2008

A new plan making model

The development of a plan making model which can be used as a guiding principle for future projects of Solid House Foundation

University of Twente
Enschede - The Netherlands

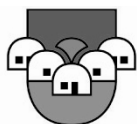Solid House Foundation

Rick Noordink

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Bachelor Thesis

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Preface

This report is the result of my internship for the Solid House Foundation, for which I have spend three months of my time in Sri Lanka. These three months that I used for researching the Inspector Eatham Rehabilitation Project and helping a hand where I could were fantastic. I did not only learn about civil engineering and management but also about the Sri Lankan and Asian culture. A culture very different from what I am used to in a land where people are still struggling for survival.

But all of this would not have been possible without the support of a number of people. First of all I would like to thank Eelke van der Werf for his time, advice and all the things he arranged and made possible for me. I also admire his perseverance during the difficult situations he often gets in to. I would also like to thank Inge de Kort, my tutor, for her patience and keeping faith in me, even though to be honest, I did not always deserve it. Next to that I have to thank the Solid House Foundation and Wim Stroecken in particular for making it possible doing this research and offering me a place in Sri Lanka. I should also thank Annet de Kiewit and Ellen van Oosterzee-Nootenboom for helping me to arrange my internship. Without all of you this would have not been possible.

Rick Noordink

Summary

During the design phase and implementation of Inspector Eatham Rehabilitation Project (IERP), Solid House Foundation (SHF) encountered a number of problems causing delays and preventing designed plans from being implemented. There were also different aspects of which SHF had no knowledge of and did not take into account during the design phase, but still had to be dealt with during the implementation of IERP.

The cause of these problems can be found in a number of aspects, namely a lack of knowledge of SHF about organisational, cultural and environmental differences between the Netherlands and Sri Lanka and combined with that an insufficiently structured plan process for IERP. Especially the last aspect is important, for a sufficiently structured plan process would probably have helped anticipate to upcoming problems, preventing them from happening.

Besides this, the design and implementation of the different infrastructures (for electricity, transport, drinking water, waste water and housing) happens apart from each other. SHF does not really handle an integral way of creating the plans and implementing them, while it can be assumed that especially by doing this, cost savings can be realised and the construction process can be more efficient.

For solving this difficulty, SHF's design process needs to be more structured and must approach problems in an integral way. For making this possible, in this research a plan making model is developed that can be used as a guiding principle for future projects of SHF.

Inspector Eatham Rehabilitation Project

IERP is a housing project in Sri Lanka, just north of Pottuvil, that officially started as from March 1st 2006. It was a rehabilitation project for victims of the tsunami on December 26th 2004. SHF worked together very closely on this project with the local organisation Sewalanka Foundation. Together they formed the Solid House Foundation Lanka. The Netherlands Red Cross and Stichting Mondiale Woonhulp are the main donors.

Because IERP was SHF's first project, they had to get to know the local situation and had to strongly adept themselves to it, for a number of points it is quite different from the situation in the Netherlands. The governmental structure is different, but they do make use of the same kind of rules and regulations. Due to the climate, there is also a big difference between the environment in Sri Lanka and that of the Netherlands. In the rainy season floods occur and elephant can form a threat. Next to that, the culture in the eyes of a Westerner somewhat strange and religion plays a much bigger role in life. The differences on all these levels makes adapting to the situation fairly difficult. And of course, due to some differences SHF encountered a number of problems during the plan making phase and implementation of IERP.

The biggest problem SHF encountered was that SHF did at first not know of the fact that the project area was owned by a large amount of people. Due to that the initial plans could not be implemented and finally even led to an implementation of the project house by house. Roads were also difficult to construct, for the landowners were not willing to give up their land. The electricity network was not designed before the implementation actually started but was in the end constructed by the Ceylon Electricity Board. A dike SHF thought of constructing could also not be constructed, because the Water Board (represents the paddy field owners) did not allow SHF to change the water flow towards

the tank. Next to that SHF had problems with the Archaeological Department who stopped the construction of two dome houses, for they were being build on archaeological sites.

Model analysis

By analysing six different plan making models, a number of similarities was found between them. These similarities say something about aspects that apparently are necessary for a functional model and for that, form the basis of the newly designed plan making model. It was found that all the models had the same kind of phases. Roughly, you could divide the plan making process into the four phases exploration, specification, design and preparation. Next to that, in every model there is some sort of subdivision of the overall problem (the design of a plan) and many of them contain checkpoints for controlling the process at where the decision can be made for a go or no-go of the project. Often, an iterative process was implemented into the model and it was designed round a focus, starting with a global design from where on more details are added, ending with the final design.
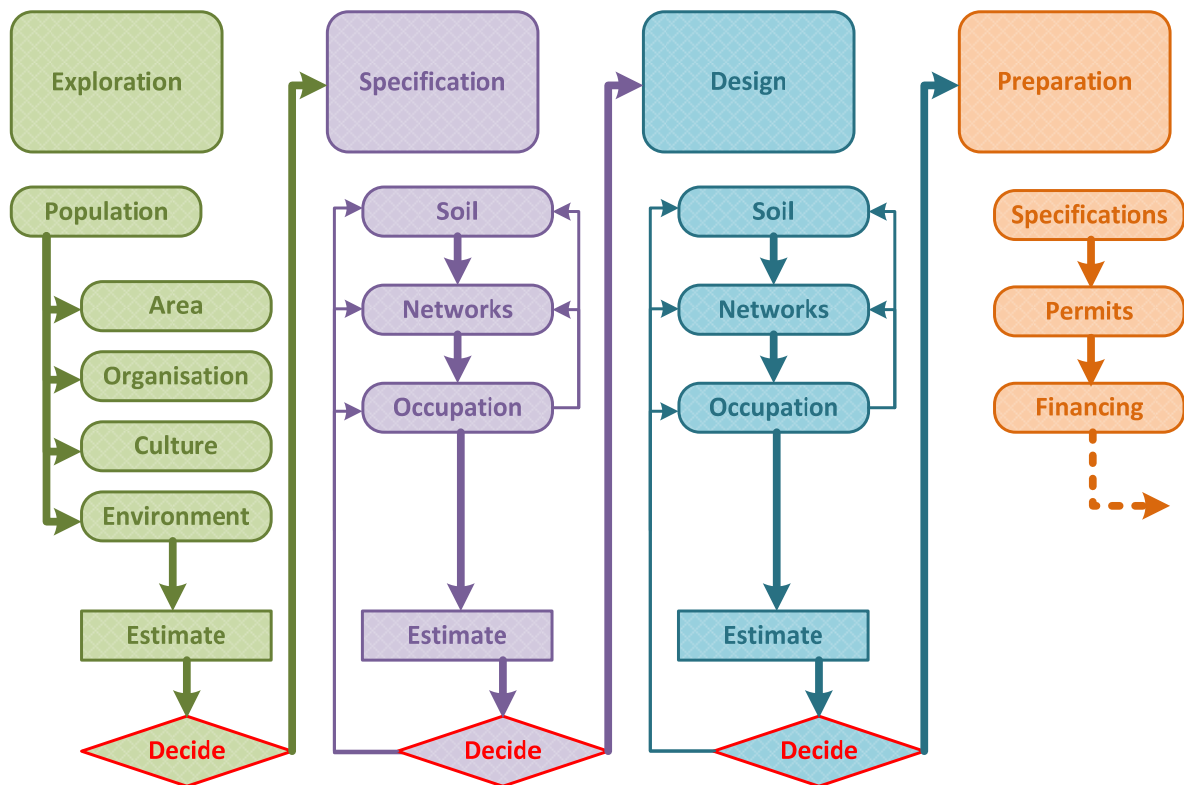
Model design

As said, the previous found similarities between the analysed models form the basis of the newly designed plan making model.

Base model

Next to that, the choice has been made to implement the layer approach for making sure, when using the new plan making model, the different layers of space (and infrastructure) are adjusted to each other.

The base model is combined with problems that occurred during IERP, aspects that were important for the design of the plan and final implementation and the activities SHF performed in the process of designing IERP. All these factors are assigned to a certain phase within the base model and after that a choice is made to implement all aspects in the form of a model step, step/checkpoint or as part of the layer approach. This limited number of ways for implementation prevents the model from becoming disorderly. Finally, all the processed information is transformed into the new plan making model, shown on the next page.

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Designed plan making model

Discussion and recommendations

For all the existing similarities between the analysed models have been implemented, it can be concluded that at least at the basis the model is valid. What makes this new plan making model different from the rest and more useful for SHF than the rest, is the fact that this model is based on the similarities and not just a combination. Where several aspects show that it is a model adjusted to IERP and with that to future projects of SHF. The starting-point in the model is a population which makes it possible to directly focus on SHF's main goal, helping people. There is also a special focus on organisation, culture and environment which is important for making a success of a project in such a different country from the Netherlands.

Next to that, the layer approach plays a big part in the new model, making it unique from the analysed models. When using the model properly this guarantees a good adjustment of the different layers of space in the final design.

The main weakness is the fact that information can be missing in all the three group of factors on which the model has been based. Though, due to the combining of the three different groups of aspects, the change that something is missing is already slim. And, because the structure of the plan making model is general enough, something missing will probably be part of one of the already existing steps.

When using this model it should be kept in mind that it is not an actual step scheme that can be completed blindly. Especially in a country as Sri Lanka it is important to just use it as a guide. When doing that, it can help a lot in keeping structure in the process and getting to an integral design.

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1 Introduction

The research described in this report is focused on the plan making process of Inspector Eatham Rehabilitation Project (IERP) carried out by Solid House Foundation (SHF). Though, this process is only a small part of what SHF works on in Sri Lanka. They are also busy with community mobilisation, livelihood development, safety and strengthening business attitude. This of course links with the plan making process in many ways during the management of the project, but is not being discussed in this research, to prevent the research from losing focus.

IERP takes place in Sri Lanka, is SHF's first project and has been taken as an example for examining the whole process of creating such a project, for examining the problems that occur during the implementation and for looking into the local situation, organisational as well as cultural.

The goal of the research is the creation of a model that can be used for future projects of SHF, preventing a number of problems from happening and accelerating the whole process from initiation to implementation.

All this is discussed more deeply later on in this report. First, in this chapter a short background is given of what initiated this research after which SHF is described, giving an image of the organisation for which this research has been taken place.

1.1 Background

During the Inspector Eatham Rehabilitation Project SHF ran against a number of problems which caused delay. For example, the designed plans could not be implemented, because the land SHF had planned to use already knew a large number of owners. As a result of that the houses had to be constructed one by one, in course of which for Dutch understandings sometimes strange wishes (of the beneficiaries) had to be taken into account. Thus, compared to the use of a detailed plan, the implementation often was a difficult and time consuming process.

For the construction of the road network and construction of water holds similar problems play a role. For example, land owners refuse to give up land for the construction of roads. For that, SHF is finding difficulties realising the road plans. Furthermore, the implementation of sanitation is difficult. Initially the environmental friendly eco-toilets, or composting toilets, would be constructed (rather than ceptictank-toilets), but due to an at first negative attitude, the plans for this were almost cancelled. This makes clear that cultural acceptance plays a major role in the design and building process.

1.2 Solid House Foundation

Based on (Solid House Foundation, 2007)

Solid House Foundation (SHF) is founded in 2003, being a non-profit and having a goal of creating social housing, teaching and sustainable infrastructure for low income groups in developing countries. It concerns the construction of safe and healthy houses that have a positive effect on the health of the population. Furthermore, the construction causes economic activity and stability.

For reaching this goal, SHF uses building methods in course of which the following aspects in combination with each other have to lead to a good result:

- Cost effectiveness;
- Sustainability;
- Building by and for the community (target group);

- Substantial improvement of the quality of the environment.

For every country and target group SHF develops adequate housing forms, using the knowledge of the considered community, her local partners, a Dutch architect think-tank and the three Dutch technical universities.

In SHF projects dome construction (the so called SolidHouses) plays an important part. This construction method makes it possible to realise solid housing in a short period of time, while the cost stay relatively low. For that reason SHF promotes the use of this housing method, without losing touch with other wishes, local circumstances and possibilities. The form and used materials lead to robust houses that can withstand most environmental forces such as hurricanes, earthquakes and floods. The dome houses are constructed by local workers, which at first will be supported by experienced workmen.

In Sri Lanka SHF worked closely together with Sewalanka Foundation. They together formed the Solid House Foundation Lanka (SHFL), the organisation that officially runs IERP. Though, because this report is written for SHF, because the model that has been developed can be used for other projects where SHF probably will not work together with Sewalanka and for the consistency, in this report there is constantly spoken of SHF, where in some cases there should be spoken of SHFL.

2   Methodology

This study is focused on the plan making process of projects carried out by SHF, where IERP serves as an example. On the basis of the plan making process of this project and on the basis of the local organisational structure and culture a process plan for the plan making process is generated.

In this chapter the actual problem where this study is focused on is given followed by the research objective and accompanying research questions. It concludes with an overview of the used research strategy.

2.1   Problem

As already mentioned in the previous chapter, SHF struggled with numerous problems during the plan phase and implementation of IERP, resulting in a both time and cost inefficient way of developing and constructing of IERP.

The cause of these problems can be found in a number of aspects, namely a lack of knowledge of SHF about organisational, cultural and environmental differences between the Netherlands and Sri Lanka and combined with that an insufficiently structured plan process for IERP. Especially the last aspect is important, for a sufficiently structured plan process would probably have helped anticipate to upcoming problems, preventing them from happening.

Besides this, the design and implementation of the different infrastructures (for electricity, transport, drinking water, waste water and housing) happens apart from each other. SHF does not really handle an integral way of creating the plans and implementing them, while it can be assumed that especially by doing this, cost savings can be realised and the construction process can be more efficient.

2.2   Research objective and questions

In practice it is proven that the use of a model based plan process, and with that a more schematised approach, results in a plan where less for the eventual implementation hampering matters are overlooked. This leads to less stagnation in the construction process.

In the Netherlands the use models in the plan process is very common. In almost every report you can find a description of a model which has been used during the plan process. However, for the development of the plans for Inspector Eatham Rehabilitation Project, SHF has not used a similar model based approach. As a result of that for certain matters it took a long time for coming up to the surface, causing a lot of delay. The use of a structured model could have helped preventing the occurred problems from happening and can help preventing these problems from happening for future developed projects. This results in the next research objective:

The development of a plan making model that can be used as a guiding principle for future projects of Solid House Foundation.

The development of this model will be based on organisational and cultural aspects of Sri Lanka and on gained experiences at IERP. Furthermore, existing process schemes and theory with regard to the plan making phase will be used. Information about this last aspect are gathered by a literature study, while the organisational and cultural aspects and the experiences of SHF are gained by a three month project visit and local interviews.

To fulfil the research objective, the next research questions have to be answered. By answering these questions and by combining the information found by doing this, a model can be shaped.

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- *What did the plan making process of IERP look like and what were the hampering factors during this phase?*
- *How are the national and local government organised in Sri Lanka and what is there influence on the construction process in general and more specific for IERP?*
- *Which cultural and environmental differences, that have influence on the plan implementation of construction projects, do exist between the Netherlands and Sri Lanka?*
- *Which problems occurred during the implementation of the for IERP formed plans?*
- *Which aspects are important for the design of a plan making model in general and which aspects are important for the design of a model specifically for IERP and future projects of SHF?*

2.3   Research strategy

The answers to the formulated research questions that are found by doing this study, should be adequate and be based on reliable information. In the next part, the way in which this has been done and with that, the way in which the research has been done, will be described. The study can roughly be divided into the next steps.

Collecting information (chapter 3) – At first, information about the organisational and cultural differences between the Netherlands and Sri Lanka and about the problems that occurred during the implementation of the formed plans was collected. For that, a three month visit to the project location of IERP in Sri Lanka took place. During this visit information was obtained by gathering information while contributing to the project, by taking interviews and generally by talking to various kinds of people (e.g. SHF's project manager, local environmental specialists and employees of NGO's). Information about the project structure SHF uses and the way SHF formed their plans for IERP were mainly acquired from documentation and via conversations with people working or volunteering for SHF. In chapter 3 all the collected information is written down.

Existing plan making models (chapter 4) – The next step in this research was the selection of several plan making models, which from their basis suit well with the circumstances in Sri Lanka. These models and schemes are collected from literature and different project plan reports. On the basis of an analysis of the selected models a list of criteria was created, which was purposed to form the basis of the in the end created model.

Model creation (chapter 5) – After drawing up the model criteria, the first model was created. This model is focused on the IERP by combining information about occurred problems, other aspects and the way SHF designed IERP, using the transformed information out of chapter 3 as part of and as input for the model. During the creation a number aspects have been combined an generalised.

Discussion and recommendations (chapter 6) – After the final version of the model was created, the positive and negative aspects and the way in which this product should be used were discussed, resulting in a number of recommendations. The discussion is divided into a discussion about the designed model and about the research itself.

Conclusion (chapter 7) – At the end of this report a conclusion is given. This is done by answering the five research questions.

3 Inspector Eatham Rehabilitation Project

This chapter is purely focused on IERP. First an overview of the project is given after which the situation is described in which the project is implemented. After that a look is given into the process of IERP, beginning with the start and ending with its implementation. Especially in this last part a number of difficulties will become clear.

The information written down in this chapter is based on personal observations, several conversations with people working for SHF and on an interview with Muthubanda Surendrarajah (see appendix D).

3.1 Project overview

IERP is a project in Sri Lanka, SHF officially started as from March 1st 2006. At first, it was a rehabilitation project for victims of the tsunami on December 26th 2004, which due to this disaster had become homeless. Later on SHF choose to also add people to the project which lived in poverty and people who were the dupes of the ongoing conflict between the Sri Lankan government and LTTE.

Inspector Eatham is situated on the north side of Pottuvil, a village located on the east coast of Sri Lanka. By the end of 2007 almost 54 dome houses were completely finished. By the end of 2008 IERP will accommodate 110 families.

During the entire period that the construction of IERP lasts, SHF has one project manager present in Pottuvil. He works closely together with the Sri Lankan organisation the Sewalanka Foundation. They administer the finances, take care of the social mobilisation and accommodate SHF with workers and the necessary knowledge about the local situation. The Netherlands Red Cross and Stichting Mondiale Woonhulp are the main donors of the project. Especially in the beginning of IERP, SHF cooperated with several NGO's (Non Governmental Organisations) like ADRA (for the construction of wells) and Swiss Contact (for education).

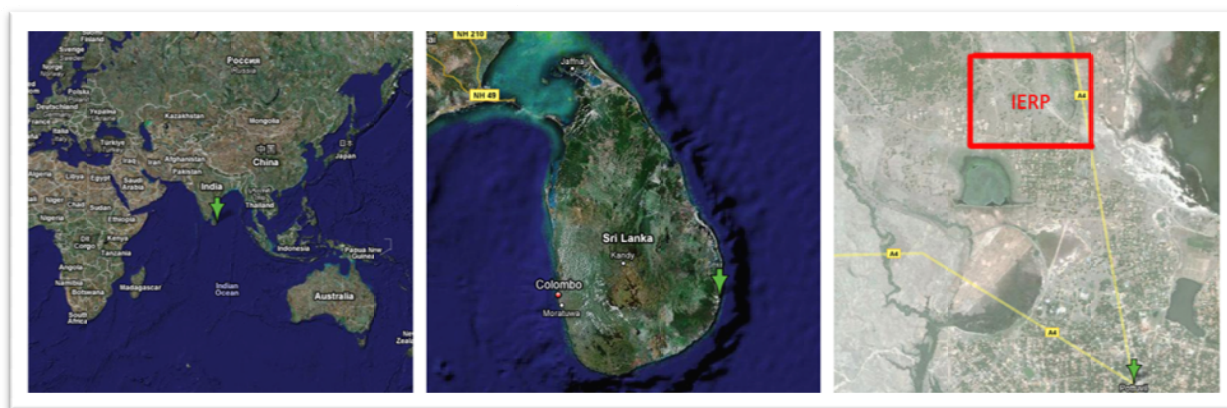**Figure 1 - Detailed drawing of IERP**

Figure 2 - Location of IERP

3.2 Local situation

As an organisation working abroad, there are all kinds of things you have to adapt to, because they occur differently from what you are used to in your own country. In this part the organisational, cultural and environmental characteristics of Sri Lanka are being discussed. These are things SHF had to adapt to.

3.2.1 Local government

The municipalities in Sri Lanka are governed by the Pradeshya Sabha (PS). In appendix A the organisational structure of the PS is shown. The PS can be compared with the Dutch town council. It is chosen by public elections once every five years and consists of a number of members from different parties and a chairman, the person from the largest party with the highest amount of votes. In Pottuvil there are nine members from four different parties; five members of the Sri Lankan Muslim Congress (SLMC), one of the Tamil Nation Party (TNP), two of the Independent Group 1 and one of the Independent Group 2. The chairman is logically a member of the SLMC. The high amount of members from the SLMC can be explained by the fact that around 80% (according to the DS) of the people living in Pottuvil is Muslim.

Though the PS's are practically independent operating authorities, the national government keeps watch over them. On district level this happens by the Assistant Commissioner of Local Government and on provincial level by the Commissioner of Local Government.

As said, the PS can be compared with the Dutch town council. The PS is responsible for controlling the market, cleaning the streets, giving out different kinds of permits (including building permits), everything that has to do with land use etc. So in general the PS is responsible for all the local affairs.

3.2.2 Regional government

For governmental affairs, like a birth certificate or a drivers license, the Sri Lankan population is assigned to the Divisional Secretary (DS), of which the organisational structure is shown in appendix B. Every municipality has its own DS and next to that an Assistant Divisional Secretary (ADS). All the DS's from the different municipalities together form the regional government, that is lead by the Governmental Agent (GA). Furthermore, each municipality consists of a number of Gramaniladari's (GN's), for Pottuvil twenty-seven, which are the representatives of the accompanying Rural Development Societies (R.D.S.'s).

The regional government stands in line with the national government and, other than in case of the chairman and the members of the PS, the GA and DS are assigned for indefinite time by the national government . So there are no public elections for this office.

In short, the regional government is there for implementing and maintaining governmental rules and regulations and for some governmental affairs as mentioned before. The regional government is in that way engaged in different sectors, like agriculture and irrigation, healthcare, environment and construction. For all kinds of projects (e.g. road building, water management and house building) the regional government, in most cases the DS, has to give approval. For organisations doing construction projects in Sri Lanka this means that they most of the time have to send in their plans to the DS, so he can check whether a project is in line with the governmental rules and regulations.

When an aid organisation is looking for a suitable area to start a project, they can also best inform with the DS. The DS knows where in the region problems lie and where there are possibilities. In some cases the DS can even provide a part of the land that is still owned by the government.

There is some overlap between the responsibilities of the PS and the DS, mainly on the big issues that can expand over a number of towns. For example, road building and water management. On these issues, the PS has direct control, while the DS only wants to be informed and checks whether the things that occur are within the governmental regulations.

3.2.3   Building permits
In Sri Lanka they make use of zoning plans where there are area's for paddy fields, forest growth, residence, industry, commercial exploitation etc. And just as in the Netherlands and many other countries, in Sri Lanka it necessary to obtain building permits to be allowed to start with the actual construction of a project. There the PS is responsible for the issuing of building permits. After the plans have been send in and an application has been submitted, it will normally take from a few weeks up to a couple of months before the permits are issued, depending on the size of a project.

For different constructions different building permits are needed. Next to that, the procedure can be distinct. In case of a housing project, a permit has to be issued for the house itself and for its positioning and for the construction and positioning of other constructions like toilets, wells and roads.

3.2.4   Housing
The design and construction method of the dome house originates from the United States. SHF has adopted this method for its strength and durability. Though the construction has been calculated on material use by Dutch engineers, structural engineers in Sri Lanka have checked the design for the use of local materials, to be sure the houses will have the assumed strength and sustainability. More important, this makes it possible to send in the design of the house (or toilet or any other construction) to the PS, where the chairman and his technical officers check the design and give the necessary approval before it can be used in practice. This approval does only count for the town the design is approved in. When a project is being build for 'free' (like in case of an NGO), the approval is often given more easy.

3.2.5   Water management
Sri Lanka knows two rainy seasons. One in the west from around April till June and one in the east from around November till January. Especially in these periods of the year a lot rain falls down, filling the many so called 'tanks' (artificial lakes) and turning the sandy roads into dirt roads. Due to the high amount of precipitation that can come down in a short time and for lack of sufficient drainage systems, in some regions floods of roads and urban area's occur, causing damage and major inconvenience.

In Sri Lanka they do already for long time have a water catchment system, using dikes to

create artificial lakes that hold water for later use, in particular for the irrigation of the paddy fields. For drinking water the Sri Lankan people normally make use of wells. The water gained by these wells, is also used for showering, cooking, washing clothes etc.

For the planning and construction of wells and toilets the Ministry of Health (MoH) has to be contacted, because they are concerned with the general healthcare. MoH checks the position of toilets compared to households and wells (at least 30ft from water sources) and also checks the position of wells compared to other polluting sources, as well as the quality of the water. This checking is done by a Public Health Inspector (PHI) from the local Medical Office of Health. In case of the use of a new kind of toilet, the design does also have to be approved by the MoH.

3.2.6 Road building

In Sri Lanka the Road Development Authority (RDA) is responsible for the construction and maintenance of the main roads. In case of a housing project there generally is no interference with this main road network. Therefore, the construction company can, except for the connections to the main roads, design a road network by its own understanding, assuming that they own the land. When this is not the case and the construction company has to use private property for the construction of a road, they can either buy the land or can, in cases where the owners are not willing to cooperate, try to use the power of the PS and the DS to expropriate the land and assign land for road building.

There are several reasons that make expropriation of land possible. In case of road building for example, land can be expropriated for roads that run from main roads to land that lies behind a certain property, depending on whether there already is another road and the distance to this road.

The PS has to give permission for the design and construction of rural or municipal roads and after a rural or municipal road is been constructed, the PS will be the owner of the road and is responsible for maintenance.

3.2.7 Electricity

Most of Sri Lankans power is generated by the use of dams. In several regions, including Pottuvil, power cuts occur regularly, which makes the supply of electricity highly unreliable. In Sri Lanka the only provider of electricity is the Ceylon Electricity Board (CEB). They are also responsible for the construction and maintenance of the electricity network and even finances this. Only might it, in that case, take many years before the construction actually starts. Therefore, many organisations pay for the network themselves, so the electricity network is finished within months and the future occupants do not have to live without electricity for a long time.

3.2.8 Culture

With its great history and long presence of different religions, many archaeological sites can be found in Sri Lanka. Depending on the origin of the structure that once was there an archaeological site can cover up to 1000 acres or more. For this, the discovery of an archaeological site can have major consequences for a construction project. Above all for the fact that the Sri Lankan Archaeological Department has great power. This governmental department can claim the land if it ones was known to be used for a temple. To find out if this is the fact, the Archaeological Department uses deeds and carries out archaeological research. Next to the Archaeological Department, the DS and the PS know were archaeological sites (if already discovered) can be found within their region.

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Compared to the Netherlands, in Sri Lanka religion plays a much bigger role in life and in some cases in a different way than it ever did in the Netherlands. For example, Sri Lankan people prefer an entrance as well as a prayer room on the east side of their house (because of the sunrise in the east). The prayer room should also not border with filthy places like the kitchen and bathroom. Though how much people prefer all this, strongly depends on the amount of money they can spend.

3.2.9 Environment

In western countries, like the Netherlands, almost all livestock is kept in barns or in land surrounded by electrical or barbed wire fences. It prevents the animals from wandering off and going missing. In Sri Lanka it works different. There most livestock wanders around freely or in herds. The cows, water buffalo's and goats often walk in the middle of the road and in towns, though this is officially not allowed without a care taker nearby.

Though a lot of forest has vanished from Sri Lanka being replaced by paddy fields and tea estates, there is still enough left to serve as a safe environment for wildlife. Most of this wildlife is harmless for the people and do not even come near the more civilised areas. There are only two exceptions and that is the elephant and the snake.

Mainly the elephant still forms a big danger and every year several people get killed by one. In daytime the elephants normally hide in the forests, but as the night falls they come out and wander over the paddy fields, roads or even through villages, where they do not hesitate to attack any person or vehicle that forms a possible threat. Because of this, people take measurements to protect themselves. In areas were a lot of wild elephants live they often build so called elephant fences around there villages or along a road. The high voltage on the wiring of these fences keeps elephants away and prevents them from entering a village or crossing a road. The Wildlife Foundation has knowledge about elephant behaviour, can therefore estimate the risk that exists in a certain area for elephant attacks and are willing to give advice on possible measurements that need to be taken. They also provide the design of the fence and information about suppliers of the needed materials.

The snake only starts forming a real problem in case of floods. Then the snakes flee from the water and end up in the often higher situated houses. However, this happens only occasionally and so far no constructive measurement has been developed yet.

3.3 Plan making process and implementation

After a lot of lobbying, having meetings with local governments and the creation of a cooperation with the Sewalanka Foundation, SHF found a community which was suitable to help and an area that was suitable for the rehabilitation project they had in mind. Since then, the plan making of IERP, as how it was known from that moment, could start. This section will give a look into how SHF handled this process and how the plans were implemented and what difficulties occurred during that implementation.

3.3.1 Start

As soon as the location for the project was known, SHF started investigating it, looking for opportunities and problems that might occur due to the landscape. During several visits to the site, it was found that Inspector Eatham was a relatively high situated flat grassland area, with some bushes and paddy fields here and there. The area, where only few huts were build and few people lived, was bounded in west by forest, in the north by paddy fields, in the east by the coastal road beween Puttuvil and Akraipatu and in the south by an urban suburb of Pottuvil, called 'Inspector Eatham', in which most of the beneficaries were located. With this knowledge and information gathered on sight, SHF created a map which they used for developing their first plans. They did this by organising a think-tank, where several high educated people participated. The result of this is seen below, a first sketch and a function scheme.
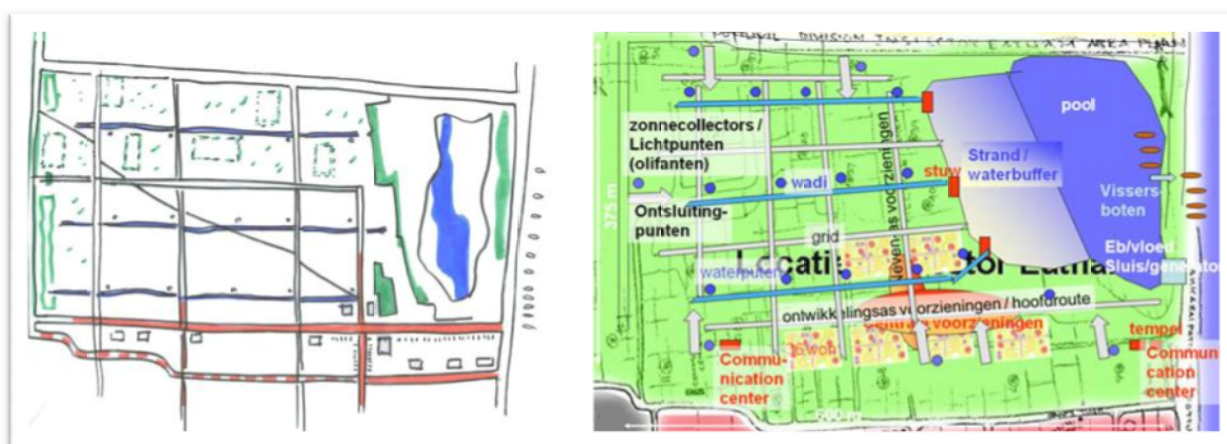

Figure 3 - First sketch and function scheme of IERP

3.3.2 Parcellation

After SHF created the first ideas and plans for the rehabilitation of Inspector Eatham, they wanted to start making more detailed plans. However, at that moment a group of local people claimed most of the land within Inspector Eatham. Though not visible for the eye and not recorded in documentation, it turned out that whole area of Inspector Eatham was squatted and was owned by many different people. This was later confirmed by the PS.

In cooperation with the local people, the only ones who knew how the land was divided, and a land surveyor, SHF then made a survey of the entire area. In the period that followed more owners claimed land and due to that the survey grew. In the end 104 owners were known and even more lots were surveyed. Luckily, most owners of the land were also the people who met up to the requirements for getting a dome house. From some lots the owners are still not known.

Due to this development, the plans that were made so far, could not be implemented in the existing situation. SHF decided to accept the parcellation for what it was, using it as a basis for the creation of

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a new plan. For this, they again organised a think-tank, resulting in the plan showed in figure 4. Though, there has to be said, that SHF saw this plan as an indication of what IERP could look like after finishing the project. It was an indication of the possibilities and thus not a plan they basically would hold on to no matter what would happen.
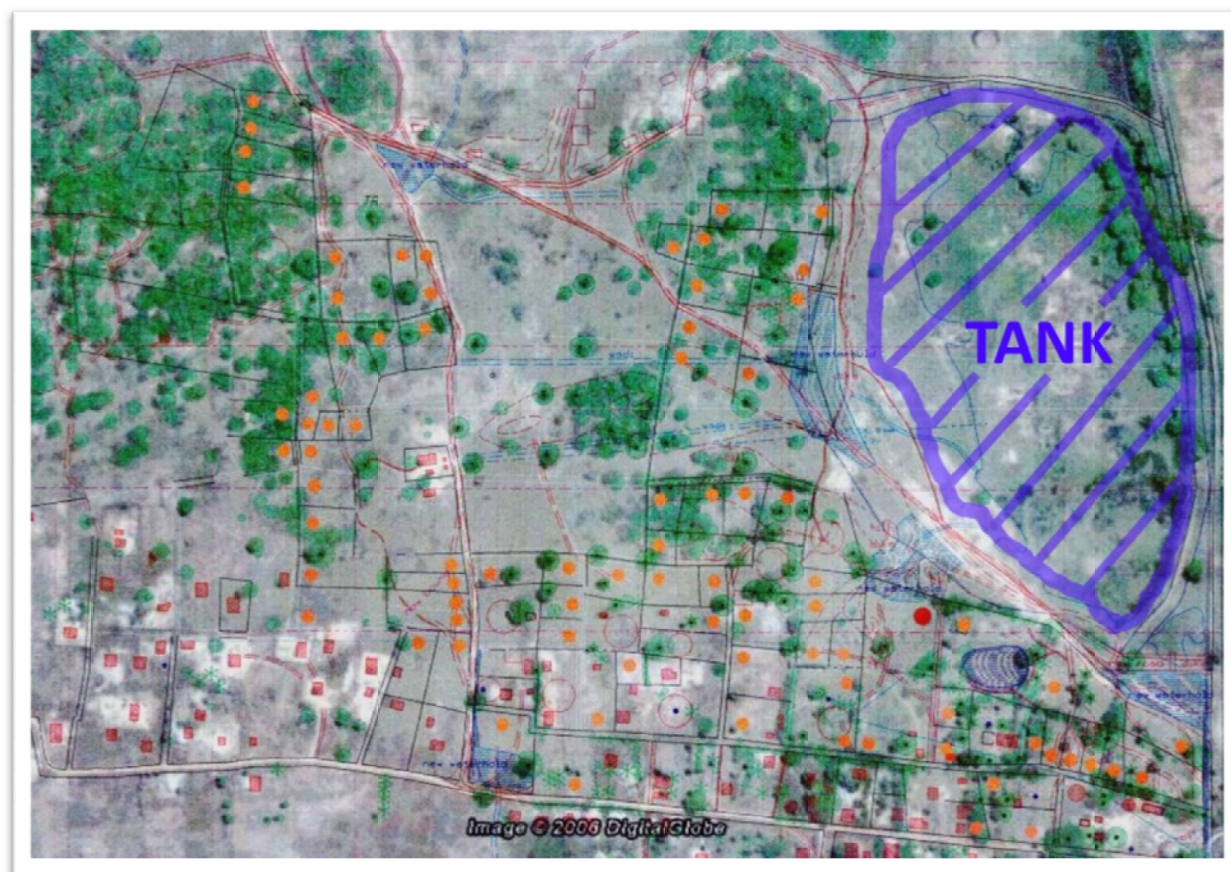
This plan contained a number of dome houses placed on the different lots in accordance with the land survey. For improving the accessibility, SHF added some roads, since the already existing road network was no more than a few tractor tracks, which ran across the land with no consideration for the boundaries of property. Next to that, they planned to create a two meter high dike around the west side of the tank, which would result in a number of water holds. Though, the parcellation was taken into account within this plan, some flexibility with the boarder lines was needed, especially for the implementation of the roads.

3.3.3 Implementation

In the meantime, one (model)dome house had already successfully been build for showing the concept to the intended beneficiaries. With the creation of the previous described plan, SHF now decided to start with the implementation of the entire plan.

Due to a series of problems that occurred during this process (mentioned in the subparagraphs below) it slowly became clear, that it was not easy to implement the entire plan at once. To that, SHF decided to take on the project house by house. Out of a list of around 180 families, provided by the Division Secretary, Sewalanka Foundation made a selection based on the chosen criteria; a family had to be either effected by the tsunami of December 26th 2004 and poor, effected by the ongoing

conflict and poor or just poor in general. Next to that, a family had to be the owner of a lot inside the project area or, as in some cases happened, obtain a piece of land from somebody else within Inspector Eatham. For those families (54) SHF started to build houses as well as toilets and rainwater harvesting tanks.

3.3.3.1   Landownership

December 2007 SHF finished the first 54 some house and was ready to start building another serie of houses. At this moment they only had the problem, that still only few landowners within Inspector Eatham meet up to the requirements for getting a dome house. A lot of others do not meet up to this and therefore SHF is not willing to build a house for them. The only possibility for SHF to use these parts of land within Inspector Eatham for house building is, by the beneficiaries to acquire it. This will only cost a lot more money than when the land would have been acquired at the start of the project, because the demand for it is higher, it is now known that the land will be used for occupation and the price increased for SHF brought a range of facilities (electricity, roads, water etc) to the land. For that, in the future the costs might become too high and it will not be possible any more for beneficiaries to obtain a piece of land, even by use of a micro credit.

3.3.3.2   Building permits

The official building permits have not been granted for a long time, even though the construction of IERP had already started. The reason for this is, that it can take a long time for getting these permits and SHF wanted to start building as soon as possible. That they were allowed to start with the construction of the dome houses comes due to a personal permission by the chairman of PS. This is something that is only possible in towns like Pottuvil.

3.3.3.3   Water management

Though SHF has not created a detailed plan for dealing with the water runoff, they do create gutters and drainage pipes, so water can runoff to lower unused areas and the Planthi Vaddai Tank (northeast of Inpector Eatham). However, these are not created following a certain plan using a water analyses of the whole area and region, but just on sight, there were water problems occur.

With every dome house SHF builds a rainwater harvesting tank. In this tank the rainwater is collected that falls down on the roof of the house. The people use the water in these tanks for everything water can be used for. Next to that, SHF builds different wells spread over the whole project area. Due to the use of the harvesting tanks the clean drinking water in the wells gets spared as much as possible.

SHF also started working on the construction of five wells in two phases, next to four tube wells that were created by ADRA. The location for these wells were chosen based on a logical positioning compared to the houses that were to be build. For the runoff of water, several gutters were created to prevent the roads from being damaged, as they are made of only gravel. This happened during the last rainy season: there where water problems occurred, gutters were dug and culverts were constructed to let the water flow down to lower situated pools and paddy fields.

The planned dike has never been build, because SHF was not allowed to create it. The Water Board (represents the paddy field owners) did not allow SHF to change the water flow towards the tank.

3.3.3.4   Road building

SHF improved existing roads and tried to implement new ones, in which they partially succeeded. This was a difficult process, as landowners did not want to give up any land for road building. Due to

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this attitude, SHF had to cooperate with the PS to expropriate land of the owners. However, due to many complaints by the landowners this process took a long time and resulted in a reduced road plan.

3.3.3.5   Electricity
In case of IERP, the electricity and the therefore needed network is provided by the CEB. The planning and construction of the network took place in cooperation with SHF. SHF paid for the network themselves.

3.3.3.6   Culture
During the project it was found out that lot 2 and 3 of IERP contained archaeological findings. Nevertheless, the DS and GA gave clearance and SHF started the construction of both dome houses. However, during this construction the Archaeological Department came to know of it, send people over to do some research an based on that, demanded that the work on these two lots should immediately be stopped until further investigation had been done.

In the period that passed on, several experts from the Archaeological Department came by and even a court case has been filed against the DS, the GA and Sewalanka. But until January 2008 no decision had been made on whether the construction could continue or the Archaeological Department would claim the land and possibly continue pressing charges against the DS, the GA and Sewalanka.

Another problem SHF had, was with the Temple Board. They found the that the building which was build for the construction of panels stood in the line of sight from the road to their temple. For that, the building had to be demolished.

3.3.3.7   Environment
For adding aesthetic value to IERP and for providing people with shades against the heat, SHF has planted trees along the roads. The problem hereby is, that all the animals walking around on the site will eat the young plantings. So as a project organisation SHF doesn't only need to worry about the planting of vegetation, but especially about the protecting of these plantings from the livestock eating it. Therefore, SHF is now using chicken mess to surround the plantings and protect it in that way.

Because IERP is situated in an environment that is rich of wild elephants, precautions have be taken. As advised by the Wildlife Foundation, an elephant fence has being constructed on the west and north side of the project area and around the tank in a way that elephants can still drink the water and bath in it.

Another environmental aspect SHF took into account was toilet pollution. Because 'normal' toilets make use of water they pollute the environment, as in Sri Lanka there is no sewer system. For that SHF use of a new kind of toilet for which the (approved) design is provided by Action Contre la Faim Action (ACF, a French NGO). Together with them the first toilet has been build after which SHF adjusted the design. Instead of bricks they started to use ferrocement panels.

In this toilet the urine and faeces are collected separately. Only the urine runs into the ground, while the faeces are collected into two separate chambers. When one chamber is filled the other can be used. In the meantime the faeces in the first chamber dry out, so the bacteria's die and the faeces (now manure) can safely be used for fertilising the land.

Due to the use of these toilets, there is no risk for polluting the ground water and wells.

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Besides that, it results in a closed circle of life. People eat from the land and later on fertilise it themselves. Though there has to be said that this is only the case when the toilets are used properly. It is absolutely necessary to keep the urine and faeces separately and to not pour water into the chambers, so the faeces can dry out and bacteria can do their work to make compost out of the feases. For this, SHF hung up signs which explained the functioning of the toilet very clearly. The future will tell whether this was enough for the people using the toilets properly.

4 Model analysis

Organisations in the western world in general use a more planned approach in trying to prevent problems, such as occurred during the plan making process and implementation of IERP, from happening. Especially during the plan making phase problems that can be expected are being mapped as good as possible so the designs can be adjusted to them. Most of the time models and process schemes are being used as guiding principle in this phase.

In this chapter a number of these existing models, obtained from literature and practise, are being discussed. From this discussion the most important aspects for the design of the new model are derived. But before all this, a focus is given on which kind of models are initially suitable to use in case of a project like IERP.

4.1 Model focus

Because of the large number of plan making models that exist, during the search for models a series of aspects is used to assess whether a model is useful for this research or not. First of all, the search was focused on plan making models designed for house building or construction projects, for IERP is a housing project. Within this group a series of different kinds (as for form and extensiveness) of models is selected, to get as many useful aspects as possible.

Due to an unstable, constantly changing situation in Sri Lanka and because of a culture where deadlines are flexible, it is more difficult to plan and to expect how things will turn out. For that, there was a slight focus on flexibility.

4.2 Discussion of different models

The models presented in this part have been obtained from literature and practise. They have been chosen by focussing the search as described before, resulting in a broad and differentiated group of models, while still every model is related to the type of project this research is about.

4.2.1 Eekelen, Rip en Wentzel

A reasonably common model (see appendix C.1) is being described by Eekelen, Rip en Wentzel (2002). They divide the design process in the following phases: project definition, structural design, temporary design, final design and specifications. By using three different steps for the actual design, a lot of attention is paid to this. Each phase consists of a cycle (programme, design, estimate and decision-making) that should be run through. The whole process starts off with focussing on central issues after which there is a continuous focus on the details. At the moment of decision-making the results of programme, design and estimate come together. In every cycle this is an important checkpoint where the decision is made whether the plans are on the right track and there can be continued with the next phase. If this is not the case, there can be decided to redo the phase partially or entirely (which makes it an iterative process) or maybe even to stop the whole project.

4.2.2 Steering committee SGB

Steering committee 'Subsidieregeling Gebiedsgericht Beleid' (2001) created a document that forms a 'helping hand' specifically for the plan process of region directed policy. By use of a step-by-step plan (see appendix C.2) a possible plan process is sketched out, where there should be reckoned with the demands SGH puts on plan making. The most important demands are:

- the formulation of measurable goals for the long term and measurable and solvable intermediate goals for four years (operational goals);

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- the linking together of planned activities with these goals;
- the monitoring of the developments and responsibility over achieved results.

Thus, an aimed approach stands central within this plan process. A remarkable aspect about their plan model is the fact that it is combined with a checklist and different communication tools that should be used during a certain step within the process.

4.2.3 Ruimte x Milieu

On the website of 'Ruimte x Mileu' (Ministry of VROM, 2007) an extensive model (see appendix C.3) is presented, which describes the process from initiative to exploitation in a very detailed way with numerous steps. Though, all these steps are divided into the four basic processes explore, programme, design and develop and is based on an environmental instrument for spatial plans (MIRUP), developed by city district Haaglanden. Compared to other models the gathering of needed information is very extensive. This instrument aims for an early harmonisation of different municipal departments, where it does not only focuses on the local problems, but puts them in perspective with the rest of the region. Next to that, the model pays attention to different layers like ground, water, environment, traffic, energy, urbanisation and environmental hygiene.

4.2.4 Cross

A very general model which is completely focused on designing, is given by Cross. His model (see appendix C.4) starts with the formulation of the main problem, after which it will be divided into a number of sub problems. Then, for each sub problem a solution is created. These sub solutions together form the overall solution for the main problem. In the end, the overall solution is tested, after which adjustments have to be made or the process continues with the implementation phase. In case adjustments have to be made, the model will be run through again, making this model, as many other models, an iterative one. This model does not contain initiation phase nor does it contain a phase for the realisation/implementation.

4.2.5 Pugh

Pugh (1986) does not describe only one model, but goes into the necessity of the use of models in general and the development of it. He says that it is important a model is shaped in such a way, that people of different disciplines understand each other during the design process. For that, Pugh claims a model must answer to a number of criteria, namely:

- It must be possible for everybody to relate it to each other;
- It must be possible for everybody to understand it;
- It must be possible for everybody to be able to work more effective and efficiently;
- It must be comprehensive;
- It must preferably have a universal application, without a clear bound with traditional disciplines, industry of product.

An example of a model which corresponds to these criteria is the model of Bleker (see appendix C.5). A new development at that moment was the use of three-dimensional design models as created by Pugh himself (see appendix C.5). In his model the product is divided into elements of specification, where all these elements are arranged in order of importance. The use of the third dimension helps people understand what a complete comprehensive design brings about. Pugh's experience is that because of this better designs are made.

4.3   Similarities and unique aspects

After the different models have shortly been discussed, in this part the similarities between the models are analysed. After that, the most important unique aspects are summed up. Table 5 in appendix D gives an overview of the properties of each model.

4.3.1   Similarities

The similarities are important for the development of a new model, because the similarities between the models, either used in practise or described in literature, say something about aspects that apparently are necessary for a functional model and by that can initially form the basis of a newly designed model.

4.3.1.1   Model phases

The most striking similarity between the analysed models is the use of the same kind of phases within the models. The phases are not exactly the same but they correspond to each other, where the emphasis of each model lies somewhere else and the models are less or more detailed and are bounded differently. The model of the steering committee is the only model that is really different from the rest. The reason for this is that this model has a quite different purpose. It is designed for structuring the creation of policy in a certain area, not for actually designing a construction project or product.

But, despite this and some differences between the other models it can be said a design model starts with the gathering of information about the situation, requirements, goals etc. Based on this information a design is made in the next part (one or more steps) of the model. After this the final design is worked out making it ready for the start of the implementation. So, a general design model includes the phases exploration, specification, design and preparation.

4.3.1.2   Subdivision

Within the models of Ruimte x Mileu, Cross and Pugh the whole 'problem' is divided into smaller 'problems'. Cross and Pugh are very clear about that, their models are actually completely based on this idea. For the model presented by Ruimte x Mileu this is less clear, because there is no subdivision right from the start, which makes its way through the whole model. Instead, Ruimte x Mileu makes use of the 'layer approach' (see step 4 within the model), in course of which the environment is analysed by splitting it up in three different layers (soil, networks and occupation). With that, the problem is automatically split up in three.

4.3.1.3   Control

Several models ask for the fulfilment of one or more aspects before there can be continued with the next phase. Eekelen Rip and Wentzel specially added the step decision-making for making the decision, based on these different aspects, to continue with the next phase. Steering committee SGB added a checklist to their model to make sure everything necessary will be thought of. Ruimte x Mileu asks for a range of aspects to be looked in to, where every phase ends with a step where the conclusions of all these aspects are combined, forming the basis for the next phase. For this, Bleker makes use of baseline documents for continuously mapping the control aspects, activities and also the problem, result, boundaries, requirements etc.

4.3.1.4 Iterations

For the models created by Eekelen, Rip and Wentzel and by Cross the use of an iterative process is clearly integrated. In case of the other models this is not the fact. At least, this is not directly shown by the way these models look. Though, for adjusting the control aspects to each other in Bleker's, most probably an iterative process is used. And in Pugh's model the '*main* design flow' and the small double arrows between each phase, suggest that the design process in this model is not completely linear. The rest of the models show no clear sign of the use of an iterative process.

4.3.1.5 Focussing

In the models created by Eekelen, Rip and Wentzel, Cross and Bleker there is a clear focus, starting with a global design from where on more details are added, ending with the final design. Where in case of Cross's model it is actually the improving of details, Eekelen, Rip and Wentzel and Bleker ask for a number complete designs on different detail levels.

4.3.2 Unique aspects

Besides all the similarities, some models do have some unique aspects which can also be useful in a model for SHF. For instance, the steering group SGB pays attention to the difference between the current situation, long term goals and operational goals and even more unique has integrated a checklist and communication tools for every step.

Ruimte x Mileu's model is with its twenty-two steps extremely extensive compared to the other models and because of that and all the tools for analyses (like the layer approach, see paragraph 5.1.1) attached to different steps, the research and work that needs to be done is also very clear. Though, this is probably to extensive and consumes to much time for a third world country where there is an urgency for houses.

Pugh's model is the only model of this set that makes use of the third dimension. Furthermore, it is the only model that explicitly ranks the different aspects of the design (elements of specification) in order of importance.

5 Model design

After analysing the different general aspects and aspects of the design process of IERP, problems that occurred and having analysed a number of models, in this chapter the information from chapter 3 and 4 are combined for the creation of the new design model. A model based on IERP, but that can generally be used for future projects of SHF.

5.1 Model basis

For the creation it is assumed that all the similarities found in the previous chapter should be integrated into the model. So, the base model will consist of the phases exploration, specification, design and preparation (see figure 5)

Figure 5 – Phases of the base model

During the exploration the goal of the project is stated and general information is acquired about the local situation, important actors, culture, the environment etc. Based on this information a first general design is made and more specific information that is found necessary for detailing the design is gathered. In the design phase the general design is transformed into a more detailed, final design. The preparation phase prepares the final design for its implementation.

There should also be strived for the integration of:

- a subdivision of the overall problem (the design of a plan);
- checkpoints;
- an iterative process;
- a focus from general designing to detailed designing.

A unique aspect (implemented in the model of Ruimte x Milieu) that can help adjust the different layers of infrastructure to each other and for that will be integrated into the new model is the layer approach. A short description of this way of looking at a problem is given in the next paragraph.

5.1.1 Layer approach
Based on (Ministry of VROM, 2007)

When you want to know what an certain area looks like, what is possible, what factors you have to take into account and which opportunities an area brings, an analysis of the spatial structures in an area and its region can give the answer. For this, the layer approach is a very useful analytical and communicational instrument. In a horizontal way by placing the an aspect in perspective to other aspects within the same layer. In a vertical way by creating links between the aspects of the different layers.

The layer approach divides space into three layers. All layers are subjected to change, only the speed in which it changes is different per layer. Some layers have a long history and fix the future for a long time, while others change within a few years.

In figure 6 the three different layers are shown; soil (ondergrond), networks (netwerken) and occupation (occupatie). The soil consists of an abiotic, biotic and water system, knows a long history and is very vulnerable. Some changes in the soil can take more than a century.

The networks (traffic, environment and electricity) are very costly and it takes a long time for changing it as well. Important changes in this layer can take round 20 to 80 years.

The occupational layer gives the pattern of how people make use of space for living, working, food production and recreation. It shows the way how people act. Next to urbanisation this layer also concerns the rural area. Other aspects that should be taken into account in this layer are air quality, noise pollution, safety and residual products.
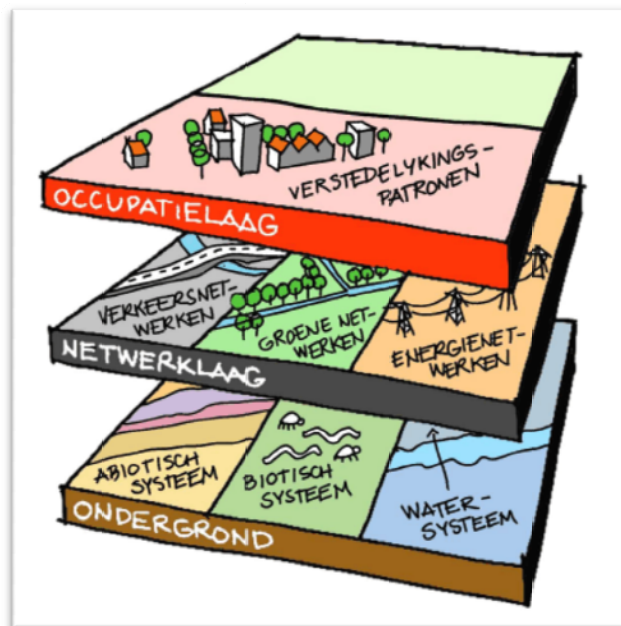

Figure 6 - Layer approach (vrom.ruimtexmilieu.nl)

5.2 Model based on IERP

The ideal model generates a design where all important aspects are taken into account and a process without any of the problems encountered during the design and implementation of IERP. For this the most important aspects are listed, as well as all the occurred problems during the plan design and implementation. The steps taken by SHF in their initial design process of IERP are also mentioned in this chapter, for they contain valuable information about data that is needed and matter that has to be done.

5.2.1 Problems

The problems that occurred during IERP are shortly described in table 1 and via the most probable cause of the problems a possible solution that would have prevented the problem from happening is given. Based on this solution all the problems are assigned to one or more phases of the four basic model phases, where the solution should be assimilated into the new model.

Problem	Description	Reason	Possible solution	Solution phase
Knowledge	Lack of detailed knowledge about procedures, regulations, culture etc.	Preliminary enquiry was possibly to much focused on the landscape, not on organisational and cultural aspects.	More extensive exploration before designing and implementation.	Exploration
Road building	Designed road plans could not be implemented.	Some landowners were not willing to give up their property.	Earlier cooperation with the local government.	Exploration, specification
Dike construction	SHF was not allowed to create a dike they designed on one side of a tank.	Water board forbid them to change the waterflow towards the tank.	Earlier acquirement about the possibilties.	Exploration, Specification
Archaeological site	Delay with the construction of two domes.	SHF was building on a archaeological site.	Earlier acquirement about possible archaeological sites.	Specification, design
Landownership	SHF could not implement their plan for IERP.	Land was owned and due to that parcelled out.	Adepting the plan to the parcellation.	Exploration
Sight on temple	A building for the construction of ferrocement panels had to be demolished (by the Temple Board).	The building took away sight from a main road on a temple.	Adepting the positioning and construction of buildings to religious places.	Exploration

Table 1 - Problems, possible solutions and the phases they should be integrated in

5.2.2   Aspects

In chapter 3 it is found that the aspects that were important for the design of the plan and finally the implementation of IERP are the following:

- Local organisation
- Communication
- Building permits
- Housing
- Water management
- Road building
- Electricity
- Culture
- Environment

For all these aspects played a key role in making IERP a success and making it possible at all, they have to be integrated into the model as well. Just as the solutions for the occurred problems. The important aspects can, other than for the problems, directly be assigned to a certain phase or several phases, where information should be gathered about the aspect for a successful assimilation into the design.

Aspect	Phase of integration
Local organisation	Exploration
Communication	Exploration, specification, design
Building permits	Preparation
Housing	Specification
Water management	Exploration, specification
Road building	Exploration, specification
Electricity	Specification
Culture	Exploration
Environment	Exploration, specification

Table 2 - Important aspects and the phases they should be integrated in

In a number of cases more than one phase is mentioned. This, because it is important to keep track of it in more than one phase or because the information needed over a certain aspect changes and is most probable more detailed.

5.2.3 Plan making process of IERP

Table 3 shows in basic, the activities SHF performed in the process of designing IERP and the phase of where in the basic model the activity would have taken place.

Step	Activity	Phase
1	Determining population	Exploration
2	Area analysis	Exploration
3	First sketches	Specification
4	Land survey	Specification
5	Plans based on parcellation	Design
6	Testing construction method	Design, preparation
7	Implementation	-

Table 3 - Steps taken in the plan making process of IERP

5.2.4 Phase assignment

Now, based on the three paragraphs before, table 4 is constructed which shows in which phase of the new model which problem, important aspect or by SHF performed activity will be assimilated. Of course there is some overlap between the three different groups, like for the landownership as a problem and land survey as activity. They are actually both the same and are combined for that.

The table also shows in what way an aspect will be implemented into the new model. The choice has been made to implement all aspects in the form of a model step, step/checkpoint or as part of the layer approach. This limited number of ways for implementation prevents the model from becoming disorderly.

The testing of the construction method has not been assigned to one of the three ways of implementation, because this aspect will be left out of the model. The reason for this is, that this has little to do with plan making and is not something SHF will do in every project.

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Phase	Aspect	Way of implementation
Exploration	Area analysis	Step
	Communication	Step/checkpoint
	Culture	Step
	Determining population	Step
	Environment	Step
	Landownership	Step
	Local organisation	Step
	Road building	Layer approach
	Water management	Layer approach
Specification	Archaeology	Layer approach
	Communication	Step/checkpoint
	Electricity	Layer approach
	Environment	Layer approach
	First sketches	Layer approach
	Housing	Layer approach
	Road building	Layer approach
	Sanitation	Layer approach
	Testing construction method	-
	Water management	Layer approach
Design	Communication	Step/checkpoint
	Environment	Layer approach
	Networks	Layer approach
	Final design	Layer approach
	Testing construction method	-
Preparation	Building permits	Step
	Specifications	Step
	Financing	Step

Table 4 - Aspects combined per phase including possible way of implementation

5.2.5   Design

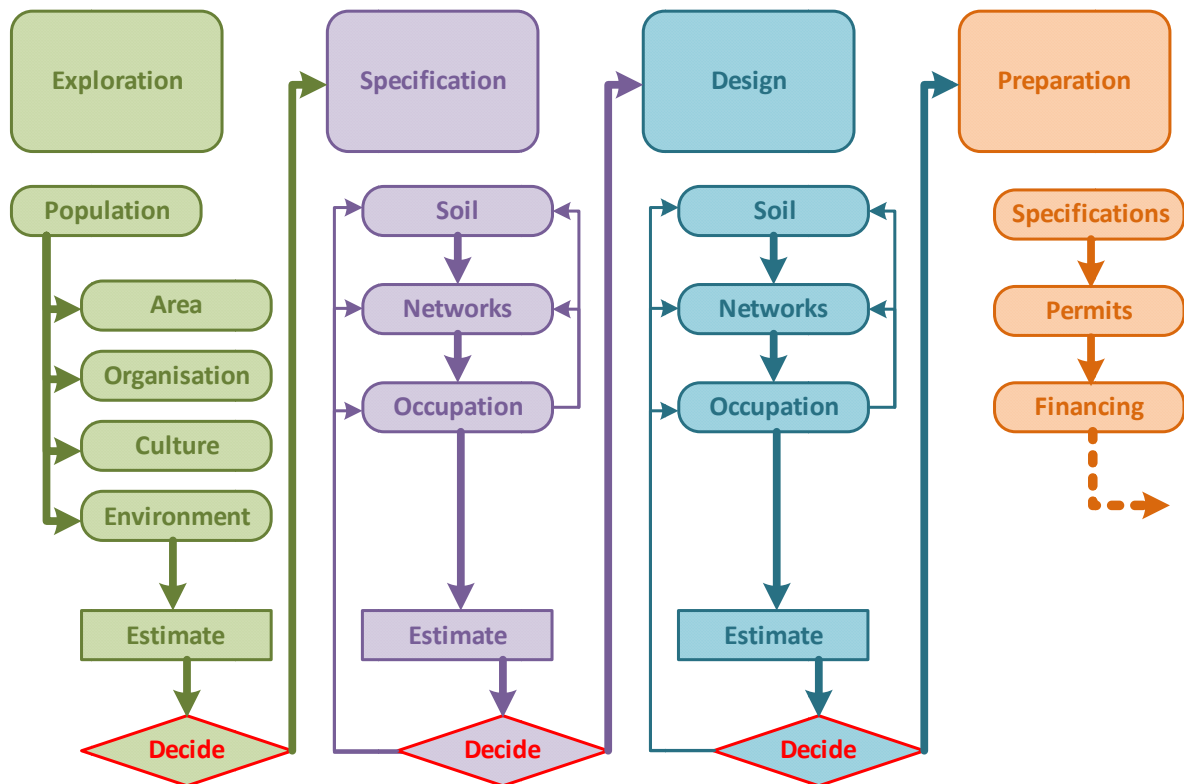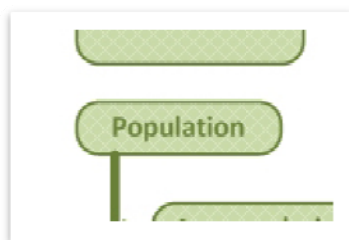The table in the previous paragraph has been transformed into the model shown in figure 7.



Figure 7 - Designed model

The model starts with the exploration phase and to be precise, with the step 'population'. In this step the goal of the at this moment possible project is set, in the form of a group of people who are in need of housing, sanitation etc. For SHF, this first step is actually the process of informing with governments and other organisations for a possible populations that corresponds to the general goal SHF has set as an organisation itself.

If this is the fact, an extended analysis should be done focusing on the area (location, landscape, landownership etc.), organisation (local and regional government, NGO's in the region, rules and regulations etc.), culture (Archaeology, religion, habits etc.) and environment (climate, natural hazards, wildlife etc.). The more information is gathered at this moment, the better the design can be adapted to the circumstances and the earlier possible problems are indicated.
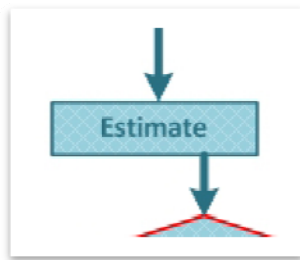
At the end of each phase an estimate is made of the costs of the project that is going to be implemented. Just as the design, this estimate will be more detailed for every next phase.
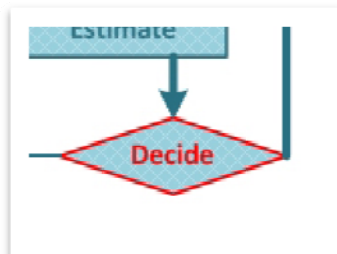
Based on this estimate a decision has to be made on whether to continue the project with the next phase, adjust the design (via the arrows) or to possibly quit. Note, that it is not possible to adjust the design in the exploration phase for there is no design yet. Though there can be decided to quit the project if at this moment it already turns out that it is going to be to expensive or for some other reason.

The decision moment is also an good moment to publish a report about the plans so far, for informing all the important actors involved.

By the decision step in the design phase, the decision is made to actually implement the plans.
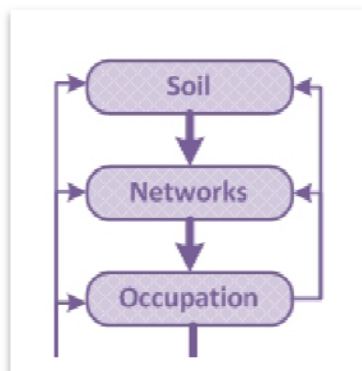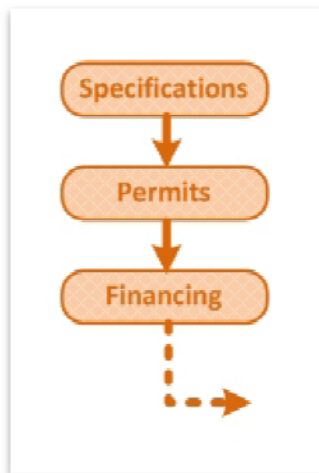
In the phases specification and design the layer approach has been implemented. A large number of aspects has been combined into this approach, for they can all be assigned to on of the three layers.

By this approach the actual design of the project is made. In the model it looks like 'networks' is based on 'soil' and 'occupation' is based on networks. In some way this is correct, because the networks are strongly dependent on the soil and the occupation on the networks and soil. Next to that, as described in paragraph 5.1.1, it is more difficult to change the soil than to change the networks and occupation and again it is more difficult to change the networks than to change the occupation.

But because decisions made in the network layer also influences the soil and decisions made in the occupation layer influences both the soil and the networks, a feedback has been implemented in the form of an arrow.

So, as described in paragraph 5.1.1, the 'problem' will be analysed and designed horizontally (within each layer) and vertically (between all the layers).

In the last phase a preparation is made for the implementation, the next phase after this model (dotted arrow refers to this). Based on the final design, construction and planning specifications should be made, so different permits can be obtained and the financial affairs can be settled.

Off course the applying for permits should already start during the other phases (to prevent delay), but here this aspect has not been implemented for this is actually a management matter. Financing is not the same as the step estimate. With financing is meant the financing of the project by, in case of SHF, donor organisations. As for permits, this also is not just a link in the chain but long process, but should off course not be forgotten

Though not physically implemented (except for the decision steps) it is important that all the actors are involved and informed sufficient during the whole plan making process, so as much desires as possible will be taken into account. There should exist a close relation with the actors by communicating regularly. The decision steps are good occasions for publishing a report about the progress. Though it is wise to not only report to them, but also ask for input.

6   Discussion and recommendations

In this chapter both the designed model itself as the whole research will be discussed and recommendations will be given.

6.1   Model

In the designed plan making model all the existing similarities between the analysed models have been implemented. The model consists of the phases exploration, specification, design and preparation, the overall problem is being divided by the use of the layer approach, checkpoints have been added in the form of decision steps, two returning iterative processes are assimilated and there is a focus from general designing to detailed designing. For that, it can be concluded that at least at the basis the model is valid.

But at the same time you can ask yourself: what makes this model different from the rest if it is formed by only combining all the similarities? Why should you, as SHF, not just use another already existing model? The reason why this is not the case is, because this model is based on the similarities and not just a combination. Several aspects show that it is a model adjusted to IERP and with that to future projects of SHF. The starting-point in the model is a population which makes it possible to directly focus on SHF's main goal, helping people. There is also a special focus on organisation, culture and environment which is important for making a success of a project in such a different country from the Netherlands.

Next to that, the layer approach plays a big part in the model, making it unique from the analysed models. When using the model properly this guarantees a good adjustment of the different layers of space in the final design. Although there is not as much information available in Sri Lanka as it is in the Netherlands, it is something that is important for infrastructural projects and was missing in SHF's original plan making process.

The main weakness of the model is the fact that it is based on difficulties encountered by SHF during the implementation of IERP, other aspects important for IERP and SHF's original plan making process. In all three parts information can be missing, due to the fact that it was not important or did not occur during IERP or that it was missed in the observation. If so, the model has not been adjusted to these missing aspects and can form a problem for a future project. Though, due to the combining of the three different groups of aspects, the change that something is missing is already slim. Next to that, the use of the layer approach and an iterative process makes it possible to create an ad hoc design. In that way the design can be adjusted to the missing aspect.

Another link that has not been described in this research, is the link with community mobilisation, livelihood development, safety and strengthening business attitude. Things that are very important for a project SHF develops, but that does not have effect on the design of the new plan making model and the steps that should be taken within this model. They do have influence on the way the model should be used, but that is part the whole of project management where the plan making process is also just a part of.

Off course this model does not form an actual step scheme that can be completed blindly, resulting in a perfect plan ready for implementation without encountering a single problem. Especially in unstable regions as Pottuvil, this will never be possible. While using this model in practice this should be kept in mind. This plan making model is there to guide and bring structure in the process of plan

making, not to tell one what to do step by step. When using it as a guiding principle, it will help a lot in keeping structure in the design process and getting to an integral design.

6.2 Research

By the development of the plan making model, the research objective has been fulfilled. For this, the different research questions have been answered adequately in the different chapters.

During the research, it is tried to keep the perspective as broad as possible, so as few organisational, cultural and environmental aspects as well as problems as possible were overlooked. As mentioned before, it is of course never possible to make sure to take everything into account. Though, a local research of three months during the implementation phase is a long time and this makes the chance slim that really important factors are missing. Only, this research was entirely focused on IERP. In case of another project in another region or country maybe the situation can be entirely different.

The design of a fairly global plan making model was done to deal with this problem, but for SHF it will always be important to keep track of occurring problems and relate them to the plan making process and with that to this model. SHF should analyse whether if it is possible to adjust the model in such a way that in the future it will prevent the problem from happening. Further research for refining this model would probably not be of any use.

7 Conclusion

After discussing the model and the research in general and recommendations are given, in this chapter a conclusion is presented. This is done by answering the five research questions on which the whole research is based.

What did the plan making process of IERP look like and what were the hampering factors during this phase?

SHF did not use a structured plan for designing IERP, but there are a number of steps SHF took during the plan making process. First SHF determined a population that was suitable to help with a location houses could be build. After this, SHF analysed the area and made its first sketches of the plan. When SHF found out, the project area was owned by a large number of people they decided to make a land survey. Based on this land survey they based their new plans. In the mean time SHF constructed their first dome house that was meant for testing the construction method and giving people an idea of the concept.

How are the national and local government organised in Sri Lanka and what is there influence on the construction process in general and more specific for IERP?

The research was focused on the local government and regional government, not the national government. The municipalities in Sri Lanka are governed by a PS, who are comparable with the Dutch town council and are among other things responsible for giving out building permits, controlling the market, cleaning the streets etc. So in general the PS is responsible for all the local affairs. Especially the chairman of the PS has a big influence and a difference in relation with him can for example make the difference in waiting for your building permits for only a few days to months.

The DS is the head organisation of the regional government. They also have rules and regulations you have to keep yourself to. The DS is concerned with governmental affairs and is there for implementing and maintaining governmental rules and regulations. The regional government is in that way engaged in different sectors, like agriculture and irrigation, healthcare, environment and construction. For all kinds of projects (e.g. road building, water management and house building) the regional government, in most cases the DS, has to give approval. For organisations doing construction projects this means that they have to send in their plans to the DS, so he can check whether a project is in line with the governmental rules and regulations. When an aid organisation is looking for a suitable area to start a project, they can also best inform with the DS.

Other governmental organisations that have influence on a construction project in Sri Lanka are the MoH (concerning healthcare in case of toilets, wells etc.), the RDA (road construction), the CEB (electricity network and supply) and the Archaeological Department.

Which cultural and environmental differences, that have influence on the plan implementation of construction projects, do exist between the Netherlands and Sri Lanka?

In Sri Lanka there are two rainy seasons. In the east of Sri Lanka there is a rainy season from around November till January. In that period people often have water problems due to the high amount of rain and the lack of sufficient drainage. SHF had to construct a number of gutters for preventing the roads within IERP from flooding.

The elephants form a different problem for the Sri Lankans. In daytime the elephants

normally hide in the forests, but as the night falls they come out and wander over the paddy fields, roads or even through villages, where they do not hesitate to attack any person or vehicle that forms a possible threat. People often build elephant fences to prevent this from happening.

In Sri Lanka there can probably also be found a lot more archaeological sites than in the Netherlands. Depending on the origin of the structure that once was there an archaeological site can cover up to 1000 acres or more. For a construction project this can form a big problem, because the Archaeological Department has to give permission for building on these sites or can even take possession of the land. Religion does also play a much bigger role in the daily life in Sri Lanka compared to the Netherlands. For example, Sri Lankan people prefer an entrance as well as a prayer room on the east side of their house and even the arrangement of their house is largely based on religion.

Which problems occurred during the implementation of the for IERP formed plans?

Even after SHF adjusted their plans to the land survey, it was difficult to implement the plans for they had a number of problems. Roads were difficult to construct, because the landowners were not willing to give up their land and a dike SHF thought of constructing could also not be implemented, because the Water Board (represents the paddy field owners) did not allow SHF to change the water flow towards the tank. Next to that SHF had problems with the Archaeological Department who stopped the construction of two dome houses, for they were being build on archaeological sites.

Next to these major problems, there were aspects SHF had not thought of during the design phase but that had to be dealt with during the implementation. For example, SHF never thought of the necessity of an elephant fence but had to find extra time and money for constructing essential protection measurement.

Which aspects are important for the design of a plan making model in general and which aspects are important for the design of a model specifically for IERP and future projects of SHF?

The aspects of a plan making model that are important in general are the model being build up out of the phases exploration, specification, design and preparation. Next to that, in every model there should be some sort of subdivision of the overall problem (the design of a plan) and it should contain checkpoints for controlling the process at where the decision can be made for a go or no-go of the project. An iterative process should also be implemented, for making the model successful in uncertain situations as in Sri Lanka, and the model should be designed round a focus, starting with a global design from where on more details are added, ending with the final design.

An aspect or tool that should specifically be implemented for IERP and future projects of SHF is the layer approach. This process tool makes it sure that the different layers of space will become adjusted to each other, something that did not happen well enough in the initial design of IERP.

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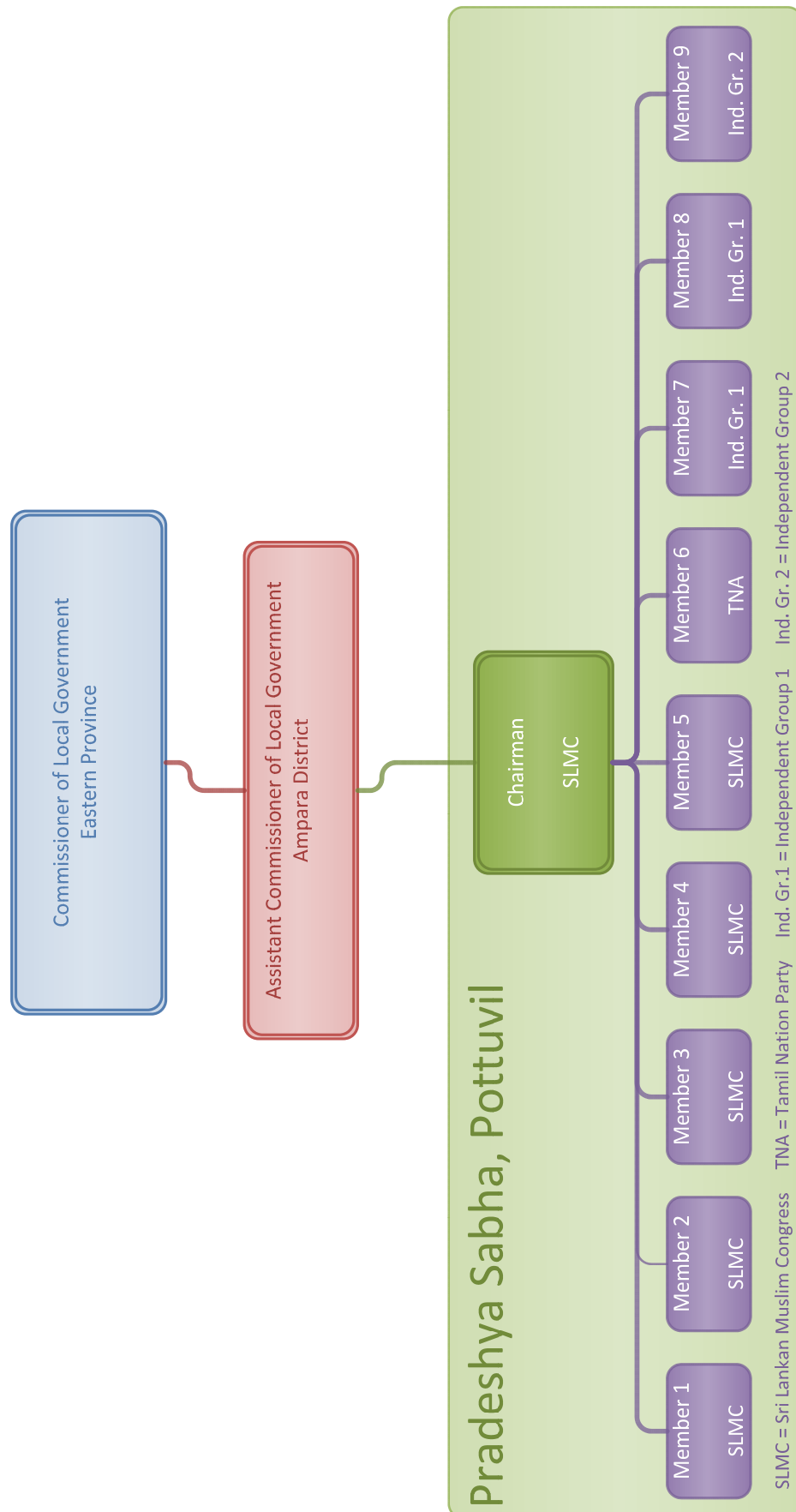
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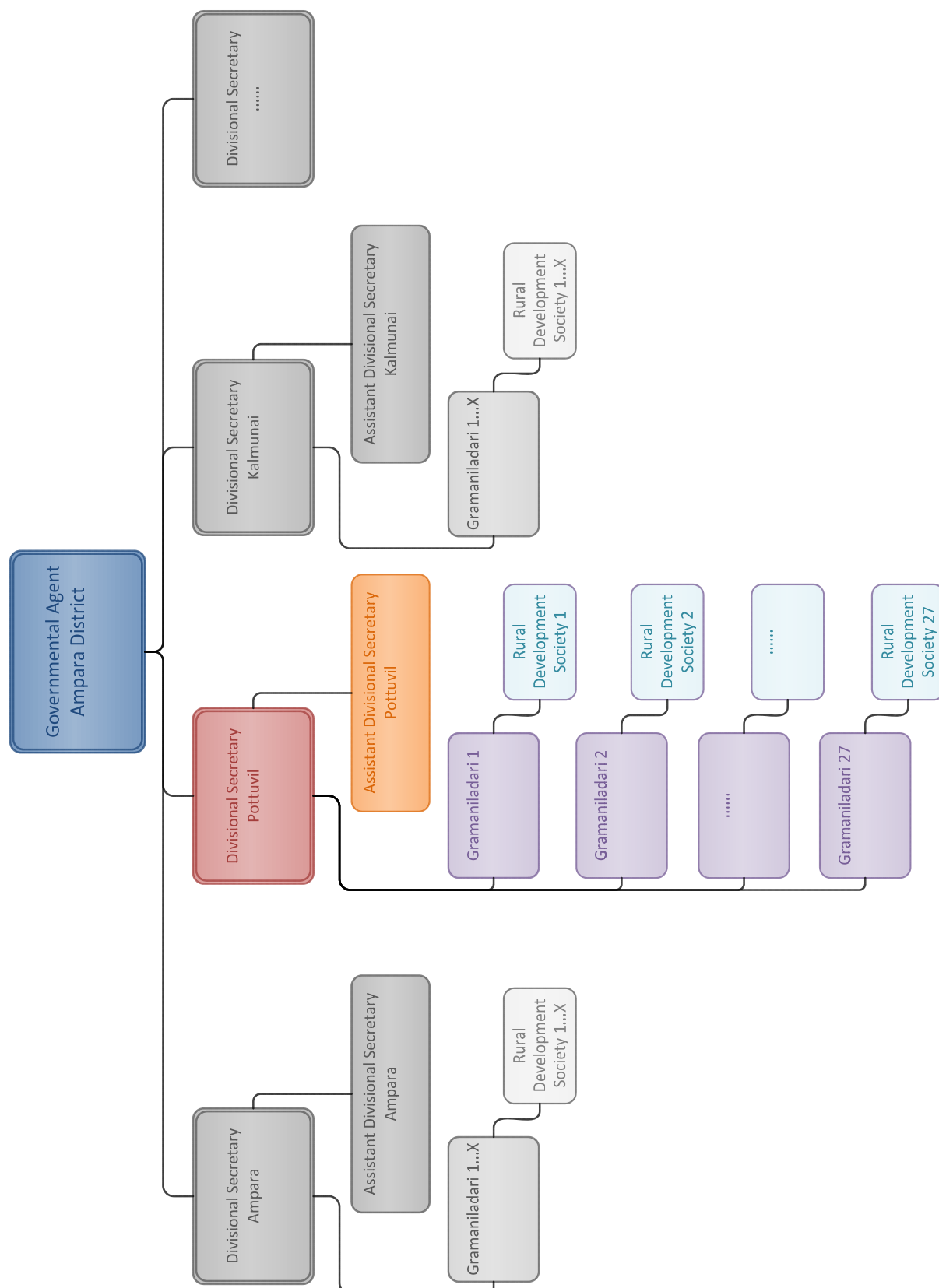
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Appendix A – Organisational structure of the local government

Commissioner of Local Government
Eastern Province

Assistant Commissioner of Local Government
Ampara District

Pradeshya Sabha, Pottuvil

Chairman
SLMC

Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7	Member 8	Member 9
SLMC	SLMC	SLMC	SLMC	SLMC	TNA	Ind. Gr. 1	Ind. Gr. 1	Ind. Gr. 2

SLMC = Sri Lankan Muslim Congress   TNA = Tamil Nation Party   Ind. Gr.1 = Independent Group 1   Ind. Gr. 2 = Independent Group 2

Appendix B – Organisational structure of the regional government

Appendix C – Models

C.1   Hogere Bouwkunde Jellema
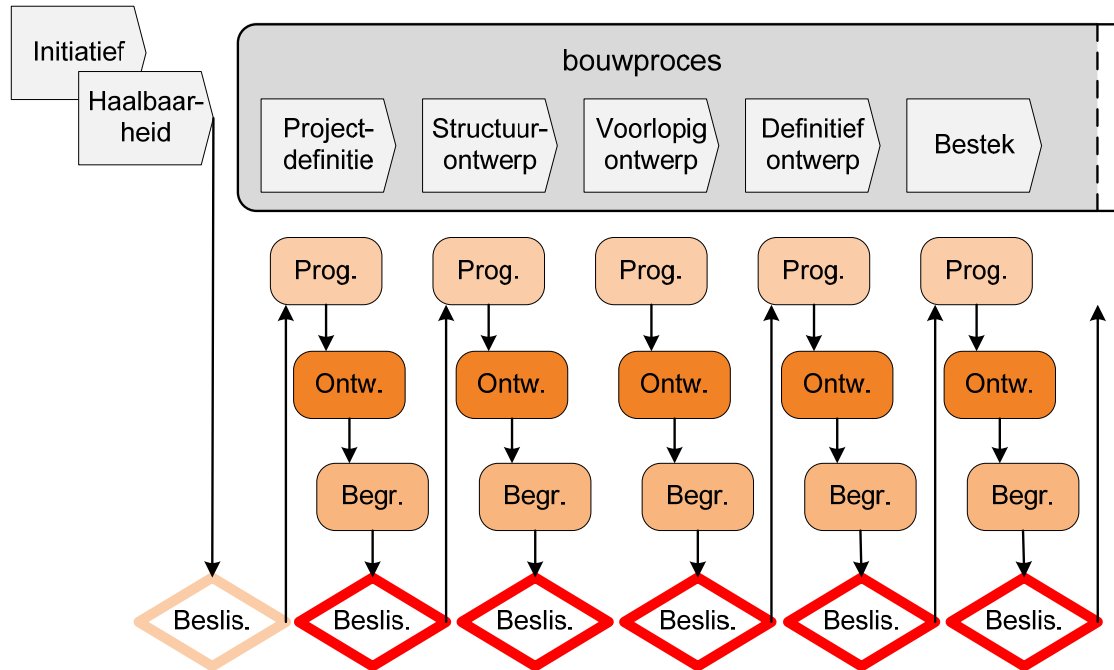
(Eekelen, Rip, & Wentzel, 2002)
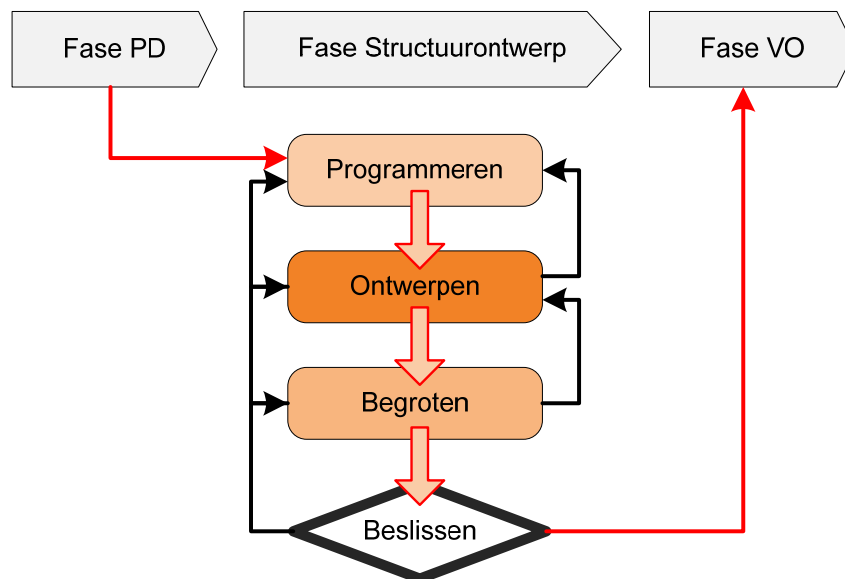

Figure 8 - Basic scheme plan development (POBB model)

Figure 9 - Structural design phase

C.2   De Handreiking gebiedsgericht beleid

(Steering committee Subsidieregeling Gebiedsgericht Beleid, 2001)
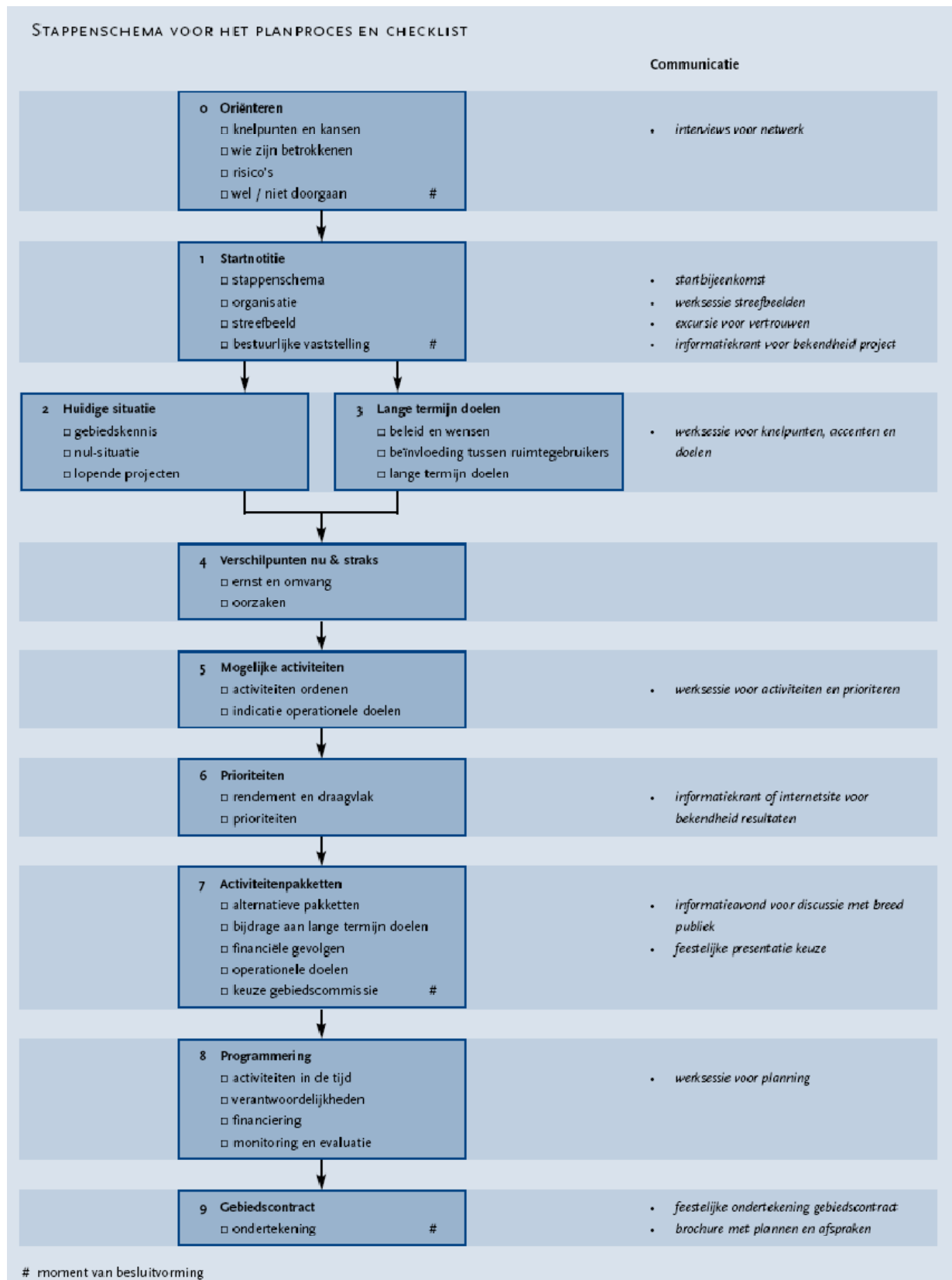

STAPPENSCHEMA VOOR HET PLANPROCES EN CHECKLIST

Communicatie

o Oriënteren
- knelpunten en kansen
- wie zijn betrokkenen
- risico's
- wel / niet doorgaan   #

- *interviews voor netwerk*

1 Startnotitie
- stappenschema
- organisatie
- streefbeeld
- bestuurlijke vaststelling   #

- *startbijeenkomst*
- *werksessie streefbeelden*
- *excursie voor vertrouwen*
- *informatiekrant voor bekendheid project*

2 Huidige situatie
- gebiedskennis
- nul-situatie
- lopende projecten

3 Lange termijn doelen
- beleid en wensen
- beïnvloeding tussen ruimtegebruikers
- lange termijn doelen

- *werksessie voor knelpunten, accenten en doelen*

4 Verschilpunten nu & straks
- ernst en omvang
- oorzaken

5 Mogelijke activiteiten
- activiteiten ordenen
- indicatie operationele doelen

- *werksessie voor activiteiten en prioriteren*

6 Prioriteiten
- rendement en draagvlak
- prioriteiten

- *informatiekrant of internetsite voor bekendheid resultaten*

7 Activiteitenpakketten
- alternatieve pakketten
- bijdrage aan lange termijn doelen
- financiële gevolgen
- operationele doelen
- keuze gebiedscommissie   #

- *informatieavond voor discussie met breed publiek*
- *feestelijke presentatie keuze*

8 Programmering
- activiteiten in de tijd
- verantwoordelijkheden
- financiering
- monitoring en evaluatie

- *werksessie voor planning*

9 Gebiedscontract
- ondertekening   #

- *feestelijke ondertekening gebiedscontract*
- *brochure met plannen en afspraken*

\# moment van besluitvorming

Figure 10 - Scheme for the plan process and checklist

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C.3 Ruimte x Milieu

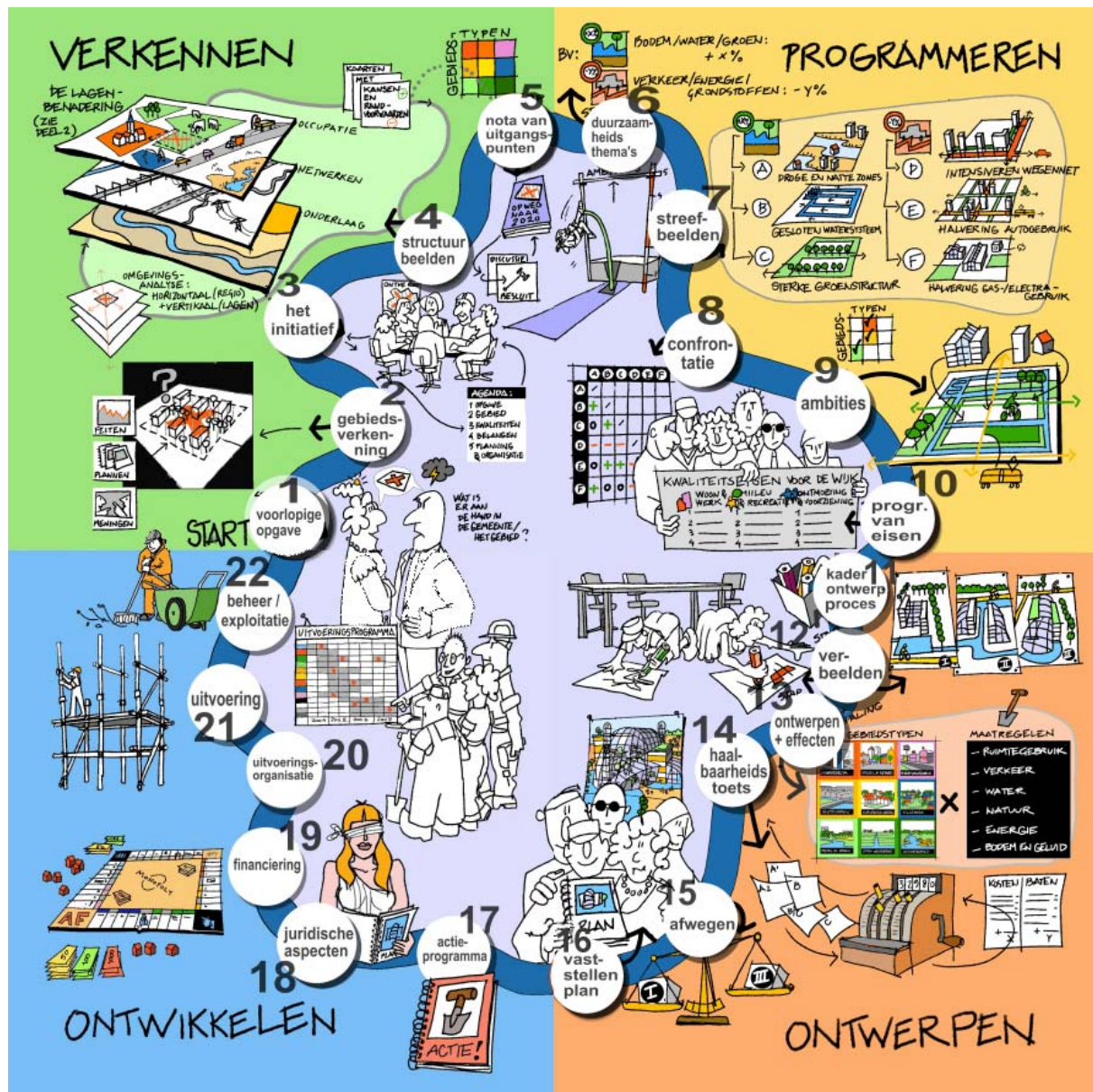(Ministry of VROM, 2007)

Figure 11 - Scheme Ruimte x Milieu
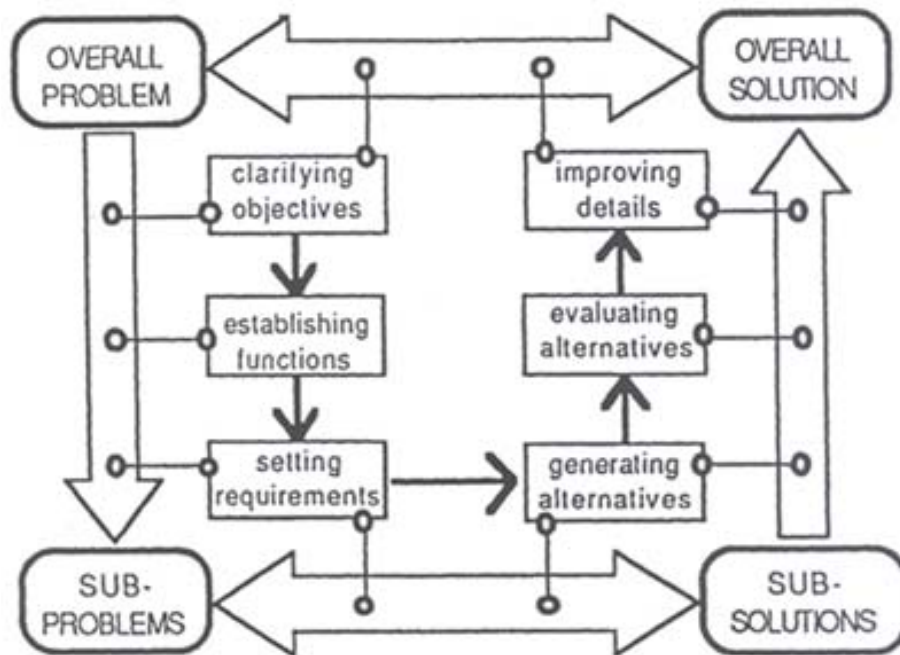
C.4   Cross

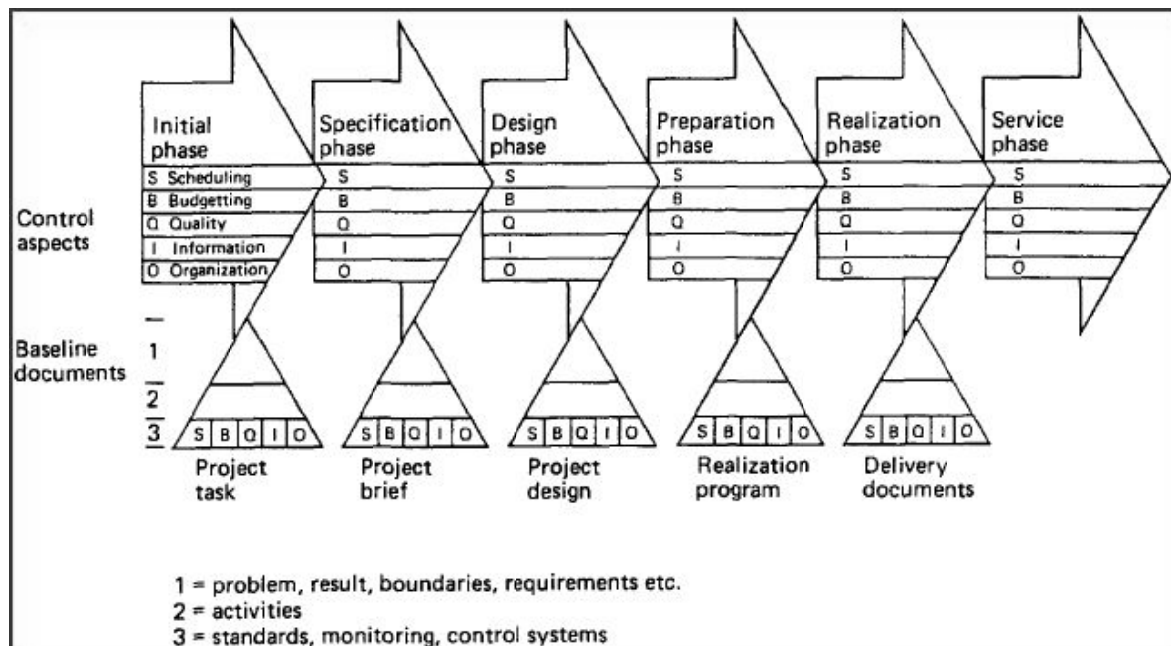Figure 12 - Design model Cross

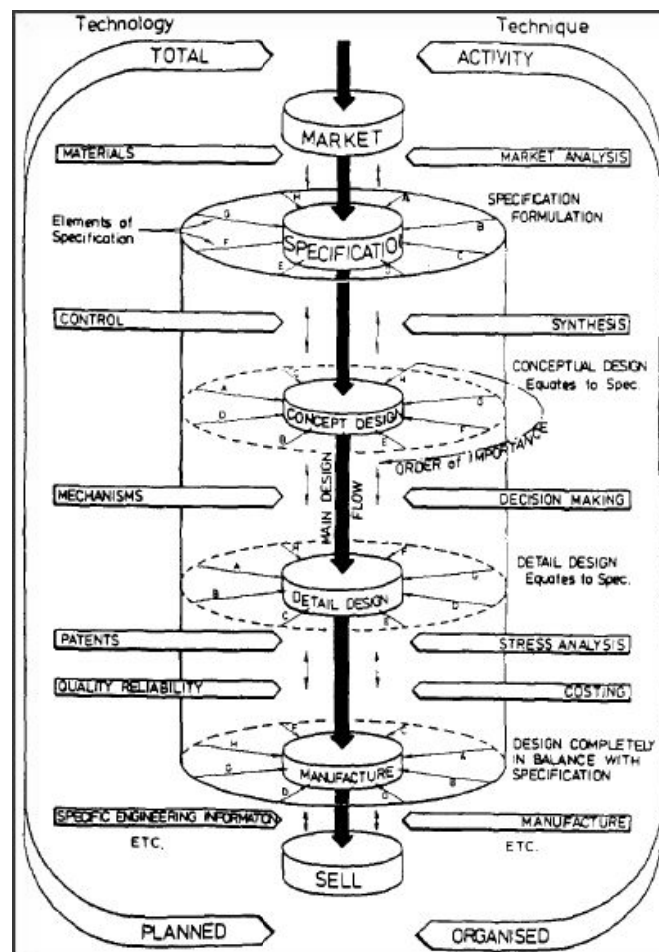## C.5   Pugh

(Pugh, 1986)

Figure 13 - Design model Bleker

Figure 14 - Design model Pugh

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Appendix D – Model comparison

Aspect / Model	Phases	Process	Iterative

Eekelen, Rip and Wentzel	1. project definition
	2. structural design
	3. temporary design
	4. final design
	5. specifications
		Within each phase the next process is followed:
		   1. programme
		   2. design
		   3. estimate
		   4. decision-making
			yes

Steering committee SGB	0. orientation 1. starting note 2. current situation 3. long term goals 4. differences now & future 5. possible activities 6. priorities 7. activity packages 8. programme 9. area contract	There are several checkpoints for every phase.	no
Ruimte x Mileu	1. explore 2. programme 3. design 4. develop	Every phase consists of a number of steps where for every step different aspects should be researched. The last step of every phase generates a summary of all the steps within the phase.	no
Cross	1. clarifying objectives 2. establishing functions 3. setting requirements 4. generating alternatives 5. evaluating alternatives 6. improving details	The overall problem is divided into sub-problems for which sub-solutions are found, resulting in an overall solution.	yes
Pugh	1. specification 2. concept design 3. detail design 4. manufacture	In the first phase the specification is divided into elements. The rest of the design is based on these elements.	Not clearly, but the 'main design flow' and the small double arrows suggest that the design process is not linear.

Bleker	1. initial phase
	2. specification phase
	3. design phase
	4. preparation phase
	5. realisation phase
	6. service phase
		Each phase consists of five control aspects:
		   1. scheduling
		   2. budgeting
		   3. quality
		   4. information
		   5. organisation
		Per phase baseline documents (divided into three layers) should be generated.
			Not clearly, but the control aspects have to be adjusted to each other, most logically in an iterative process.

Table 5 - Model comparison

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Appendix D – Interview Muthubanda Surendrarajah

Date: 10-01-2008

Location: Beach Hut, Arugam Bay, Sri Lanka

Interviewer: R. Noordink

Personal details interviewed person:

- ➢ Full name – Muthubanda Surendrarajah (Laden)

- ➢ Date of birth – 1979-08-10

- ➢ Nationality – Sri Lankan

- ➢ Profession – Capacity & Peacebuilding Coordinator

- ➢ Organisation - ADRA

- ➢ In short – Born in Pottuvil and has lived most of his life there, except for two years where he has been working in England.

Remarks: During the interview, Ladan called several times with a member and chairman of the Pradeshya Sabha, to ask for some specific information.

Questionnaire

A – Regional- and local government
1) How is the regional government organised? (see organisational structure)
   - Governmental Agent (GA) -> Divisional Secretary (DS) ->Gramaniladari (GN) -> Rural Development Society (RDS)
   - Governmental institution
   - Assigned by the government for indefinite time
   - No elections

2) Where lies the responsibility of the regional government? Which area's do they work in?
   - Responsible for implementing and maintaining governmental rules
   - For a birth certificate, a drivers license etc.
   - Also for checking whether everything that happens in their region, happens according to governmental rules and regulations
   - This is mostly done by the DS

3) In what way do they propagate this?
   - Governmental rules and regulations

4) How is the local government organised? (see organisational structure)

- Pradeshya Sabha (PS) is the local government
- Actually the PS is 'non-governmental', in the way that it is not 'in line' with the Sri Lankan government. PS is completely chosen by the local people, every 5 years.
- PS consists of 1 chairman (with the most votes of the members of the biggest party) and, for Pottuvil, 9 members.
- SLMC – Sri Lankan Muslim Congress (5 memb), TNA – Tamil Nation Party (1memb), Independent Group 1 (2memb), Ind. Gr. 2 (1memb)
- Government keeps watch over the PS's by use of an Assistant Commissioner of Local Government (ACCG) for the district (in case of Pottuvil the Ampara District). Above him stands the Commissioner of Local Government (CLG) fot the whole province (in case of Pottuvil the province of Trincomale)

5) Where lies the responsibility of the regional government? Which area's do they work in?
- PS is responsible for all the local arrangements like:
  o controlling the market;
  o cleaning of the streets;
  o everything that has to do with land use;
  o and giving out permits.

6) In what way do they propagate this?
- Local rules and regulations

7) On which area's does the regional government overlap the local governments policy?
- There is overlap, manly on the big issues that also expands over different towns
- Like road building, water management, drainage
- For most issues, the PS has direct control, while the DS only wants to be informed and checks whether the thinks that occur are within the governmental regulations

8) How are conflicts handled that occur due to this?
- GA can give advice, but can't control the PS (at least, while handled conform the governmental regulations)
- Though they can put pressure on the PS directly or via the CLG of ACCG

B – Governmental influence on a housing/construction project
1) What is the procedure when starting a housing/construction project?
   a. Who to contact first, local- or regional government?
      - DS, they can give information about the possibilities in their region
      - Knows where the problems lie
   b. How to find a proper area for the project?
      - DS can provide an area to build (there still is free land)
   c. Are building permits needed?
      i. What's the procedure?
         - Permits are needed for the construction of the house itself and for the lot its going to be build on
         - Building permits are given by the PS

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    ii. How long does is takes?
- In case of Pottuvil it depends on the chairman, can take from one day up to around a week or two
- Normally, when following the official procedures (in other regions of Sri Lanka), it can take a few months

    iii. Is the word or a contract with the local chairman of PS at first enough?
- In Pottuvil it is, somewhere else probably not

2) What roll does the government play in the process of purchasing land?
    a. Are they able to help you with that?
- Yes, they know about the local situation and where possibilities lie

    b. Are there zoning plans?
- Yes, there are area's for paddy fields, forest growth, residence, industry, commercial exploitation etc.

    c. Can land be expropriated from its owner?
- It is possible for the PS and DS to do this
- There has to be a very good reason
- Land owner gets a certain amount of money in return
- Decision can be fought in court

      i. If so, how long does this procedure take?
- unknown

      ii. For certain purposes, like road building, only?
- Not only for road building, also in other cases where the government needs that typical part of land
- For main roads the Road Development Authority is responsible and is able to expropriate land
- People have to clear 3 feet of their land for roads that run from a main road to land that lies behind theirs
- However, this depends on whether there already is another road and on the distance to this road

3) Does a construction method (like SolidHouses) have to be approved? By who?
- Yes, this is done by the PS, more specific the chairman
- Plans have to be send in, which will be looked at by the chairman and its technical officers
- If the chairman gives approval, then its approved
- When a project is been build for free (by an NGO), the approval is often given more easy

    a. If so, does the approval count for the whole of Sri Lanka?
- No, just for the town its being approved in

C – Wells and sanitation
1) What is the procedure for the planning and construction of wells and toilets?
    a. Which organisation to contact?

- Ministry of Health (MoH), because of healthcare
- MoH checks the position of the toilets compared to households and wells (at least 30ft from watersources)
- MoH also checks the position of wells compared to polluting resources, as well as the quality of the water
- This checking is done by a Public Health Inspector (PHI) from the Medical Office of Health
- Next to this the PS has to give approval for the construction (give out permits)

b. Is there a difference between an public an private project?
- Public:
    o Inform DS
    o Inform PS for building permits
    o Let MoH approve the location
    o PHI checks on quality of the water
- Private:
    o Same as in a public case, only you don't need to inform the DS

c. Can they do it on paper or do they need a project visit?
- Plans can be send in for checking
- During the construction process a PHI will come by for inspection

d. Does the medical health officer checks the positioning of wells or does he assign area's where it is ok to build a toilet or well?
- He checks on the positions and of course can give advice when this chosen position turns out to be wrong

e. What does a medical health officer take into account?
- Next to the positioning of wells and toilets, he checks on the quality of the water in the well

2) Does a new kind of toilet design have to be approved?
- Yes, by the MoH

D – Remaining questions
1) Is the Electricity Board the only supplier of energy and energy networks?
- Yes
- They even pay for the network, it can only take many years before they start the construction
- As a building organisation you can also pay for the network yourself, then the construction of it starts a lot sooner (within months)

2) Are cows sacred? What is allowed to do to them and what is not?
- Cows are officially not allowed on the street without a care taker nearby
- PS can give fines for letting cows wander in public area's without a care taker nearby

- It's not allowed to hit or torment animals, especially cows, for they are sacred for Buddhist an Hinduistic people

3) Where can you get information about whether there is an archaeological site in a certain area?
- Inform at the Archaeological Department
- DS and PS als know were archaeological sites are within their region, they have maps

4) What influence does the different religions have on a housing/construction project?
   a. Entrance to the east?
      - Yes, this is preferred
      - How much people prefer it, generally depends on how much money they have
      - It's a Hindu (most Tamil are) and Sinhala tradition
      - It's because the sunrise is in the east, so the light enters the house

   b. Prayer/religious room?
      - Prayer room is preferred on the east side of the house
      - Preferably not bordering on the kitchen and bathroom (filthy places)
      - This also depends on the amount of money people can spend