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THE MATERIALS TO NATURAL RESOURCES AND LOCAL AVOID SLIDING SOIL

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ABSTRACT

Trenggalek district 2/3 hills with easy sliding and land survey results showed easy sliding soil, but very fertile. A survey was conducted to prove that some villages experience insatiability, supported by a secondary data gathered by some experts on geology, geological maps, geography final report study of natural disaster management Survey methodology is collecting primer data of local wisdom potential, existing location condition, soil structure, access location to transport of material, tools and equipment. This study aims to maintain natural conditions, natural environment and to investigate the local materials . The result shows that sliding landslide is caused by invisible water sources and soil being carried by water that could push the land. Overcome sliding with local material, planting, ready natural resources. Solution of sliding soil in the village should be cheap, easy to be implemented. The analysis should meet two major items. First, natural resources that existn are countours, planting a useful tree, soil fertility and groundwater maintained for the source of life. Second, local material potentials are circle pipe concrete, bamboo knitted, bamboo piping. The principle of the solution is a part of the force that suppresses channel so that the building structure is not heavy. In conclusion, the soil fertility, local material, natural environment should be maintained by planting and recharging them with affordable and simple design, unity structure building, infrastructure and appropriate construction. An efficient transportation is able to make building insfrastructure without landslide so it will give a comfortable, safe and sense of security.

Keyword: natural resources, local material, unity structure building, ease of construction, solution to overcome landslides.
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1. INTRODUCTION

The total area of high and medium potentially expansive estates is 116030.8778 km² or ± 90.682% of the total land area of Java Island of 129934.0475 km² (without small islands) or 132107 km² (with small islands). The percentage of total land area with high expansion potential is 74.7191% (Geology report of Expert ESDM 2011)

Trenggalek District 2/3 hills lands with sliding soil and survey results show easy landslide soil because it consists of volcanic soil clay. Panggul Sub-district is located 59 km southwest of Trenggalek City, half of which is a mountain range that circles a wide circular lowland from the west, north to east to the south coast and forms a vast valley with its bay, a fertile soil area covering the watersheds that flow up Indian Ocean.

Solutions hilly land area of the village belonging to the population, certainly must be different solutions to solve the problem land owned by the agency/institution. Owned institutions are usually sufficient funds and structures for buildings are relatively heavy.

Easy landslide soil in villages and hilly areas should be cheap, easy to obtain, not to damage soil fertility, planting a useful tree, groundwater must be maintained for the source of life. Under surface soil do not let any water be stored or not until permanent ground water (aquifer) because it will shift the soil. Sliding causes loss of life, injury. Property. This gives rise to traumatic and wary of people living in hilly or lowland areas

Providing rural easy landslide soil solutions that many encountered in Indonesia should analyze several factors: Contour, land, planting, building owners, environmental and social conditions, financial ability of building owner, ease of implementation, utilizing local materials and optimum cost. Based on reference.. So not all Easy landslide soil with three solutions of land replacement, soil stability, water management. This should always be done water management, plant roots that absorb water and hold the soil

Easy landslide soil is the soil or rocks whose clay content has the potential for shrinkage due to changes in moisture content. Resulting in a non-uniform settlement in the upper building especially if the differential setlement

The expansion of montmorillonite minerals. The structure of montmorillonite is only bound by H2O ions; this ion is very easily separated because it can be said mineral montmorillonites very unstable. In stagnant conditions, water easily infiltration into the gaps between these layers so that the mineral expands, when it dries, the water between the layers also dries out so the minerals shrink.

Soil consists of 3 components (internet, 2014), namely air, water and solid materials. Air is considered to have no technical influence, while water greatly affects the technical properties of the soil. The space between the grains, in whole or in whole can be filled with water or air. When the cavity is filled with water, the soil is said to be saturated. Dry soil is a ground that does not contain water at all or its water content is zero.

Easy landslide soils have different characteristics with the type of soil in general namely: Clay Minerals, clay minerals that cause volume changes generally contain montmorillonite or vermiculite, whereas illite and kaolinite can be expansive when the particle size is very smooth.

Soil Chemistry, Increased cation concentration and increased valency cation height may inhibit the development of soil.

Plasticity, Soil with high plasticity index and liquid limit has the potential to expand larger.

Soil Structures, focused clays tend to be more expansive than those dispersed.

Dry Weight Soils that have a high dry content weight indicate a small particle spacing, which means large repulsive forces and high development potential.

Soil expansive in the countryside, soil should be maintained fertility, maintained water content to not expand. The structure of the building on the easy landslide soil, not only with soil stability, but the main ways the partially force is drained, partly held by the structure so that the soil structure is isolated, not easily moved or sliding. It is necessary in carefully, observed, analyzed location, natural environment, communities (Triastuti, N.S,2017)

The low-income population mostly occupy the suburbs or rural areas. The hillside are dominated by underpriviledged settlements. They cannot be blamed due to the fact that the land in Java is hilly and fertile so they can earn a living by farming. The hill is lush but it can shift easily. Engineers have to be able to answer this challenging circumstance by utilizing the existing potential around the location.

Many home industries made such as circle pipe concrete, bamboo knitted, bamboo building pole and made roof buffer, natural potency such as boulder, limestone,

Aggregate extraction in the Lower Fraser Valley of British Columbia, Canada, has affected the soil water storage of the Pepin Creek watershed. Although local government has set regulations for aggregate extraction projects to avoid negative environmental impacts, the gradual loss of soil materials and associated changes in vegetative cover has led to an alteration of the water balance within the watershed, which may affect surface or groundwater levels, and aquatic habitats. The study assessed the effects of aggregate extraction on the water storage of the Pepin Creek watershed and estimated that 25% of the surface area of the Canadian portion of the watershed has been affected by aggregate mining with an estimated loss of water storage of 10%. Evapotranspiration has decreased as a result of the removal of the vegetative cover. Precipitation has remained relatively constant over the study period but the annual discharge measured at Pepin Creek has decreased. Recommendations for enhancing environmental monitoring to better measure and understand ecological functions of the watershed during aggregate extraction are provided.

In this study, the Landsat archive images were used to detect the history of LULC changes in the metropolitan city of Berlin and the metropolitan region of Erlangen-Nürnberg-Fürth-Schwabach. In addition, the historical data from the maps and the statistical data have been used to check the accuracy of this detection.

Built-up area proved to occupy the largest space in both study areas in the period of current study. The percentages of the built-up area were 51% to 61% for the metropolitan city of Berlin and 45% to 52% for the metropolitan region of Erlangen-Nürnberg-Fürth-Schwabach during the past 40 years. A dramatic change has been seen from agriculture to built-up, green and open as well as forested area, especially within the period of 1985 to 2015 in Berlin. Until 2015, the agricultural area occupied a relatively large part, but remained stable, of the metropolitan region of Erlangen-Nürnburg-Fürth-Schwabach. There was an increase in forested and green and open area from the period of 1972 to 2003 for both study areas on one hand.

In the last decade, the open area in the two areas of study has been significantly expanded to ensure the nature and soil balance and for the recuperation under protection. The increase in forest and green areas is an inviting trend in the two study areas to preserve the natural ecosystems and its biological diversity in the urban areas of these regions.

The results show that the overall accuracy of remote sensing data is between 88% and 94% for Berlin and from 86% to 87.5% for Erlangen-Nürnburg-Fürth- Schwabach. This could indicate that integrating remotely sensed and GIS data are useful to monitor and mapping the

LULC for both urban areas. However, better spatial and temporal resolution data enables us with improved results to avoid environmental and ecological problems.

Characterizing water quality of discharges (affected by NPS) into the river reach is necessary for better managing riverine water quality and preventing water quality degradation. In the paper, monitored event mean concentrations (EMCs) of stormwater runoff and mean concentrations of snowmelt and baseflow of seven common pollutants from sub-catchments, which are categorized into four land use types including commercial, industrial, residential and on-going development land uses, were used to investigate the linkage between land use and water quality. Statistical analysis techniques were adopted to identify differences or similarities in water quality among different flow types, different land use types, and among/between catchments of same land use.

The results also showed median EMCs of pollutants of snowmelt and baseflow are, in general, lower than those of stormwater runoff. In addition, Stormwater Management Model was employed to investigate the physical process that would affect water quality response to storm events for two typical land uses, industrial and residential land uses. The modeling results supported that wash-off of particulate matters might primarily affect water quality response of catchments between different land uses. All the results shed the light on the necessity of quantifying pollutant loading considering the characteristics of land uses.

Below is a list of the three typology of slope which susceptible to shift or landslides. (Karnawati, 2001; in Priyono et al., 2006), namely:

1. The slopes are arranged by pile of loose soil covered by rocks or more compact soil.
2. The slopes are arranged by sloping sloped rock layers.

The slopes are composed by rock blocks. Beside the slope gradient, the patterns gives a high impact towards the slope stability (Suranto, 2008; Nugroho et al.,2013). For instance, the alteration or conversion (from forest to non-forest), and cliffs cutting for road and/or housing on a steep slope area as well increase the risk of soil occurrence landslide (Paimin et al., 2009). This matter is caused by the inappropriate utilization of land in ability and power support which actually leads to its height potential landslide hazards.

Four complementary approaches are necessary to reduce risk and maintain slope stability: 1. establish and implement guidelines for suitable land use in upland landscapes; 2. establish and enforce standards of practice for slopes that have been altered by human activity; 3. management of vegetation on natural slopes; and 4. rehabilitation of landslide affected lands and livelihoods and curtailment of off-site impacts landslide management and recognition of the role that forests and trees play should be integral part of climate change adaptation and disaster risk reduction. Landslide incidence and associated impacts are expected to rise because of climate change and expanding development in upland areas. The impacts of landslides can be widespread, resulting in loss of life, settlements, infrastructure, agricultural land, natural resources, heritage sites and more. The solution to minimize the problem, however, simply involves identification of hazardous slopes, management of vegetation and land use on these slopes, and implementation of engineering practices when altering slopes. Forests, and in particular trees and shrubs, play a key role in maintaining and enhancing slope stability, and should be considered an integral part of upland management. The large root plants should be planted in the hill area to prevent avalanche and to absorb the water to prevent erotion, save the water reserves in dry session.

1.1. Objective

In rural buildings the solution to the implementation should be the natural balance maintained, utilizing the natural potentials with plants, cheap, easy, using local materials, maintaining soil fertility, maintaining soil contour, groundwater must be maintained. The fertile soil in rural landslide is naturally solved and engineering

2. THEORICAL BACKGROUND

From some references that is

Holtz and Gibbs (1956), classify the degree of shrinkage based on Plasticity Index, Easy landslide soil classify based on colloid content, plasticity index and shrinkage limit Chen (1965), classified the degree of land development based on Liquid Limit. Chen (1988), classified the degree of land development based on the Plasticity Index.

Roman (1967), classify degree of ground development based on Plasticity Index. Easy landslide soil classification based on plasticity and shrinkage index.

From the table below three expert's show Plastic Index > 32, Shrinkage limit is stated by Holtz and Gibbs (1956), and shrinkage Roman (1967) states index, it means different. Colloid Content stated by Holtz and Gibbs (1956), 2 other experts do not state. Probable Expansion percentage differs considerably between Holtz and Gibbs (1956)> 30, Chen> 10 (1965), for very high easy landslide soils.

Table 1 Index easy landslide soil classification based on plasticity and shrinkage index

Data from index tests								
CC *1	**PI*1**	**PI *2 (1988)**	**PI*3**	**SI(%)* 3**	**SL *1**	**PE*1**	**PE *2**	**DOE**
>28	>35	>35	>32	>40	<11	>30	>10	Very High
20-31	25-41	20-55	23-32	30-40	7-12	20-30	3-10	High
13-23	15-28	10-35	12-23	15-30	10-16	10-20	1-5	Medium
<15	<18	0-15	<12	<15	>15	<10	<1	Low

Note:

a. CC = Colloid Content (%minus 0,0001 mm)
b. PI = Plasticity Index
c. SI = Shrinkage Index
d. SL = Shrinkage Limit
e. DOE = Degree of Expansion

The balance of nature is steady by maintaining the natural conditions of terracing and the plant absorbs water. Building isolation so that it does not move by clamping and holding the horizontal force by making stone retaining wall give countefort on the area of shear potential (Triastuti, N.S,2017)

Hills and ranks of active volcanoes triggered by tectonic plate pressure, 80 percent of Indonesia is prone to landslides. According to data from the Ministry of Energy and Mineral Resources, there are 918 landslide prone locations in Indonesia, mostly in Central Java (327 locations) and West Java (276 locations). The annual loss from this disaster is Rp 800 billion and a million people are threatened. Pojok IPTEK Internet on April 2008.

Landslides occur due to several factors, such as weathered structures due to the scorching tropical climate and lots of rain. Rock sediment volcanoes and mixed sediments between gravel, sand, and clay, generally easy to weather and vulnerable to landslides when on a steep slope. Population density also increases the environmental burden of hilly areas.

The impact occurred in landslide slope area. Water accumulated at the bottom of the slope increases the weight of the soil. If the water penetrates to the impermeable soil that acts as a field of slip, the soil becomes slippery and the topsoil on it will move out the slope, explains Surono, Head of Volcanology and Geological Disaster Mitigation.

"Slope stability can be achieved if the modification of slope geometry is combined with vegetative reinforcement," said Febri Himawan, a researcher from Padjadjaran University at the Integrated Superior Research program some time ago.

The slope stabilization system was achieved with slope slope reduction of 5 percent with annual crop mixing, rambutan, durian, and *jengkol* with density of 200-400 trees per hectare.

Trembesi tree or also called kihujan tree (Samanea saman) is one of the best greening trees. The growth is fast, the stems are large, strong and the canopies are wide and can absorb 28 Ton Co2 per year. Trembesi can live in a critical area and has a high acidity. Previous research proves, terambesi trees planted on a one-hectare land can bind 0.6 tons of oxygen per day. This tree is superior to overcome the flood, capable of storing 900 cubic meters of water also channeled 4000 liters of water per day. In addition to being a reforestation plant, based on Hartwell's (1967-1971) research in Venezuela, Trembesi root can be used as an adjuvant when taking a hot bath to prevent cancer. Trembesi leaf extract can inhibit the growth of microbacterium Tuberculosis (Perry, 1980) which can cause abdominal pain. Trembesi can also be used as a cold medicine, headache and intestinal disease. But this tree is more suitable to be planted around the City Park or wide field, in addition to eating places. The roots of the tree are too large and reach far, causing damage to the road or building. Pojok IPTEK Internet on April 2008

Bamboo is often juxtaposed with snake's nest or other dangerous animals, but if we arrange them well, bamboo is a special greening crop. Although it is included in the type of grass with a hollow stem, segmented and rooted fibers but bamboo is a reliable pollutant absorber, a good binder and water filterer, and certainly also a large oxygen producer. Like the natural air conditioning, able to reduce the temperature around him and able to grow up to be at an altitude of 3800 mdpl. Growth can be relatively fast, in one-day bamboo can grow more than 30 cm long and enter in adult age at 3 years. Bamboo plants have very strong rhizome roots. This root structure makes bamboo can bind the soil and water well. Compared to trees that only absorb rain water 35-40% of rain water, bamboo can absorb rain water up to 90%. And where there is bamboo forest, beneath it is always stored clean water. In addition to beneficial to the environment, young Bamboo can make vegetables that we often call a bamboo shoot.

3. METHODOLOGY

3.1. Approach and Methodology

Survey methodology of several villages experiencing sliding, collecting secondary data of geological analysis from geologists, geological maps of ESDM 2016 (Ministry of Energy and Mineral Resources), Trenggalek geography from local government Trenggalek, final report study of natural disaster management (soil movement)

The soil is the location studied focuses on the Terbis village of Panggul sub districts. Land Location contour, relatively more stable and invisible source of water that can push the ground.

Three step approach was used and is discussed below:

a. All relevant data and information were collected from Regional Development Planning Board of Trenggalek. (BAPEDA/ Badan Perencanaan Pembangunan Daerah Trenggalek).

This involved visiting BAPEDA head-office in Trenggalek and project site East Java. Intensive discussions were held with Regional Device Work Unit (SKPD/ Satuan Kerja Perangkat Daerah) and BAPEDA team, Government officials who were involved with the project intervention, fully or partially.

b. References were understood and taken on the idea from the current journal of soil, tree, land use, drainage, website, previous reports of field conditions at that time

c. Thirdly, Focused Group Discussions were organized with BAPEDA to get data and information on the various aspects of longsor. In these discussions, the participation of people in yard of resident chairman's house

i. From Focused Group Discussions, it is found that people who live in very high landslide potential landslides, ask to be moved to a location where the potential of landslide is relatively smaller.

ii. Community and Regional Disaster Management Agency (BPHD) collecting documents of landslide and land cracks, disasters occurring in the community.

iii. The community shows the location of the disaster and at the beginning of the disaster and similar events several years ago in the same place

3.2. Data

Figure 1 2 3 Type of soil cracks during dry season, expands and landslides during rain

The writer focuses more on the village of landslide.

The soil characteristics that are easily sliding are visible in the soil black or black with gray mix and when dried cracked as in the picture, when the rain absorbs much water so that each particle expands, urges each other so that the soil shifts

Conducted survey in Trenggalek District but not yet budgeted by local government so that not done topography, soil investigation, hydrogeology; geology of terbis village has not been done.

Primary data from direct observation of land in the field are:

1. Soil color, soil properties,

Water flow, flow direction, water behavior

Soil behavior is easy to slide, landslide or broken

Type of house damage, mosque, infrastructure

The main effect of shear is the different contour, hill-lowland and big content surface water.

2. Existing plants are observed

The existing trees grow by themselves, there is no pattern of planting and varieties of trees, some of the roots are not strong enough to strengthen the movement / force suppress the building and infrastructure. The surface water and water source are not well organized so it flows wild in all directions which adds pressure to the movement of the soil

3. Interview with community and BAPEDA Trenggalek (Regional Development Planning Board of Trenggalek) officials Residents of drought when the dry season, while rain season, landslide / disaster, so that makes people feel uncomfortable. Sources of water recorded a total of 361 springs scattered in each district and most have been utilized. Geographic Potential Disaster response to land movement in Terbis Village

Secondary data:

1. Geological results from the Internet Ministry of ESDM and from geological associations
2. Stone data, soil history from internet Ministry of ESDM Rainfall and hydrological data from Metrology and Geophysics Topography of the internet Bakosurtanal (National Coordinating Agency for Surveys and Mapping)
3. Geography of the internet Bakosurtanal Result of soil investigation Geomorfologi, Statigrafi, Struktur Geologi,
4. Analysis of soil samples from the final report of the Faculty of Engineering Gajah Mada University

3.3. Data Analysis

In hills must be planted with large root plants to prevent landslides and absorb water to prevent water from eroding, storing water and water reserves in the dry season. In the plain area should be planted by absorbing water to prevent flooding and as a reserve in the dry season.

The disaster can be prevented by keeping the trees on the slopes. The plant will absorb water and its roots bind the soil. The bare ground or hill on the slopes should be greened.

Potentially avalancous steep slopes should be avoided by not building houses at the foot of the slopes. Steep cliffs near roads and settlements should be supposed to be prevented from collapsing. Its surface is compacted according to soil conditions and is covered by suitable plants

3.4. Techniques Used in Data Analysis

From the soil type visual, the analysis of soil samples, visual contour, geological structures including shear faults, rising faults, down faults, in some places the structure is a fold

Slope stabilization can also be done with a civil engineering approach, ie by making reinforced concrete walls or stones. Relying on the weight of the wall to withstand lateral loads, the height of the covered soil should be adjusted. The wall must be equipped with drainage system in the form of drain holes in some parts of the wall.

4. RESULTS AND DISCUSSION

Previous research results that the slopes need to be reduced, to make it more small slope. According to the authors this can disrupt the eco system and the balance of nature is changing. This can trigger another disaster. Therefore, contour and existing peil are maintained but resolved with solutions with natural natural and building structures, infrastructure. In addition, the cost is very high if the slope in the crop, made ramps. While the cost of local government should be allocated for other activities prospering the community

On the bare slopes, exposure to the sun's heat will make the soil lose moisture until pores and cracks or cracks appear. When it rains, water will infiltrate the crack. Landslides usually occur during the transition season because rain with very high bulk flushed in a short time. The high rain intensity makes the water content of the soil quickly saturated

In principle hills must be planted with large root plants to prevent landslides and absorb water to prevent water from eroding, storing water and water reserves in the dry season. In the plain area should be planted by absorbing water to prevent flooding and as a reserve in the dry season.

Large hill area planted with large multi-use trees, mahogany tree (Swietenia sp) is perfect for reforestation in schools, highways or the environment. In addition to its rapid growth, easy maintenance. The mahogany tree is also known to greedily absorb water. the growth of mahogany trees can reach 50 meters. The ability of air filtering mahogany is also quite thumbs up, mahogany trees can absorb 47 - 69% of air pollution around it. The wood is strong and often used as home furnishings. In addition, mahogany fruit can also be used as a lot of drugs also free radical antidote. Sap often used as raw material glue. And the leaves can be used as animal feed. It's just that we need to be a little diligent to clean up the garbage from the seeds and leaves that we have to do more often than other trees

The riverside area with bamboo plant prevents flooding because surface water is absorbed by bamboo and as a reservoir of river water. When planted in the hill area, worried people do not get water.

Village Terbis, Panggul districts Trenggalek, black and easily shifted. Shows areas of landslides that are very expansive due to montmorrelite.

Table 2 Value Range of Terbis Data from index tests

CC	PI*3	SI*3	SL*1	PE(%TVC)*2	DOE
>28	>32	>40	<11	>10	Very high

Relocation site is kaolin soil and contour site is relatively more stable and invisible source of water that can push the ground. Kaolin expansive expansion properties is smaller than montmorellite

Table 3 Value Range of Relocation Site Data from index tests

CC	PI*3	SI*3	SL*1	PE(%TVC)*2	DOE
20-31	23-32	30-40	7-12	3-10	High

The occurrence of development and depreciation of the soil becomes very dangerous, especially very high degree of expansive, such Land is classified as unstable so that it can damage the building and infrastructure building. One effort to obtain the soil properties that get certain technical requirements is by soil stabilization methods.

The technical nature, the stabilization can be divided into 3 types namely: mechanical stabilization, physical stabilization, and chemical stabilization (Ingles and Metcalf, 1972). Location is steep, slope 45-50 degrees, narrow land, limited costs, so no three types of soil stability.

The solution is different from the owner of the company or local government, the village community. The village community is very low income. In addition, the soil is maintained fertile.

The soil in the village is very fertile, but for the structure of the building / house, the infrastructure is easy to move and landslide so it needs to be given the right solution that is:

1. The fertile soil should be preserved so that it can not overcome landslide with chemical, lime and other materials that damage fertility

2. In the hills planted large rooted trees, absorbing much water, as an oxygen producer, in the lowlands, especially near the river planted with bamboo. In planting trees with large roots prevent landslides, the roots absorb water, many water is prevented for water reserves and prevent water from flowing so as not to slide.
3. The hill should be protected from the shifting of the soil; the water must be absorbed partially so that not all will slide into the lowlands.
4. Water should not flow haphazardly, make recharge so partial or residual water flow must be directed to the downstream flow, it is very crusial accommodated discharged.
5. Drainage made from small cross-section to large cross section. Materials used from the surrounding materials such as many stones, boulder and middle stone.
6. Each building and infrastructure to take sub drain to flow surface water. Design of building installed sub drain, the shallow bore foundations tied tie beam, floor plate into the unity of the structure .
7. Slope stability can be achieved if the modification of slope geometry is combined with vegetative reinforcement
8. Each building and infrastructure is given a simple structure, easy to implement, easy to obtain materials, transportation is relatively easy with simple transportation
9. The lowlands must be able to receive water spills, made up the recharge. The formula of absorption to reach ground water
10. The soil should be fertile in the yard of the building, infrastructure so it must remain environmentally friendly, the housing environment must be isolated, so that the influence of active soil pressure and water pressure is partially distributed through sub drain, distillation and the rest force received structure.

Resolve cases correctly, life time is achieved; utilize local materials, optimal cost. In the event of damage, the disaster of the poorer society is thus greater institution that is the state only to take care of the time, the cost of energy is excessive to take care of disaster. (Triastuti,N.S 2017)

The author's main analysis of the soil is isolated, with the philosophy load is not all resistant, but partially distributed, the rest of the force is retained so that the structure is not too expensive and it is expected that the structure does not fatigue so long life time

Avoid sliding soil solutions in the village should be inexpensive, easy to obtain, does not damage soil fertility, and ground water must be maintained for life source, ease of implementation, utilizing local materials and simple work equipment. Below the surface soil do not let the water is stored not until water reserves because it wills the soil sliding

The analysis must meet 10 (ten) requirements above and steady contour. The plan of the building is the infrastructure, the house, the bottom of the building in the installs sub drain so that water does not push the building. Soil in the bearing with the shallow bore foundation tie beam tied, the floor plate becomes the unity of the structure when there is unity settlement so as not to damage. The bottom of the lowest contour is given counterfort to withstand the horizontal force. Under the road was given a brace

The natural or contour conditions are not altered, so the natural balance remains, while maintaining the terrain, the active soil pressure conditions $P = \gamma H2\ Ka$ (1)

P = active force

Ka = active ground pressure coefficient.

H = Height retaining wall. γ = weight of soil volume.

Distance contour soil relatively small so that the active force is small.

Ground water or surface water should be drained so as not to damage the structure, with sub-drain made at the bottom of housing and infrastructure. Loss of energy due to sub-drain is ƛL.v2 / (D.2g) (2)

L = length of pipe, D = pipe diameter, V = flow velocity, g = gravity

Land in the village of settlement of expansive land problem cannot be equated with land for city location or land used for institution. The land in many villages has its limitations:
It should not use chemicals, so the soil remains fertile, isolation by giving the wells done by

Installing a concrete circle hollow, the inner soil is taken so that the circle hollow of concrete drops and the contents of reinforced concrete. Active soil pressure received circle hollow concrete and reinforced concrete. In addition, the circle hollow concrete foundation can support the load above it. Carrying capacity of shallow bore foundation = A.σ + A skin. τ (3)

Limitations of mobilization of work tools, materials available, to form the terraces so that residents comfortable with adjusted level / peil with human power.

Sub drain with easy to get material that is circle hollow concrete and bamboo or PVC pipe, which need to be paid attention is not to sub drain covered soil, so that the holes need to be covered by gunny sack, knitted bamboo or geotextile.

To settlement together the bottom and top structure of the unite . EI / L stiffness (4)

E = Modulus Elasticity;

I = moment inertia,

L = span of structure.

I enlarged by merged the upper and lower structures, so that it is very rigid, settlement together.

Materials that are easy to get for example concrete circle hollow, bamboo for distillation, thin knitted bamboo and thick knitted bamboo

Simple technology, so that local people are given training on job training about 4 hours can already be done for example shallow bore foundation, sub drain, structure to horizontal force (stone retaining wall and counterfort)

Work tools hoes, temper and simple tools of carpentry

Pipe for sub drain and distillation of bamboo or pipe PVC pieces easily available. The soil should be kept water content so little as not to expand. The pressure of water discharge Q = VA (5) or water pressure Ɣair.H (6) entirely in the sub drain, the subdrain of force-suppressing force due to water is eliminated, thereby reducing the structure, the more cost-effective and less fatigue- The water is well managed by drained into drainage that has been calculated capacity.

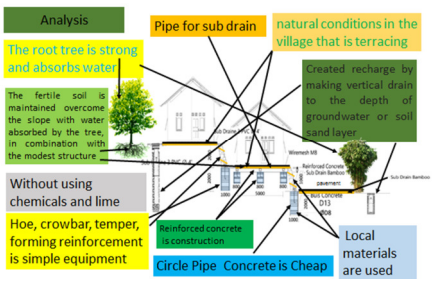

Figure 4 Ten solution to avoid sliding

Ten solutions

1. The fertile soil is maintained, overcome the slope with water absorbed by the tree, in combination with the modest structure
2. Planted large trees such as mahony, trembesi, teak, absorb water and prevent sliding
3. Defended existing peil condition but need to be formed terracing
4. Desained master plan drainage with continuous drainage
5. Terasering with open or closed drainage, the material used river stone / boulder from the mountain.
6. Sub-drain PVC, bamboo or circle hollow concrete covered fiber tree or fiber tree sack before the water comes under the building
7. Slope stability with made terracing according to existing contour condition with retaining pipe circle soil in the contents of reinforced concrete.
8. Cheap because not using deep foundation, but shallow foundation that is foundation well with circle hollow of concrete (buis concrete). Transportation wheelbarrow with animals eg cows
9. Created recharge by making vertical drain to the depth of groundwater or soil sand layer
10. Design of building installed sub drain, the shallow bore foundations tied tie beam, floor plate into the unity of the structure

5. CONCLUSION

Conclusion by maintaining soil fertility, ground water level is maintained, Prevent landslide by planting trees whose roots absorb water and roots to prevent landslides eg mahogany trees for hilly areas and little land buildings, water must be recharge until ground water after partially absorbed plants, when flowing must until the drainage, river or sea, to prevent flooding in the lowlands assisted plants that absorb water even though the roots are less powerful eg bamboo (special plant for lowland), maintaining fertility without adding chemicals or lime powder, local materials ie pipe circle concrete , river stone or boulder, natural environment overcome with plants, recharge, structure building / housing and infrastructure that unity structure, cheap budget, simple and ease construction, light load transportation can be made middle load building and infrastructure without landslide, thus giving a sense of security, comfortable, safe

Major findings and policy recommendations are described below

1. The hilly land until lowland is maintained existing contour, maintained the eco system and natural conditions, in order to avoid a new balance that can cause other disasters
2. Fertile soil should be maintained, as well as natural conditions maintained environment, hilly land maintained. For the sustainability of people's lives, do not soften the chemicals because they can contaminate them. Water is recharged to aquifer or deep ground water.
3. The right solution, cheap, easy to implement, to overcome the landslide but must pay attention to the natural environment by maintaining the natural balance, ground water is not disturbed, the social environment is not moved away from the location of cultivation or the source of life, so that the community more prosperous, the main need to match planting is filled with soil fertility

4. The structure of the building on the easy landslide soil, not only with soil stability, but the main ways the partially force is drained, partly held by the structure so that the soil structure is isolated, not easily moved or sliding. It is necessary in carefully, observed, analyzed location, natural environment, communities. Excessive water is the main enemy of soil easy landslide soil, the main solution of sub drain installed under houses, roads and other buildings This is to prevent shear potential from high to low direction contour. The balance of nature is steady by maintaining the natural conditions of terracing and the plant absorbs water. Building isolation so that it does not move by clamping and holding the horizontal force by making stone retaining wall give counterfort on the area of shear potential. The under and upper structure counts the working force (Type and nature), the structure should not be all forces retained, but partial forces distribution so that structure are inexpensive and long life time. Easy landslide soil solutions are all the same must be in accordance with the conditions of society, natural environment conditions, the cost is relatively cheap, as much as possible using the material around or local materials and ease of implementation
5. Public participation and awareness is required, the contribution of the State apparatus to budgetary considerations, local government, integrated, thorough and measurable analysis of the results of geological surveys, hydrogeology and soil investigations for easy sliding soil design. In addition, analyzed natural environment, community, availability of costs, local material potential
6. Resolve cases correctly, lifetime is achieved; utilizing nature, giving profit and positive impact of non financial and financial, utilize local materials, optimal cost. In the event of damage, the disaster of the poorer society is thus greater institution that is the state only to take care of the time, the cost of energy is excessive to take care of disaster.

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