- 8) Click Editor button, click Save Edits, and click Stop Editing.
- 9) On ArcToolbox window, click + symbol on 3D Analyst Tools \rightarrow on Functional Surface, double click Add Surface Information.
- 10) Next will appear Add Surface Information. On combo box of Input Feature Class, choose layer "sungai_utama_01_dissolve". On combo box of Input Surface, choose layer "dem_10". Check AVG_SLOPE from Output Property. Click OK button.

sungai_utama_01 dissolve	- 6
nput Surface	
dem_10	- 🖻
Output Property	
Z_MIN	
Z_MAX	
Z_MEAN	
SURFACE_LENGTH	
MIN_SLOPE	
MAX_SLOPE	
VG_SLOPE	
Select All Unselect All	Add Value
1ethod (optional)	
	1000

 According to the theory, the banjir bandang occurred in river sections that have a slope between 2 – 10 degrees. Therefore, we have to determine the river segments that have the criteria.

Click Selection and click Select By Attributes.

12) Next will Select By Attributes window. On combo box of Layer choose layer "sungai_utama_01_dissolve". Write the formula "Avg_Slope" >=2 AND "Avg_Slope" <11 on formula window. Click OK button.

Select By	Attributes
Layer:	sungai_utama_01 dissolve
Method:	Create a new selection
"FID" "Id" "Avg_Slop	2 2 2) [Like]
	() Not
ls	Get Unique <u>V</u> alues <u>G</u> o To:
SELECT * F	ROM sungai_utama_01 dissolve WHERE:
"Avg_Slop	e" >=2 AND "Avg_Slope" <11
Cl <u>e</u> ar	Verify Help Load Saye

- 13) Right click layer "sungai_utama_01_dissolve", point the cursor to Data, then click Export Data. Insert data that will be exported into folder: Data source for training\11 Creating banjir bandang hazard area, and give name "sungai utama 01 dissolve edit.shp".
 If there is question whether the exported data will insert into ArcMap workspace, answer Yes. Next will be formed layer "sungai utama 01 dissolve edit" in ArcMap workspace.
- On this step we will edit the data or objects of layer "sungai utama 01 dissolve edit", according to the slope ranges in step 11 above.
 Click Editor button, on Start Editing window, choose layer "sungai utama 01 dissolve edit".

15) Click button on Editor toolbar, and select all objects on layer "sungai utama 01 dissolve edit" which are beyond range between the up arrow and down arrow, as shown below.



- 16) After all the objects selected, remove by using the Del key on the computer keyboard.
- 17) Click Editor button, click Save Edits, and click Stop Editing.
- 18) On ArcToolbox window, click + symbol on Data Management Tools \rightarrow Generalization, double click Dissolve. Next will appear Dissolve window.
- 19) On combo box Input Features, choose layer "sungai utama 01 dissolve edit". On text box Output Feature Class, save the data into folder: Data source for training\11 Creating banjir bandang hazard area, give name "sungai utama 01 target.shp". Check FID on Dissolve Field(s) window. Click OK button. Next will be formed layer "sungai utama 01 target" in ArcMap workspace.

Dissolve	
Input Features	
sungai_utama_01_dissolve_edit	- 🖆
Output Feature Class	
anjir bandang hazard area\sungai_utama_()1_target.shp 🛗
FID Id Avg_Slope	

Step 3. Changing 2D features into 3D features

- On this step we would like to make 2D feature into 3D features.
 On ArcToolbox window, click + symbol on 3D Analyst Tools → Functional Surface, double click Interpolate Shape.
- 2) Next will appear Interpolate Shape window. On combo box Input Surface, choose layer "dem_10". On combo box Input Feature Class, choose layer "sungai utama 01 target". On text box Output Feature Class, save the data into folder: Data source for training\11 Creating banjir bandang hazard area, and give name "sungai utama 01 target 3D.shp". Click OK button.

Interpolate Shape		×
Input Surface		^
dem_10	8	
Input Feature Class		
sungai_utama_01_target	6	
Output Feature Class		
eating banjir bandang hazard area\sungai utama 01 target 3D.shp	8	
Sampling Distance (optional)		
Z Factor (optional) Method (optional)	1	
BILINEAR	~	
Interpolate Vertices Only (optional) Pyramid Level Resolution (optional) 0	~	~
OK Cancel Environments Show	Help >>)

3) Export data/layer "sungai utama 01 target 3D" into folder: Data source for training\11 Creating banjir bandang hazard area, and give name "sungai utama 01 target 3D p5".

If there is question whether the exported data will insert into ArcMap workspace, answer Yes.

- On ArcToolbox window, click + symbol on Data Management Tools → Features, double click Adjust 3D Z. Next will appear Adjust 3D Z window.
- 5) On this step we will make an assumption of banjir bandang inundation height. For preliminary assumption, we can use height value as 5 m from river bed.

On combo box Input Features, choose layer "sungai utama 01 target 3D p5". On text box Adjust Z Value, fill with value 5, which means that we will raise the height of feature/object is at 5 meters. Click OK button.

[≪] Adjust 3D Z	
Input Features	~
sungai_utama_01_target_3D_p5	- 2
Reverse Sign of Z Values (optional)	
NO_REVERSE	~
Adjust Z Value (optional)	
	5
Convert From Units (optional)	
	~
Convert To Units (optional)	
0105 22	× ×
OK Cancel Environmen	nts Show Help >>

Step 4. Making banjir bandang hazard area

- Right click layer "sungai utama 01 target 3D p5", then export into folder: Data source for training\11 Creating banjir bandang hazard area, and give name "sungai utama 01 target 3D p5 edit.shp". If there is question whether the exported data will insert into ArcMap workspace, answer Yes.
- 2) Click Editor button, click Start Editing, choose layer "sungai utama 01 target 3D p5 edit" on Start Editing window, then press OK button.
- 3) Select entire objects on layer "sungai utama 01 target 3D p5 edit" using button on Editor toolbar.
- 4) Open or view the Advanced Editing toolbar by right click on any empty space on ArcMap workspace, then click Advanced Editing.



5) Next will appear Advanced Editing toolbar as below.



- 6) Press Copy Features Tool 🗹 button on Advanced Editing toolbar.
- 7) By using reference of the selected object position in the form of "X" sign, copy and paste the selected object to the left and right in parallel, approximately as far as 750 meters.



- 8) Click Editor button, click Save Edits, and click Stop Editing.
- On ArcToolbox window, click + symbol on 3D Analyst Tools → TIN Management, double click Create TIN. Next will appear Create TIN window.

10) On text box Output TIN, insert the resulted data into folder: Data source for training\11 Creating banjir bandang hazard area, give name "tin_01". On text box of Spatial Reference, choose "WGS_1984_UTM_Zone_49S". Choose layer "sungai utama 01 target 3D p5 edit", on combo box Input Feature Class. Press OK button.

K:\SABO IV\# Traini	ng SOURCE #\r	new results\11	Creating banjir b	0
patial Reference (op	otional)			_
WGS_1984_UTM_Zd	one_49S			1
nput Feature Class (optional)			_
			•	6
in_feature_class	height_field	SF_type	tag_field	+
🔶 sungai_utam	Shape.Z	hardline	<none></none>	
				×
				1
				-
				+
<			>	

- 11) On ArcToolbox window, click + sign on 3D Analyst Tools \rightarrow Conversion \rightarrow From TIN, double click TIN to Raster.
- 12) Next will appear TIN to Raster window. On combo box of Input TIN, choose layer "tin_01". On text box of Output Raster, insert the resulted data into folder: Data source for training\11 Creating banjir bandang hazard area, and give name "raster_01". On combo box Sampling Distance, choose "CELLSIZE 10". Click OK butoon.

Input TIN	
tin_01	▼ 6
Output Raster	
#\new results\11 Creating banjir bandang	hazard area\raster_01 😁
Output Data Type (optional)	
FLOAT	~
Method (optional)	
LINEAR	~
Sampling Distance (optional)	
CELLSIZE 10	~
Z Factor (optional)	
	1

- On ArcToolbox window, click + sign on 3D Analyst Tools → Raster Surface, double click Cut Fill. Next will appear Cut Fill window.
- 14) On combo box of Input before raster surface, choose layer "dem_10". On combo box of Input after raster surface, choose layer "raster_01". On text box of Output raster, insert the resulted data yang into folder: Data source for training\11 Creating banjir bandang hazard area, and give name "cutfill_01". Click OK button.

Input before raster s	urface			Transf 1
dem_10			-	
Input after raster su	rface			
raster_01			•	2
Output raster				
E #\new results\11	Creating banjir ba	andang hazard ar	ea\cutfill_01	1
Z factor (optional)				
				1

- 15) Right click layer "cutfill_01", and open the attribute table.
- 16) Right click column "VOLUME" and click Sort Ascending.

ill_01					×
Rowid	VALUE*	COUNT	VOLUME		Anna I and
2	3	48549	-294819	1	Sort
32	33	10484	-194473	7	Sort Descending
9	10	2917	-648596		Advanced Sorting
78	79	6947	-5243050		Auvanceu sorting
30	31	2579	-2128978.		Summarize
50	51	1655	-1135866.30	5	Statistics
5	6	840	-1132687.20	-	5005005111
37	38	54	-56061.767		Field Calculator
22	23	64	-29837.2497		
62	63	160	-24017.1173		
95	96	73	-19950.9231		Turn Field Off
38	39	32	-11442.529		Franze & Infranze Column
18	19	37	-11442.2607		Treeze/ontreeze coldinin

17) Select entire row that have negative value of VOLUME.

l_01				
Rowid	VALUE*	COUNT	VOLUME	AREA
52	53	1	-32.7606201171875	100
31	32	1	-28.009033203125	100
4	5	1	-16.0888671875	100
39	40	1	-12.567138671875	100
26	27	1	-4.6875	100
66	67	1	-4.6173095703125	100
19	20	1	-3.173828125	100
20	21	1	1.226806640625	100
36	37	1	4.248046875	100
76	77	1	4.7210693359375	100
42	43	1	7.000732421875	100
13	14	1	20.806884765625	100
3	4	1	25.37841796875	100

- 18) On ArcToolbox window, click + sign on Conversion Tools \rightarrow From Raster, double click Raster to Polygon.
- 19) Next will appear Raster to Polygon window. On combo box of Input raster, choose layer "cutfill_01". On combo box Field, choose VALUE. On text box Output polygon features, save the resulted data into folder: Data source for training\11 Creating banjir bandang hazard area, and give name "cutfill_01.shp". Check Simplify polygons (optional). Click OK button.

5	Raster to Polygon	
	Input raster	<u>^</u>
	cutfil_01 💌	6
	Field (optional)	
	VALUE	~
	Output polygon features	
	K:\SABO IV\Data source for training\11 Creating banjir bandang hazard area\cutfil_01.shp	8
	Simplify polygons (optional)	
	OK Cancel Environments) Show He	!p >>

20) Click Clear Selected Features button.

Step 5. Editing banjir bandang hazard area

 Banjir bandang hazard area need editing as there are hazard areas that are outside of the river flow and there are hazard areas that do not fit the logic or reality on the field. Right click layer "cutfill_01" → Edit Features, and double click Start Editing.

	Copy Remove		ools Is	
	Open Attribute Table Joins and Relates		ools	
813	Zoom To Layer Zoom To Make Visible Visible Scale Range	,		
	Use Symbol Levels			
	Selection	•		
	Label Features	_	-	
	Edit Features	+	1	Start Editing
R	Convert Labels to Annotation			Define New Types Of Features
% _	Convert Features to Graphics Convert Symbology to Representation		-	Organize Feature Templates
	Data	•	1	
 <!--</td--><td>Save As Layer File Create Layer Package</td><td></td><td></td><td></td>	Save As Layer File Create Layer Package			
TAR	Properties		1	

- 2) Right click layer "cutfill_01" \rightarrow Selection \rightarrow Make This Only Selectable Layer.
- 3) By using button on Editor toolbar, select polygon object on layer "cutfill_01" that on the river flow.
- 4) Delete the objects by press Del button on computer keyboard.
- 5) For polygon object that should be edited by changes its shape, the first is select the object by using ▶ button on Editor toolbar.
- 6) On Editor toolbar, click Cut Polygon Tools 😐 button.
- 7) Cut the polygon objects that assume the inundation is not fitted with the actual condition in the field.



8) After all of polygon objects has finished editing, click Editor button, click Save Edits, and click Stop Editing.

Next we will use "area rawan banjir bandang ref.shp" that contained in folder: Ref.

VII. Making Landslide Potential Map and Banjir Bandang Hazard Map

- 1) Open/run ArcMap, choose Blank Map.
- 2) Insert data "citra satelit.tif" that derived from folder: Data source for training\01 Satellite image.
- 3) Insert data "das ref.shp" and "area rawan banjir bandang ref.shp" that derived from folder: Ref.
- 4) Insert file layer of "Potensi longsor berdasarkan faktor gabungan.lyr" that derived from folder: Data source for training\10 Landslide potential by combine factor.
- 5) Change the transparency layer of "Potensi longsor berdasarkan faktor gabungan" and layer "area rawan banjir bandang ref", become 35%.
- 6) Click layout view button, located at the bottom of the ArcMap workspace.



7) Right click on any empty space ArcMap workspace, and choose Layout to display Layout toolbar.

Layout Toolbar is like the figure below.



- 8) Click Change Layout 🛍 button on Layout toolbar.
- 9) Next will appear Select Template window. Click tab ISO (A) Page Size, choose ISO A3 Portrait.mxd. Click Finish button.



10) Click Insert on ArcMap main menu, then click Title.



11) Next will appear Insert Title window. Write the title as "Peta potensi longsor dan rawan banjir bandang". Click OK button.



Set type, font size and its position on the map.

- 12) Click Insert on ArcMap main menu, then click Scale Bar.
- 13) Next will appear Scale Bar Selector window.



Choose "Alternating Scale Bar 1", then click OK button. Set type, font size and its position on the map.

- 14) Click Insert ArcMap main menu, then click "North Arrow".
- 15) Next will appear North Arrow Selector window.



Choose the north symbol as you wish, then click OK button. Set type, font size and its position on the map.

- 16) Click Insert ArcMap main menu, then click "Legend".
- 17) Next will appear Legend Wizard window.

das ref area rawan banjir bandang ref potensi_longsor_berdasarkan_	das ref area rawan banjir bandang ref potensi_longsor_berdasarkan_fakto
citra satelit.tif	
<	
et the number of columns in your ler	

On Legend item are, remove satellite image by choosing layer "citra satelit.tif" on part of Legend Items, and by clicking statements button. Click Next button.

18) On Legend Wizard part-2 window, we can change the legend title and change the view color and font character. Click Next button.

egend litle	
egend Title font properties	Title Justification You can use this to control the justification of the title with the rest of the legend.
B I U	

19) On Legend Wizard part-3 window, we can change the view of legend frame. Click Next button.

Legend Wizard	
Legend Frame Border	
Background	
Drop Shadow	
Gap <u>R</u> ounding	
Preview	J.
	< Back Next > Cancel

20) On Legend Wizard part-4 window, we can change the view character of legend symbol for each layer. Click Next button.

_egend Items:	Patch
Area rawan banjir bandang	Width: 40.00 (pts.)
Daerah Aliran Sungai Potensi longsor berdasarkan faktor gabun	Height: 20.00 (pts.)
	Line: •
	Area:

21) On Legend Wizard part-5 window, we can change the spacing between each layers in the legend.

Title and Legend Items:	11.43	(pts.)		e
Legend Items:	7.14	(pts.)	Legend Item 1	Legend Item 3 Heading
Columns:	7.14	(pts.)	Label description	Label description
Headings and Classes:	7.14	(pts.)	Label de soription	Label description
Labels and Descriptions:	7.14	(pts.)	Legend Item 2	Legend Item 4
Patches (vertically):	7.14	(pts.)		
Patches and Labels:	7.14	(pts.)		

Click Finish button. Set the size and its position on the map.

- 22) To insert the coordinate information on the map layout, right click Layer on the Table of Contents and click Properties.
- 23) Next will appear Data Frame Properties window. Click Grids tab.

	Annotation Gro	ups Extent In	dicators	Frame	Size a	ind Positio
General	Data Frame	Coordinate S	/stem	Illuminat	ion	Grids
Reference grids	are drawn on top	of the data frame	in Layout	view only.		
				<u>N</u> e	w Grid	R
				Ren	nove Gri	t
			Style		ityle	
				Pto	perties	
				Convert	To Grau	hics

- 24) Click New Grid button.
- 25) Next will appear Grids and Graticules Wizard window. There are 3 radio button for different coordinated system. Choose Graticule, click Next button.

	Graticule: divides map by meridians and parallels
ors-	Measured Grid: divides map into a grid of map units
pars-	Reference Grid: divides map into a grid for indexing
pors-	
bos-	Grid name: Graticule1

26) Next will appear Create a graticule window. Fill in the Intervals part, the coordinate interval that we want to show. For example, on parallel line and meridians line, we fill with value 3'. Click Next button.

	Appearance Labels only Tick marks and labe Graticule and labels	els		Style:	
1-5/2	Intervals				
		Deg	Min	Sec	
4 2	Place parallels every	0	3	0	latitude
	Place meridians every	0	3	0	longitude

27) Next will appear Axes and labels window. Choose character of line and label that we want to show. Click Next button.

Axes and labels	?
	Axes
- (Sin.	Line style:
1	Minor division ticks
1 ASP	Number of ticks per major division:
	Labeling
	Text style: AaBbCc
	<back cancel<="" td=""></back>

28) Next will appear Create a graticule window. Determine the character types of coordinate boundary lines, and determine wheter we want to display Neatline (line edge map). Click Finish button.

Create a graticule	2
	Graticule Border
	Graticule Properties Store as a static graphic that can be edited Store as a fixed grid that updates with changes to the data frame
	< Back

Automatically, ArcMap will show the label of coordinates label on the map frame. This coordinate value will automatically change if we change or pan the data/object position.

29) To adjust the position of objects on the map layout to be more neat and pleasant to look at, we can set the margin of a certain size according to our wishes.

The trick, click and drag the mouse cursor on the bar layout to produce a certain margin size. Automatically, the dashed line in blue will be formed. Objects that exist in the layout can be snap to the line.

	5	Å ¹⁰	15 <u>1</u> 2	0 25	A30	35 40	45	50 58	60	J65	70	J75	180	J85	 90
00 414						Layout	M 🖸		1 21		15	6%	•	2) (2)	- 6 - 1
889 (394 (399 (404 (5						®⊳ F	р _е	eta	3	Ρ	0	oto	e	n	si
g 79 p84					11:	3°30'	0"E						1	13	°33'
349 554 559 384 569 374			7°54'	0"S		+									+
329 334 339 344															

30) Here are some tips that provide information about the tool differences between Tools toolbar and Layout toolbars.



From both toolbar, we can see that there are some tools that have image/icon similarity that are the tool of Zoom In, Zoom Out, Panning, Full Extent / Zoom Whole Page. When we use the tool from the Tools toolbar in the Layout workspace, then the change is object data or the contents of the map. Whereas if we use the tool from Layout toolbar, then the contents of the object data will not change but just the view of the layout only.

As an example we can use the Zoom In tool on the Layout toolbar to zoom in the corners of the map frame when we want to set the size of the margin.

- 31) To make/export the map into PDF format, click File and click Export Map.
- 32) Next will appear Export Map window. Choose the type of file that we want to save that is PDF.

Export Map				
Save in:	🚞 11 Creating ba	anjir bandang hazard area 🛛 🍸	🖌 🕝 🤣 📂 🛄 - 🟠	
My Recent Documents	Cutfil_01 info raster_01 tin_01 membuat peta			
My Documents				
My Network Places	File name: Save as type:	Peta potensi longsor dan rawan l PDF	banjir bandang 👻 🛛 Save	-
General Format	Pages Advance	ed		
Resolution: Output Image (Fast Ratio:	300 Quality (Resample Ra Quality (Ra Quality	et Djibouti		
Clip Output to	Graphics Extent			

On part of Options, set the Resolution = 300 dpi and Output Image Quality = Best. Click Save button.



33) Here is a map the resulting.