SOIL TYPES MAPPING FOR CAU RIVER BASIN AND INTEGRATION INTO PHYSITEL SOFTWARE .

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ABSTRACT

River basin is an natural ecosystem with complex interacting components. Soil is one from most important component in the structure of river basin environment. Soil surface play role of water preserve, endormose surface water and regulate basin environment. Model for integrated management of river basin is an form where presented close relation between land and water environment in the basin area. The simulation for interaction between land and water components in one mathematic model for river basin environment protection such as Physitel software is a present matter of concern.

Soil types map, including mechanical components of soil based on particles size at trangular sand, limon, clay, and humus thickness are very important in the mathematical model for river basin flow simulation. Information integration system in Physitel support decision makers utilize river basin management model with geographic information system. Spatial data in that integration system will be sensible as nature simulation and help us better to manage water resource in the basin.

1. Background:

River basin is an area of converge both surface and underground water flow discharge to the river. River basin is an natural ecosystem with complex interacting components. Soil is one from most important component in the structure of river basin environment. Soil surface play role of water preserve, endormose surface water and regulate basin environment.

There are three ecosystem regions in Cau river basin: plain, plato and mountainous areas. Topography of the basin create general flow trend at Northwest – Southeast orientation. Highland or wetland, swamp areas, abyss, different subbasins... are natural components which influence to water quantity and quality in the basin. Model for integrated management of river basin is an form where presented close relation between land and water environment in the basin area. There are variety of stakeholders relying on natural resources within watershed, their activities have a direct influence on natural ecosystem balance. Therefore, the simulation for interaction between land and water

components in one mathematic model for river basin environment protection is a present matter of concern.

2. Soil types mapping for Cau river basin:

The interaction between accumulation and denudation proccess to land creation components in Cau river basin originated a diversity of soil types in the area. Based on pedology, in the soil map scalle 1 : 250 000, there are 6 soil groups as follow:

Humic Alisols	Leptosols
Ferrasols and Ferralic Acrisols	Acrisols
Wetland soil	Fluvisols

From 6 above soil groups divided into 18 soil units and one unit of rocky mountain. The most popular soil type is Ferrasols and Ferralic Acrisols in mountainous area. This soil type distributed in the upstream part of river basin. Acrisols and Fluvisols exist on some plato and plain on central- and downstream areas of Thai Nguyen, Bac Giang with land cover mostly are rice and crops cultivations.

Beside of pedologic origination, soil types cover also divided to mechanic structure and humus thickness, it's compositions. That components are very important in the simulation model for surface water flow and discharge in the river basin. From first soil classification, mechanical components of soil divided based on percentage of physical clay particles sized < 0,02mm as follow:

- Sand : percentage < 10%
- Mixed sand : percentage 10 – 20%
- Light red clay ; percentage 20 – 30%
- Medium red clay : percentage 30 – 40%
- Heavy red clay : percentage 40 – 50%
- Clay : percentage trên 50%

According to thickness of humus layer (fine-grained soil), soil classification of FAO as follow :

- Epi Lithic : less than 50cm.
- Endo Lithic : 50 – 100cm.
- Bothi Lithic : more than 100cm.

Agglomerate level and gley of soil are important in the soil map classification too. Gley level divided to: fragile, medium and powerful; at the same time, the gley had beeb defined based on thickness of gley taking from field investigation. The agglomeration divided into 2 class: inland agglomeration and bottom agglomeratiom.

3. Integration of Soil classification map into Physitel software

In Physitel software model, mechanical component of soil divided into 11 class based on "mechanic triangular": sand, limon, clay as follow:

- Cát (sand)
- Cát mùn (loamy sand)
- Mùn cát (sandy loam)
- Mùn (loam)
- Mùn bùn (silt loam)
- Mùn cát sét (sandy clay loam)

- Mùn sét (clay loam)
- Mùn sét bùn (silt clay loam)
- Sét cát (sandy clay)
- Sét bùn (silt clay)
- Sét (clay)

Mechanic component mentioned above had been calculated for surface soil cover less than 50cm. In particular, for Cau river basin and Thai Nguyen – Bac Can provinces, based on field investigation, mechanical components of soil had been classified for 3 thickness level: 0-30cm, 30-50cm and >50cm.

Table 1: Mechanical component for 0 – 30cm thickness level.

Mechanical components	COUNT	Sand (%)	Limon (%)	Clay (%)
Clay và Limon (SAL)	3	30.1933	28.6667	41.1400
Clay, Sand and Limon (SACL)	525	39.7807	29.3660	30.8533
Limon (L)	295	42.6538	33.3992	23.9470
Sandy Limon (CL)	132	53.9702	23.2483	22.7814
Sand (C)	421	58.7646	25.3842	15.8512

Table 2: Mechanical component for 30 – 50cm thickness level.

Mechanical components	COUNT	Sand (%)	Limon (%)	Clay (%)
Clay và Limon (SAL)	24	34.7963	23.8258	41.3779
Clay, Sand and Limon (SACL)	677	38.1706	30.4525	31.3769
Limon (L)	210	44.8339	32.9910	22.1751
Sandy Limon (CL)	301	52.7746	24.0764	23.1491
Sand (C)	158	57.5237	24.6260	17.8503
SI	1	37.2300	32.1300	30.6400
SICL	4	33.4575	34.1175	32.4250

Table 3: Mechanical component for > 50cm thickness level

Mechanical components	COUNT	Sand (%)	Limon (%)	Clay (%)
Clay và Limon (SAL)	65	32.1026	24.6471	43.2503
Clay, Sand and Limon (SACL)	789	35.6921	31.7294	32.5785
Limon (L)	149	45.2871	33.1630	21.5499
Sandy Limon (CL)	349	50.6730	24.6970	24.6300
Sand (C)	24	56.3233	24.8958	18.7808

Table 4: Soil Mechanical component for 5 main class (Vietnam standard)

Mechanical components	COUNT	Sand (%)	Limon (%)	Clay (%)
Sand	1	74.0100	19.8800	6.1100
Mixed Sand	28	65.9618	20.9246	13.1136
Light Red Clay	514	57.5819	25.2651	17.1530
Medium Red Clay	790	40.9022	30.9021	28.1957
Heavy Red Clay	46	37.9893	25.8309	36.1798

Table 5: Soil Mechanical component for 11 class in Physitel

Mechanical components	Sand (%)	Limon (%)	Clay (%)
Sand	74.0100	19.8800	6.1100
Loamy Sand	70.0200	20.0000	11.0100
Sandy Loam	65.9618	20.9246	13.1136
Loam	62.1000	22.2500	15.1100
Silt Loam	57.5819	25.2651	17.1530
Sandy Clay Loam	40.9022	30.9021	28.1957
Clay Loam	38.1100	29.6100	32.2800
Silt Clay Loam	37.9893	25.8309	36.1798
Sandy Clay	32.1000	26.6500	41.2500
Silt Clay	22.6900	33.7300	45.5800
Clay	22.0000	27.9000	50.1000
Rocky			

When input to Physitel software, soil classification map with 11 mentioned above class had been transfer to UTM, zone 48, elipsoid WGS84. In the simulation process of HYDROTEL flow, each class giving respective coeficient. That play very important role also in water quality model and GIBSI in final.

Data integration process had been present in *Fig. 1*

4. Conclusions

Soil types map, including mechanical components of soil based on particles size at trangular *sand, limon, clay*, and humus thickness are very important in the mathematical model for river basin flow simulation. Those models are good tool for us to manage river basin environment for sustainable development. In recent years, with development of informatic technology and remote sensing technique, many software for satellite data processing with high speed and accuracy had been developed. General comprehensive information given from remote sensing data is very useful for input and renew of database for natural resources monitoring, management and effectively utilization.

Information integration system described above support decision makers utilize river basin management model with geographic information system. Spatial data in that integration system will be sensible as nature simulation and help us better to manage water resource in the basin.

References:

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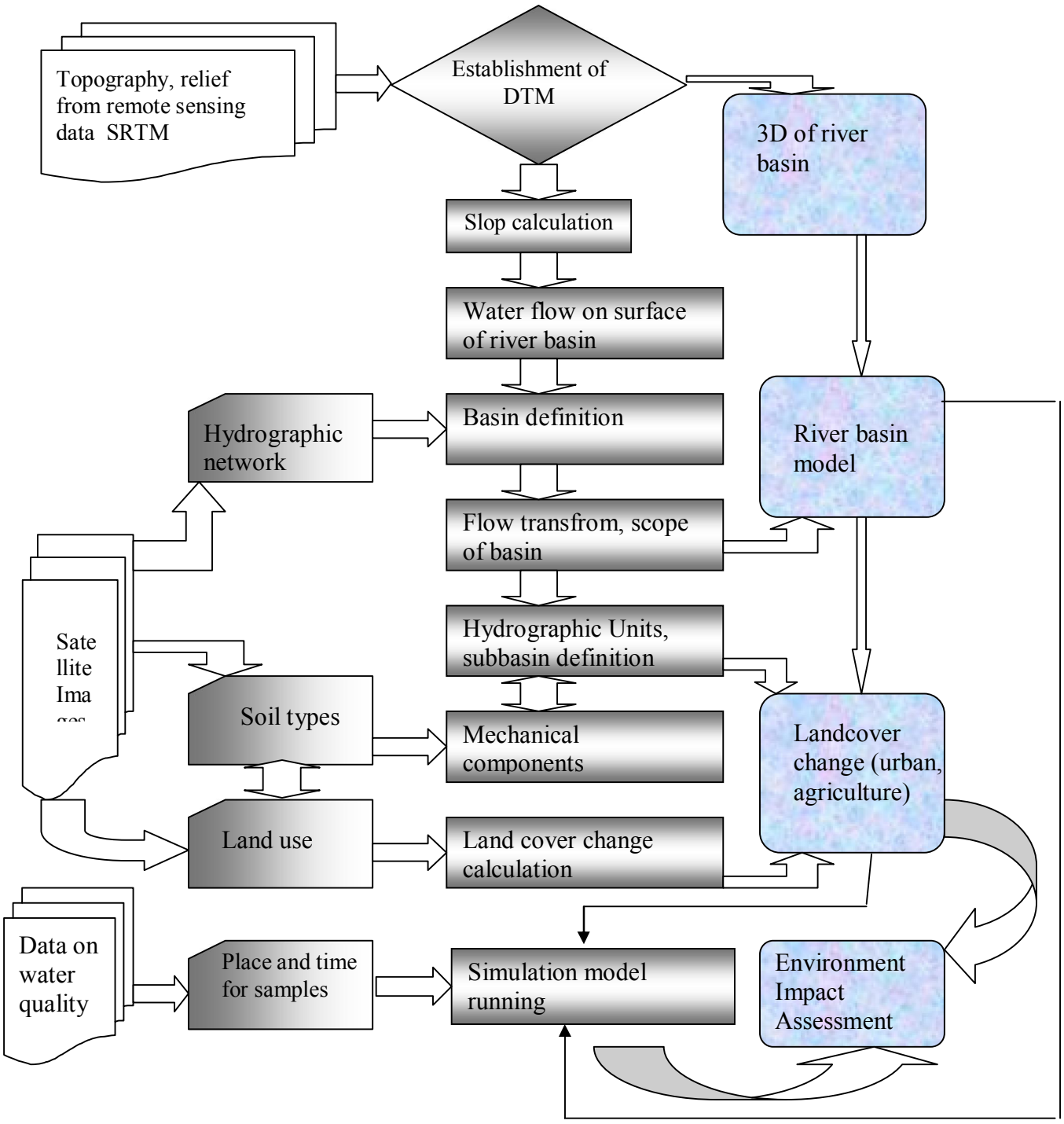
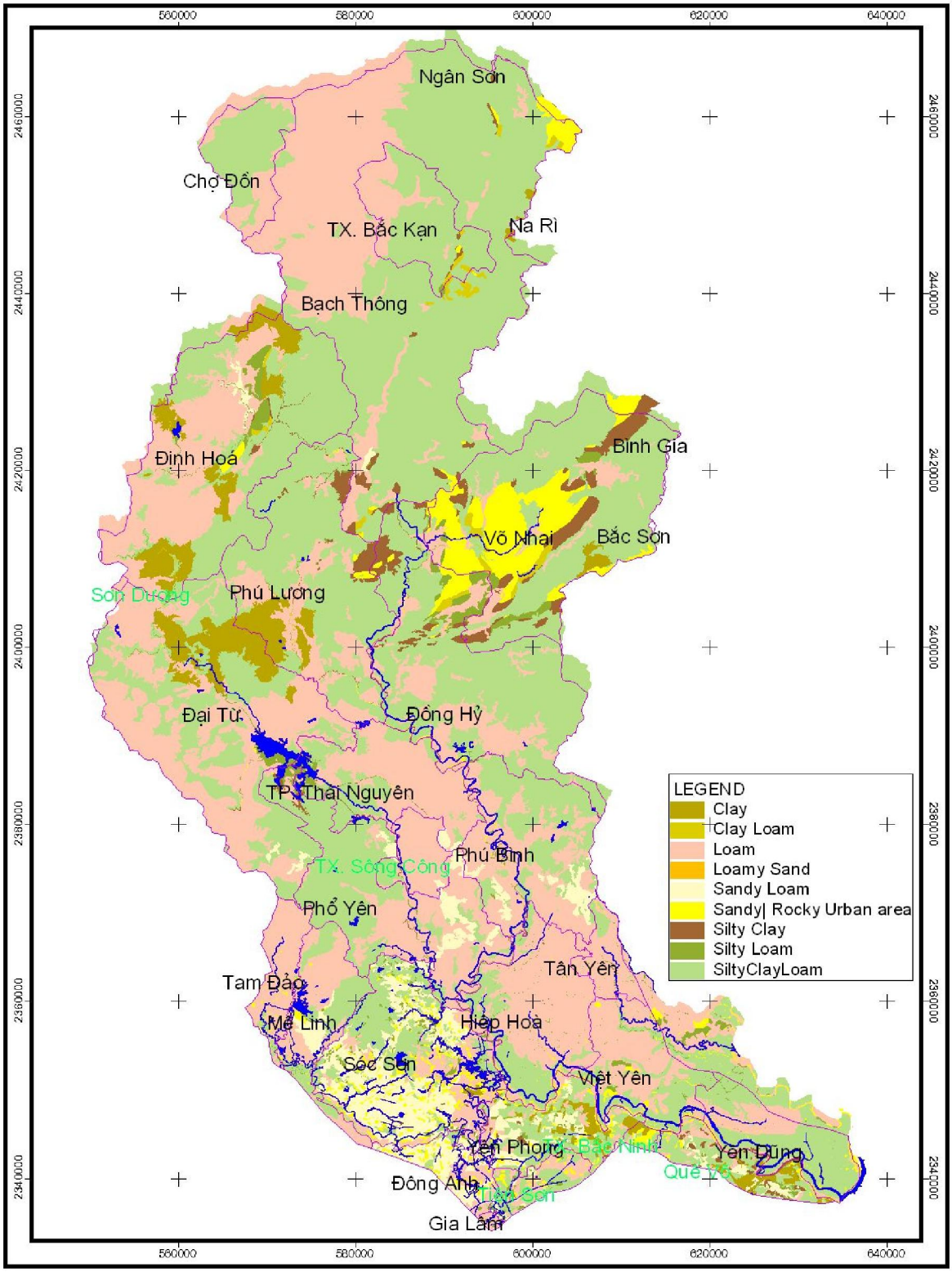
***Figure 1*: Data integration proccess into model for general management of river basin**.



BẢN ĐỒ PHÂN LOẠI ĐẤT LƯU VỰC SÔNG CẦU - SOIL TYPES MAP OF CAU RIVER BASIN



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