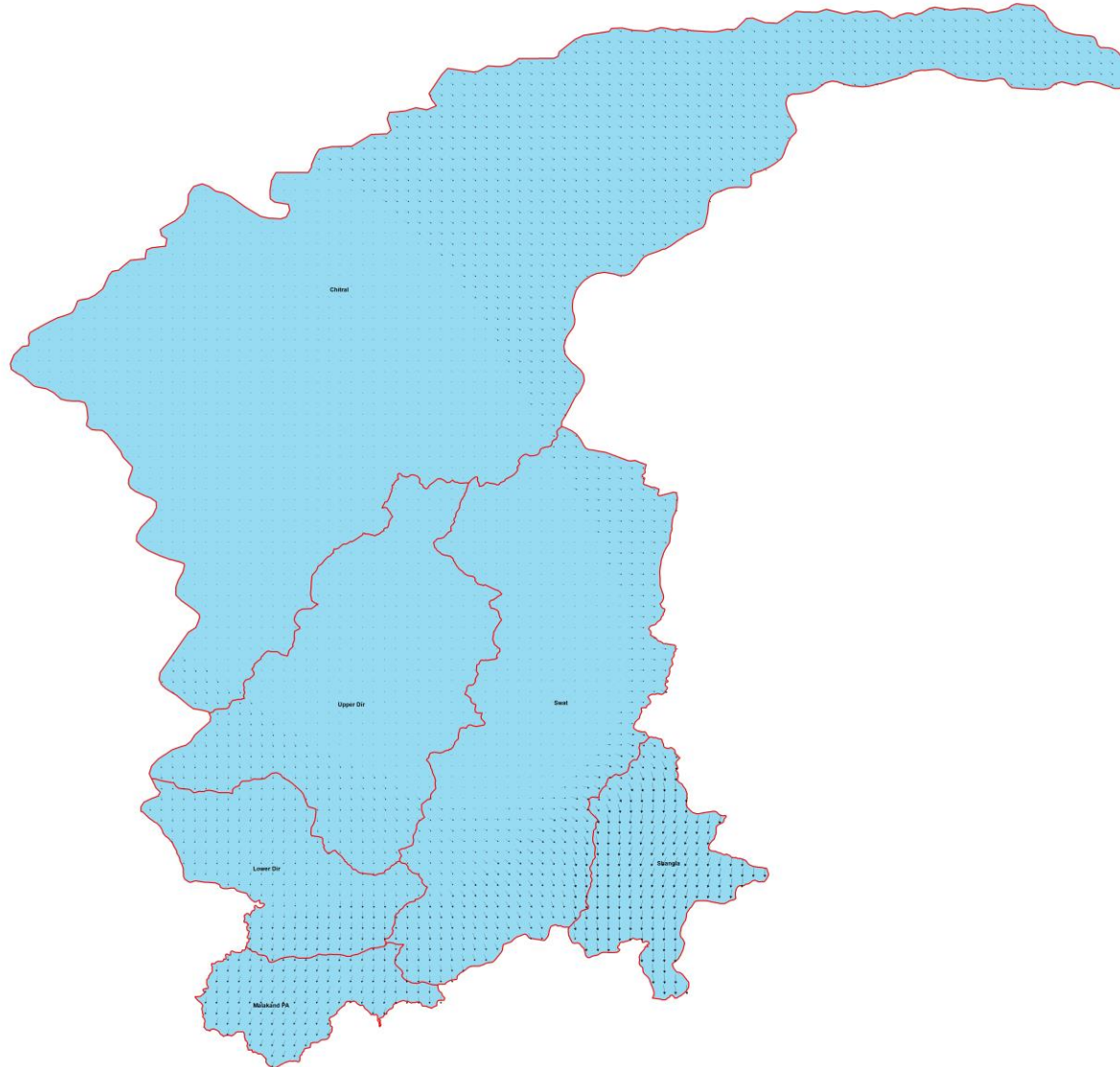
# CONCLUSION





# CONCLUSION

## *Wind Analysis of Malakand Division*



### Legend

#### Wind Speed (km/hr)

3.003282 - 4.482337

4.482338 - 5.264813

5.264814 - 6.882757

6.882758 - 8.997933

 Malakand\_Division

0 15 30 60 90 120 Kilometers