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2018
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**Presented at the FIG Congress 2018,
May 6-11, 2018 in Istanbul, Turkey**

XVI FIG Congress 2018

6-11 May 2018
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**EMBRACING OUR SMART WORLD WHERE THE CONTINENTS CONNECT:
ENHANCING THE GEOSPATIAL MATURITY OF SOCIETIES**

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Developing Model of Agriculture Land Consolidation As a tool to recover from Industrial Liquid Waste Pollution Hazards (9311)



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Institut Teknologi Bandung

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Background

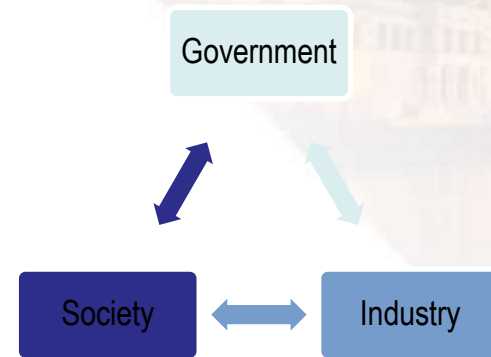
Research Area in Ranca Ekek district



Mineral Condition in Agruculture soil

Chemical Elements	Content within soil in (ppm)	Quality standard of Soil (ppm) (Alloway)	Above the quality standard
Cu	43,00 – 83,00	60 – 125	Yes
Zn	57,00 – 137,00	70 – 400	Yes
Pb	8,73 – 22,76	100 – 400	No
Cd	0,05 – 0,19	3 – 8	No
Cr	0,78 – 24,93	75 – 100	No
Ni	13,75 – 20,53	100	No

Stake Holders in Land Consolidation





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PROBLEMS

- **What effort should be done to recover the industrial liquid waste hazard with high level efficiency?**
- **What is the role of community development to overcome the hazard of liquid waste?**
- **What methods and land consolidation model which appropriate to solve the liquid waste hazard related to the characteristics of environment in areas contaminated as well as the legal aspects of the land tenure?**

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OBJECTIVES

- **To generate liquid waste hazard mitigation solutions in order to improve water quality and productivity of agriculture (recovery from disaster)**
- **To generate the appropriate consolidation model with the characteristics of the environment in areas contaminated as well as based on the legal aspects and the environment**

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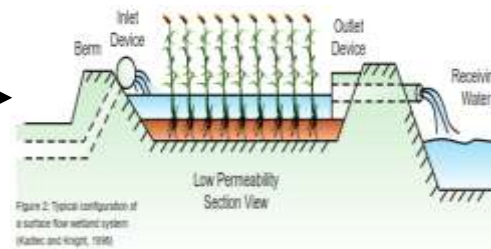
Liquid Pollution



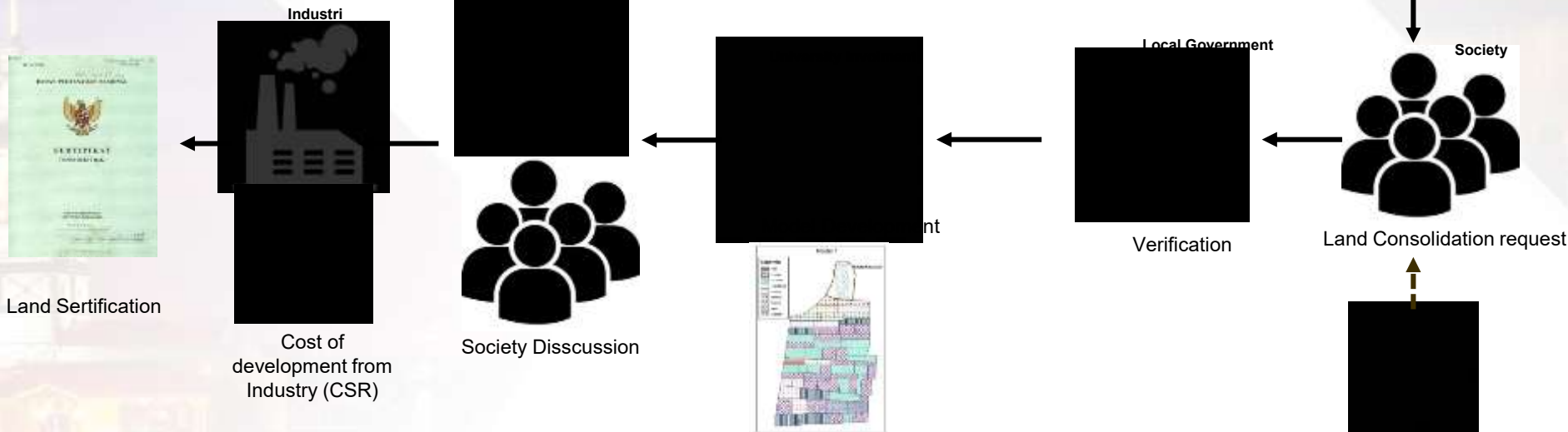
Agriculture land Damage



Fitoremediation



Need the lands



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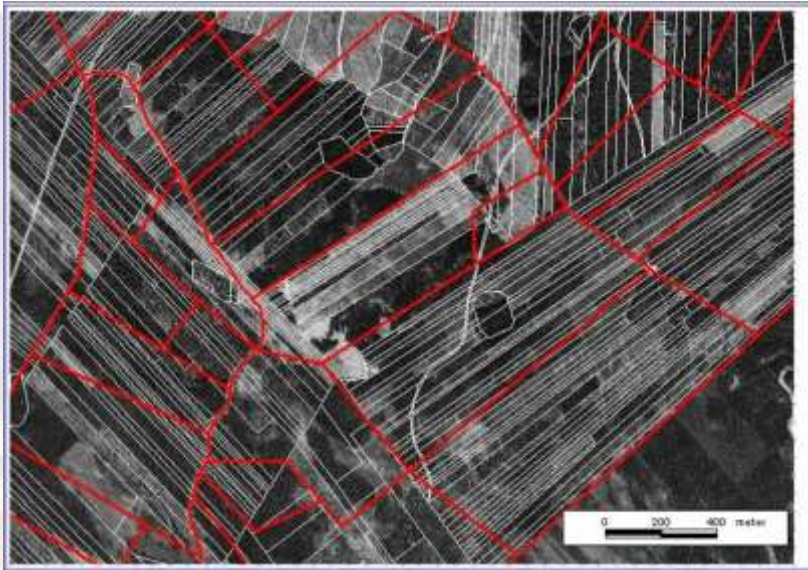


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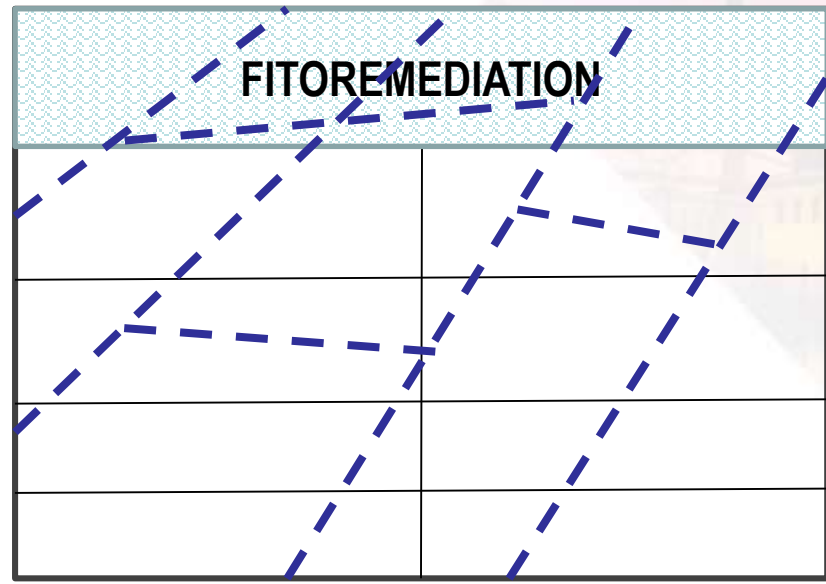


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Agriculture Land Consolidation



Agriculture Land Consolidation in this research



There are Community involvement

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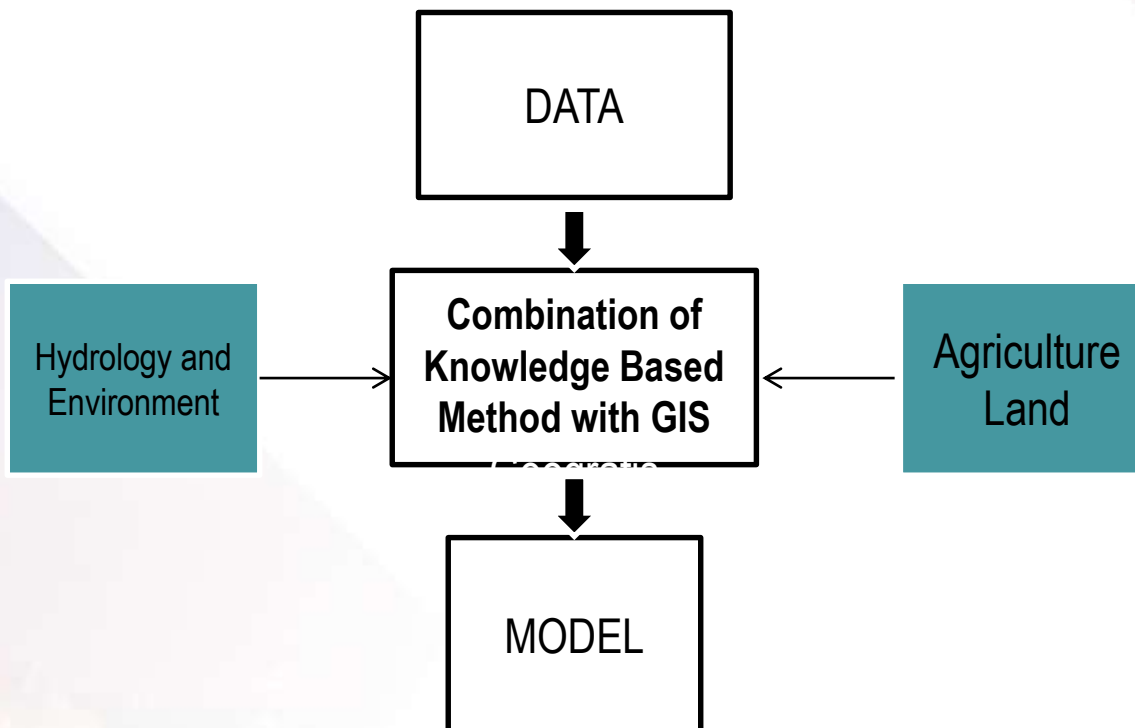


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Combination of Knowledge Based Method with Geographical Information System



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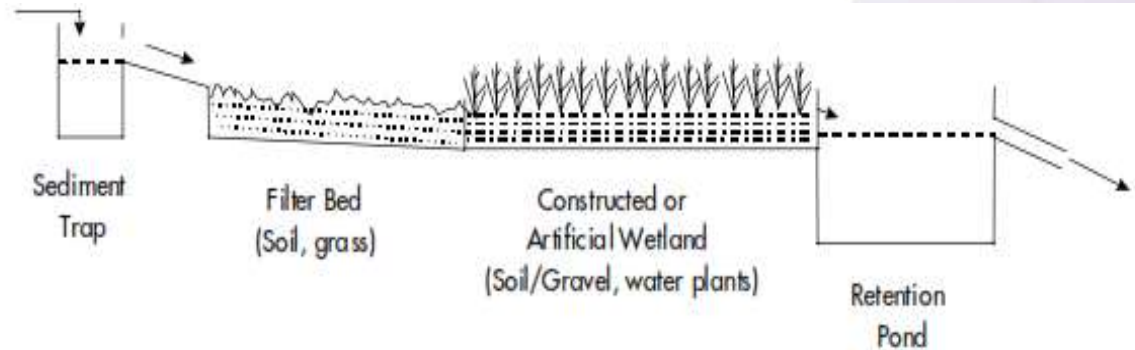


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Fitoremediation by developing of *Constructed Wetland*



Formula Reed

$$A_h = KQ_d (\ln C_o - \ln C_t)$$

Description	Value	Data sources
Constanta	5,2	Standard constanta for Agriculture land less than 2,2 ha (Wetland International, 2003)
Qd (average debit of liquid pollution (m3 d-1))	520,67	Computation result by methods of F.J. Mock
Co (average content of BOD ₅ (mg l ⁻¹))	147 mg/L	Research Result by Nurhaeni (2011)
C _t (threshold content BOD ₅ (mg l ⁻¹))	60 mg/L	Liquid Pollution Standard BOD5 from Environmental regulation No.5 year 2014

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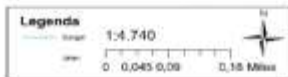
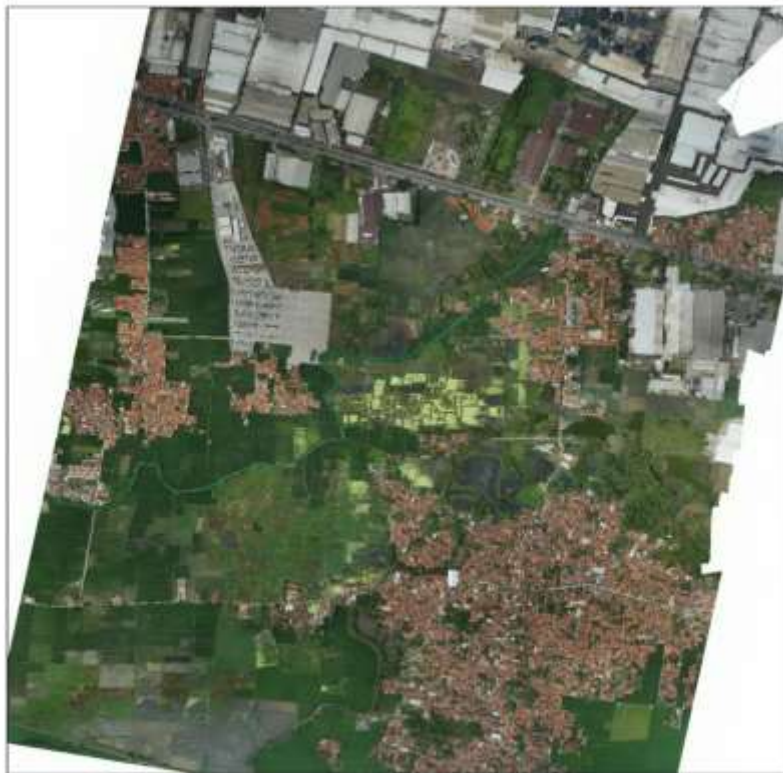


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Peta Foto Desa Linggar



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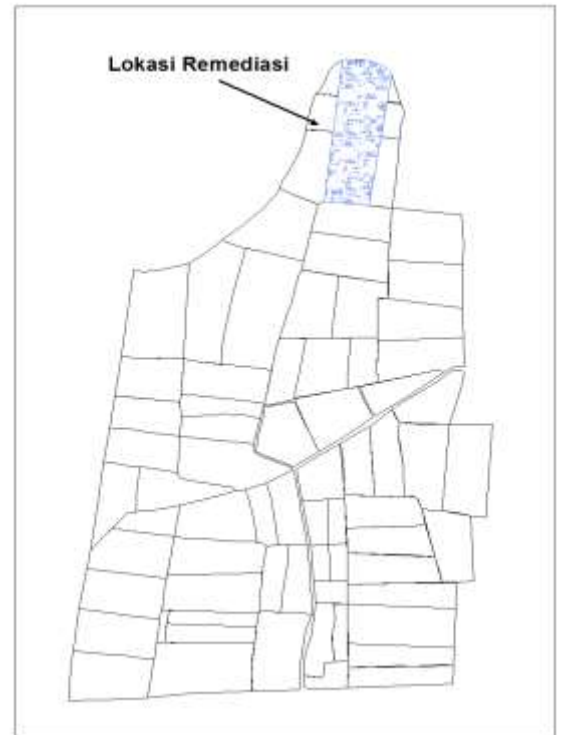
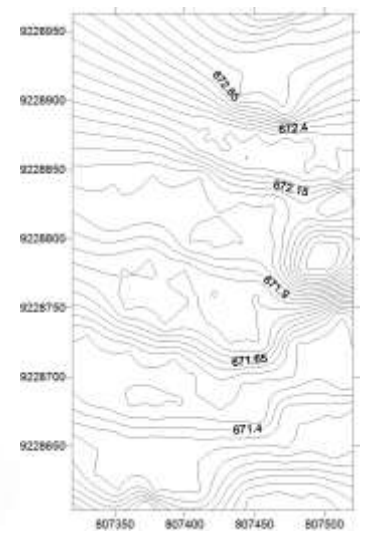
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Site Selection of Agriculture Land Consolidation

- Simple Irrigation
- Near the polluted river
- Land ownership data



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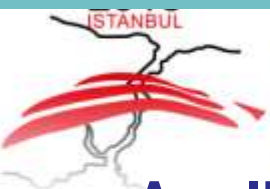
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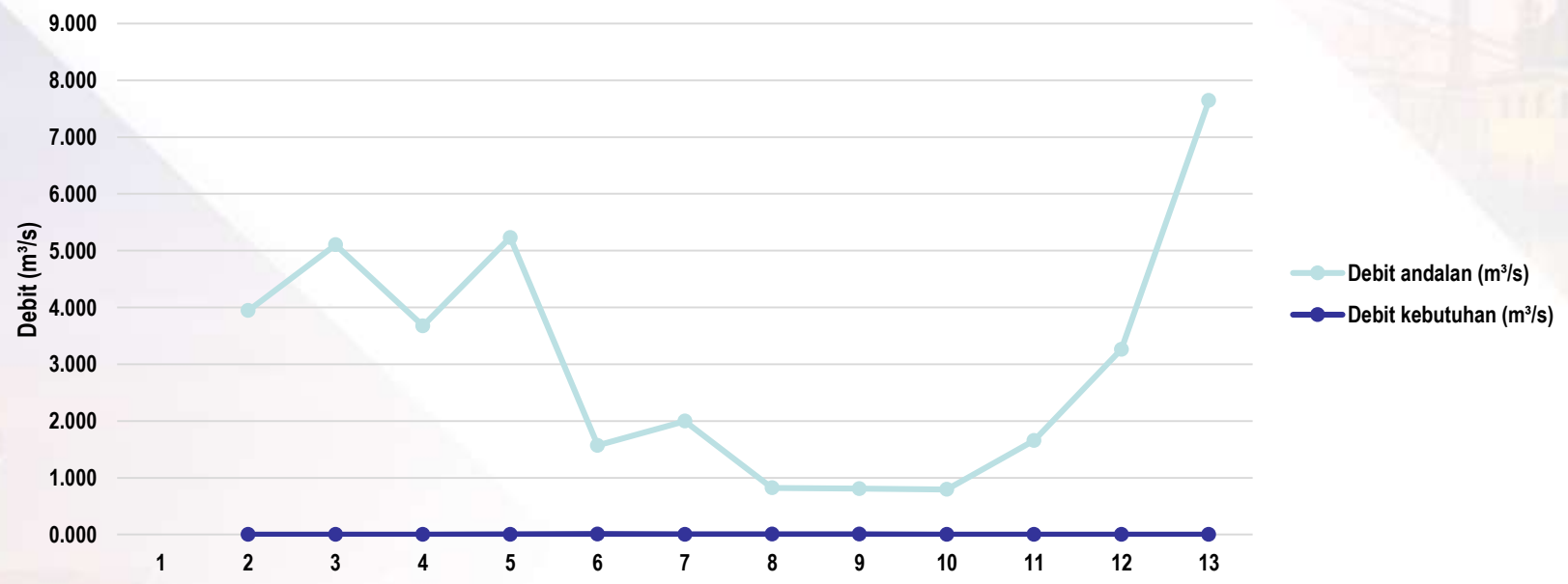
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Analisis Water Supply and Water Demand

Comparison of Main Debit and Debit Needed



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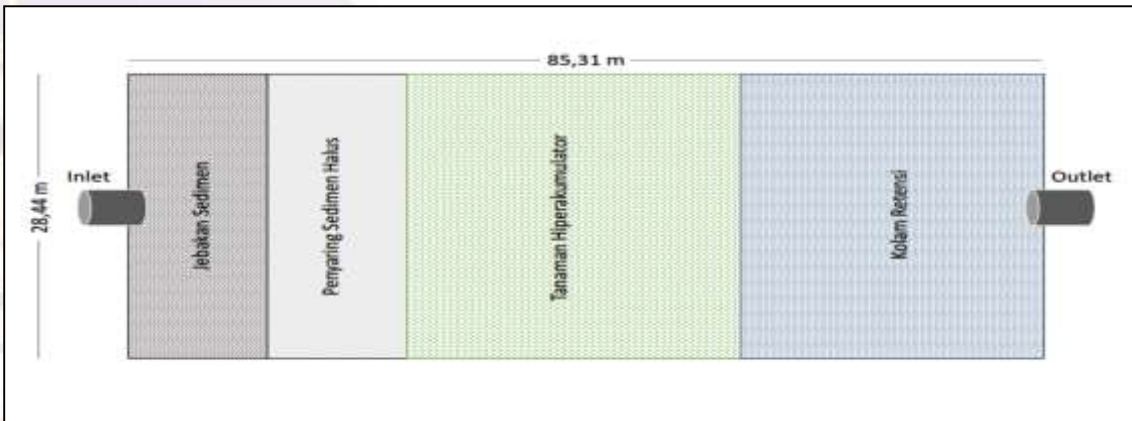
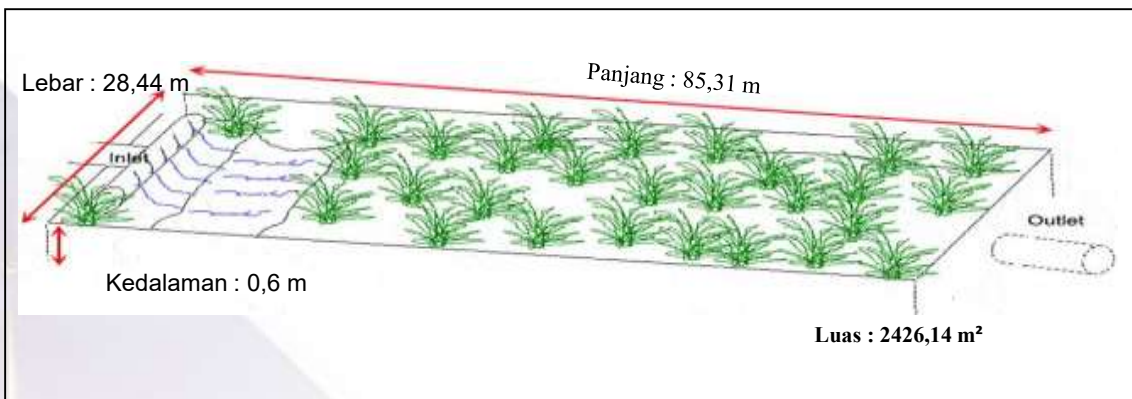
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Constructed Wetland



1. Plantation Hyper A1



2. Plantation Hyper A 2



3. Plataction Hvoer A3



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Model 1

- Same Procentage of STUP (Contribution of Land for development)
- Parcel design with the same area per ownership

Model 2

- Same Procentage of STUP (Contribution of Land for development)
- Parcel design per ownership

Model 3

- STUP Area with a distance weight from parcel to parcel
- Parcel design per ownership

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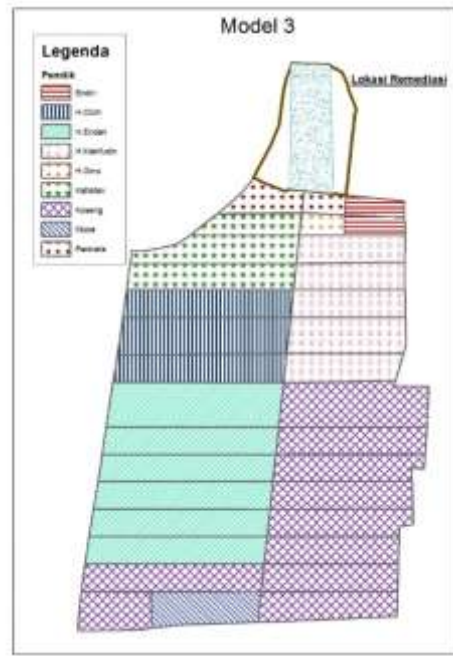
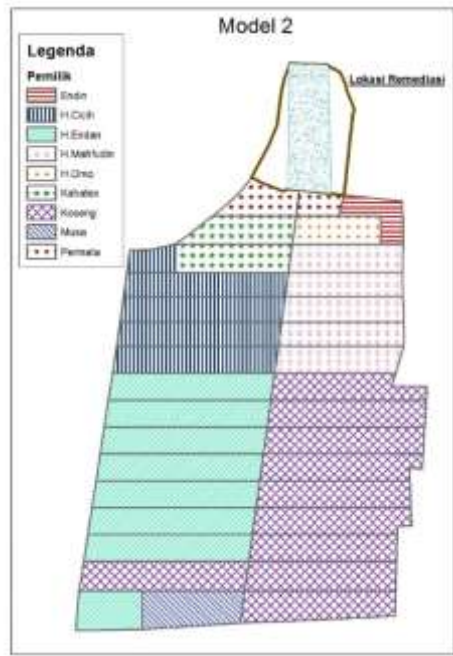
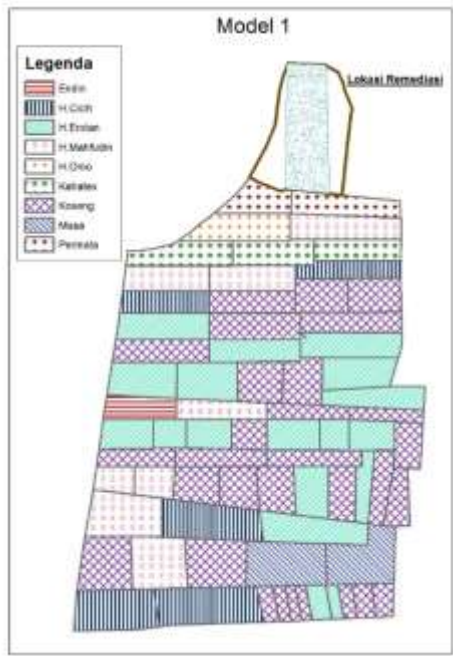
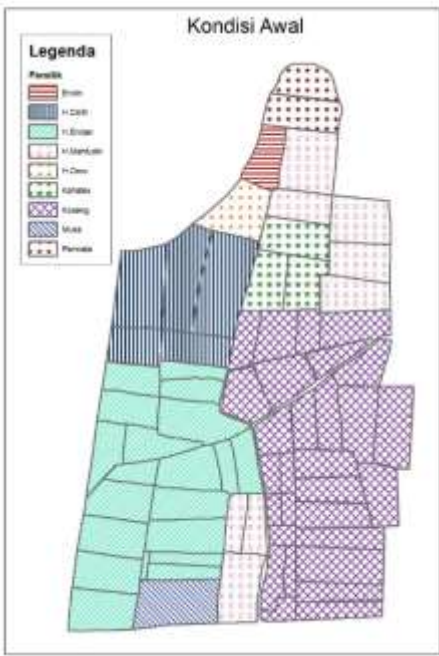
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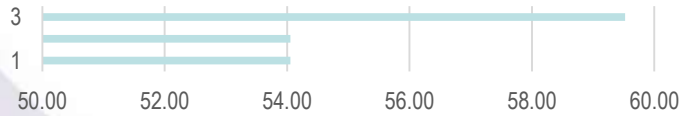
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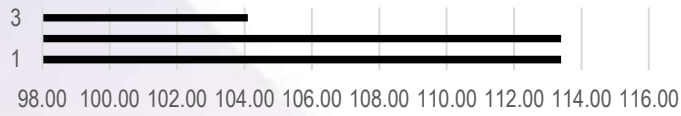
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Area comparison of STUP among Model

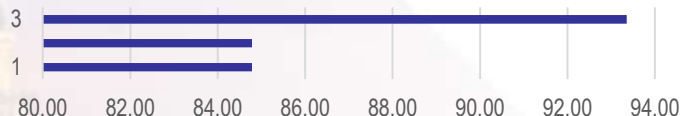
Endin



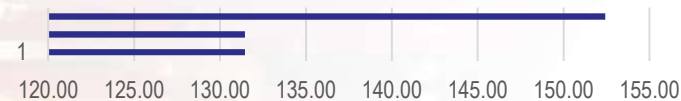
Musa



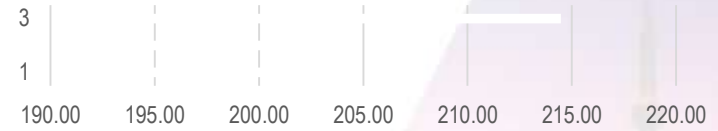
H.Omo



Permata



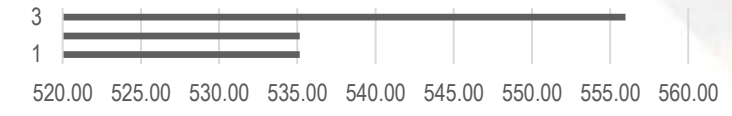
Kahatex



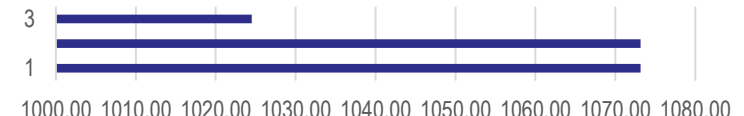
H Cich



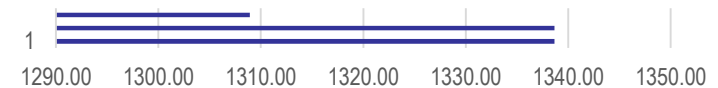
H.Mahfudin



H.Endan



Koseng



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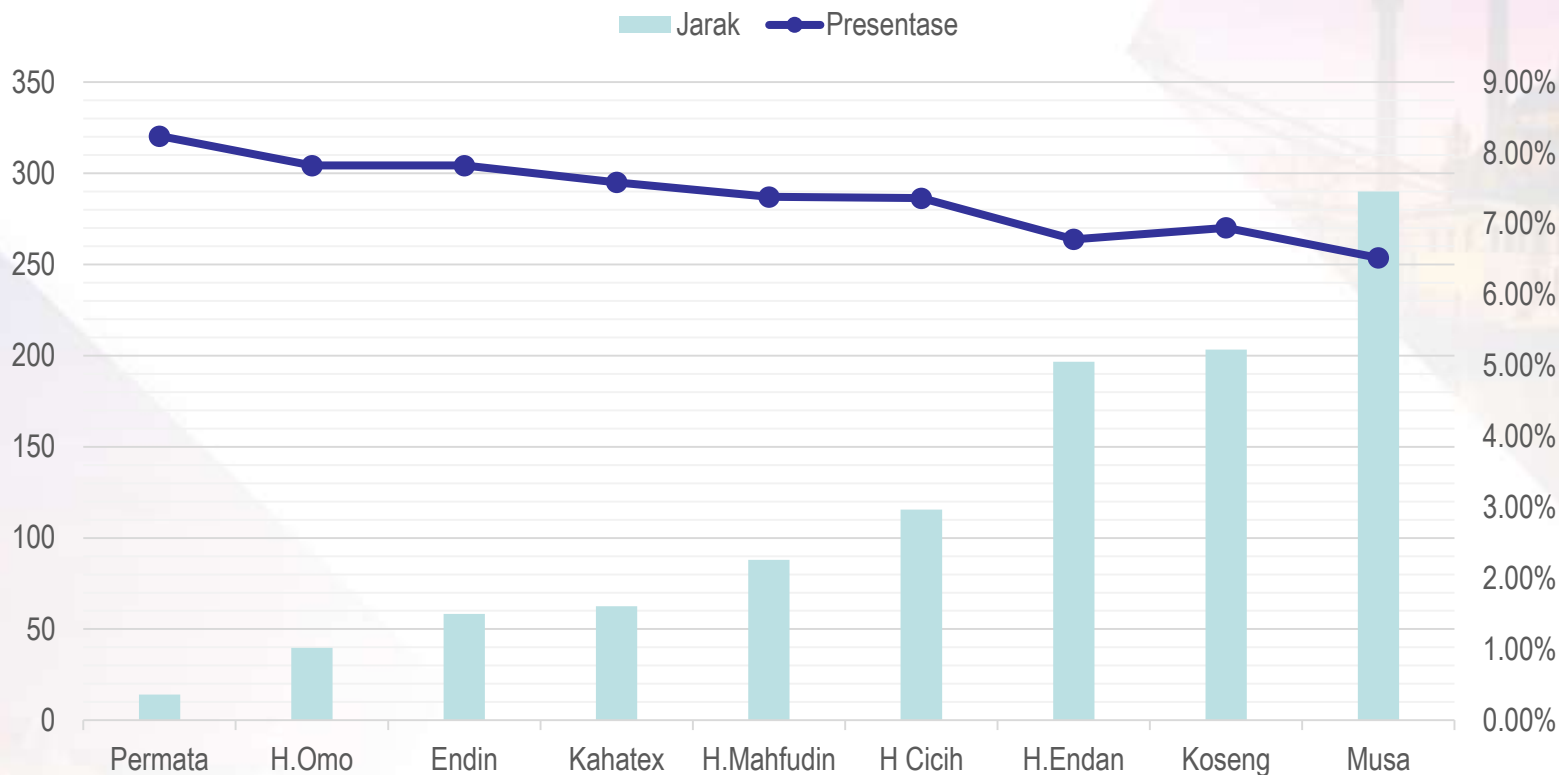


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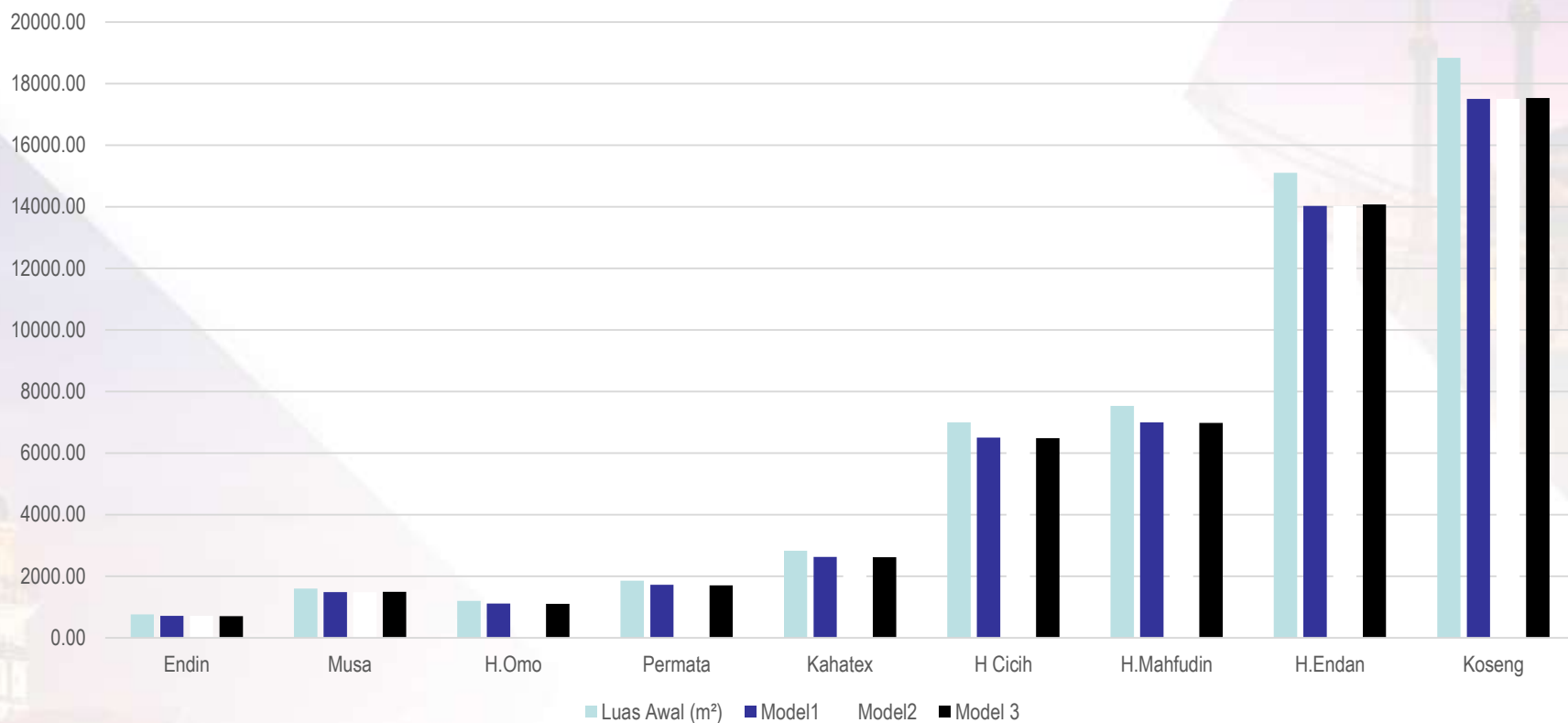
Distance Comparison and Presentage of STUP Model 3





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Area comparison among Model



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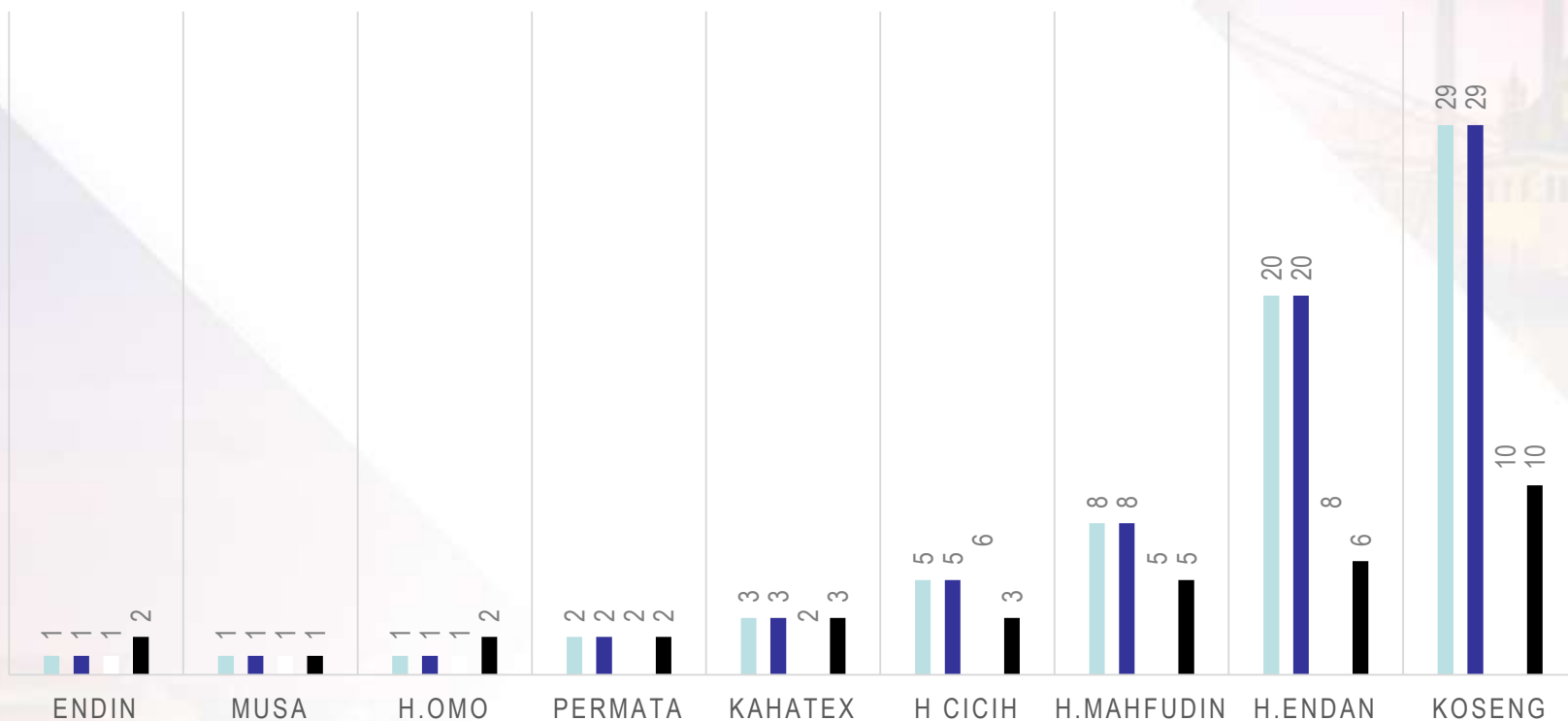
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COMPARISON OF TOTAL PARCEL NUMBERS

Jumlah Persil Awal Jumlah Persil Model1 Jumlah Persil Model2 Jumlah Persil Model 3



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Model	Advantage	Disadvantage
Model 1	<ol style="list-style-type: none"> 1. Percentage of STUP is uniform 2. Number of parcel constant 3. the parcels distributed with same area (water distribution equal) 	<ol style="list-style-type: none"> 1. The parcels are dispersed 2. Parcel design not in good order
Model 2	<ol style="list-style-type: none"> 1. Percentage of STUP uniform 2. Parcel area become larger 3. Good parcel design n not distributed 	<ol style="list-style-type: none"> 1. Less number of parcels
Model 3	<ol style="list-style-type: none"> 1. Percentage of STUP based on the water quality distribution 2. Parcel area become larger 3. Good parcel design n not distributed 	<ol style="list-style-type: none"> 1. Percentage of STUP not uniform 2. Need more study & socialization regarding to weighted of parcel distribution.

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Impact of Remediation and Consolidation

Impact	Before	After	Description
Environment (Content of BOD5)	147	60	Deminishing of 59%
Agriculture Production (Paddy)	0,6 ton	2,5 ton	Improvement of 400%
Income (per hectare)	Rp 3.069.600	Rp 12.790.000	improvement 400%
Legal aspect of land tenure	Letter C (Girik)	Ownership Title Certificate of Land	Security Tenure

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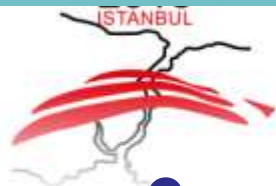
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Conclusion

- Development of constructed wetland is needed to reduce the polluted liquid waste of industry within the Agriculture area.
- Location of Agriculture Consolidation has 5,8 hectares with number of parcel lands of 70 and belong to 9 owners. The need of land remediation only for 0.4 hectares, so that the rest of consolidated area is 5,3 hectares.
- Base on this consolidation model, there are 3 different model approaches, where model 1 and 2, every parcel gave contribution of 7 persen of total area origin, where the model 3, contributed area differently between 6-8%, because of the parcel distance weighted method was applied to the distance of remediation land.
- Base on the areal analisis and STUP, model 3 is an proper model regarding to the wisdom of water qualityy distribution. The parcel design of model 3 using the block of ownership system where parcels location are more proper irrigated.
- The effort to recover industrial waste liquid pollution hazard to agriculture area, the development of land remediation is very important role to recover the environment :
 - reduced the content of BOD5 around 59%)
 - improving the society walfare with the district
 - Improving agriculture production and
 - Security of land tenure by applying the ownership title related to the land properties.

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Recomendation

- **Need to study more comprehensively in Fitoremediation and *Constructed Wetland Development* in Rancaekek District**
- **For the maximum advantage, the development of Fitoremediation can be distributed to most agriculture area. Because need to get STUP for more larger areal of agriculture development.**

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Thank You FIG 2018 Istanbul Turkey

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