

For better understanding the model structure, we should consider our model in equilibrium. Equilibrium implies that all stocks stop changing, which in turn means the values of flows become zero.

The system dynamics models provide the opportunity to analyze the results of particular parameters interacting and reactions to individual factors changing.

During our modeling project, we have considered the Capital model, defined the model boundary and described the behavior of the key variables. Moreover, we have converted feedback diagrams to level and rate equations, estimated and selected parameters values, simulated the model and tested the model behavior and sensitivity to perturbations. We have explored the main principles of Capital model. Both qualitative and quantitative system dynamics modeling of the investment have been presented.

References

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THE POLICY IMPLEMENTATION ACCORDING TO SYSTEM DYNAMIC APPROACH

Policy analysis is a social and political activity. True, analysts take moral and intellectual responsibility for the quality of their policy-analytic work. But policy analysis goes beyond personal decision making. First, the subject matter concerns the lives and well-being of large numbers of their fellow citizens. Second, the process and results of policy analysis usually involve other professionals and interested parties: it is often done in teams or officewide settings; the immediate consumer is a "client" of some sort, such as a hierarchical superior; and the ultimate audience will include diverse subgroups of politically attuned supporters and opponents of the analysts' work. All of these facts condition the nature of policy analysis and have a bearing on the nature of what is meant by "quality work."

Talking about policy implementation worth to know about distinction of two types of model: explanatory model and policy model.

Explanatory model is a model which explain the past. This model should include policies that were operating in the past and should not include new policy structure.

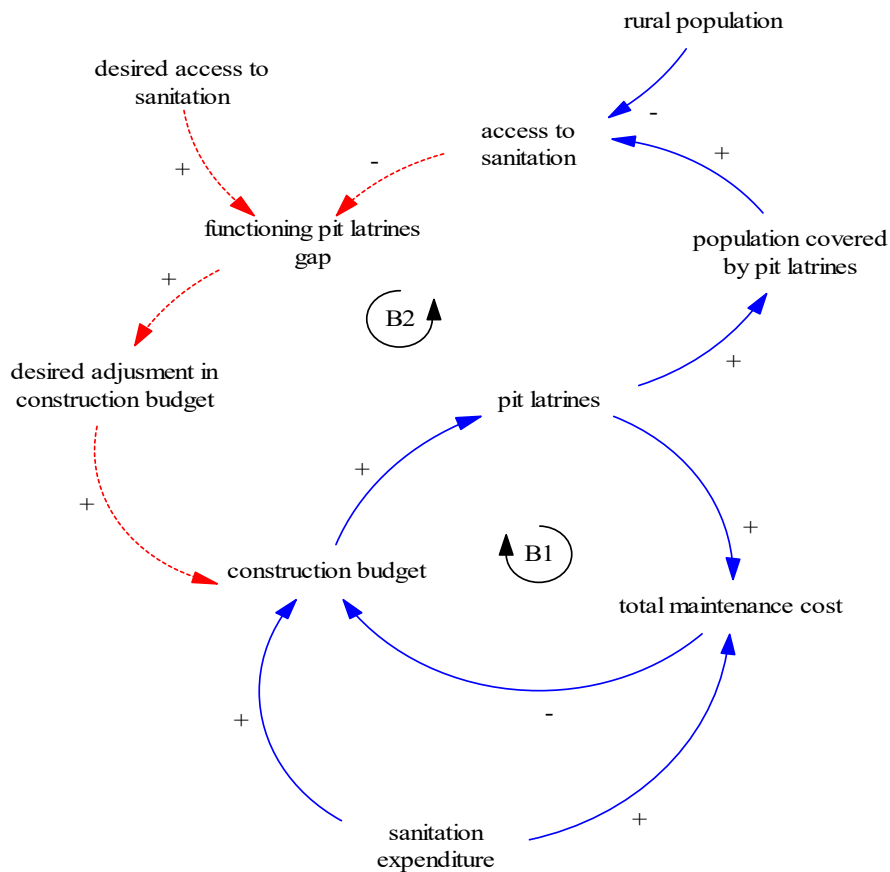
Policy model is a model which improve the future. This model includes new policy structure that is added after was built a model that explains the past.

General procedure (after Explanatory Model is built and tested):

- Identify desired outcome;
- Choose a policy strategy to analyze;
- Formulate information feedback structure.
- Identify “wishful thinking” links, where implementation planning is necessary.

Let us take a look at example of policy implementation to sanitation sector in some African country. It should be noted first that human right to water and sanitation are widely recognized by Member States of the United Nations. Access to water and sanitation are considered important socio-economic and health and key determinants of child survival, maternal, and children’s health, family wellbeing, and indicators, on economic productivity.

The sanitation is a one of the sectors of huge social development model. Like most of the developing nation, SDG 6 which is access to water and sanitation seems to be in a very vulnerable situation. As is described by the government, only 40% of the population had access to sanitation in 2015. Regarding the Millennium Development Goals (MDGs) with the target to halve the population without access to sanitation between 1990 and 2015, the population having access to proper sanitation should be 55% in 2015. Access to sanitation has become a key issue for people who live in in this area, especially for rural population.

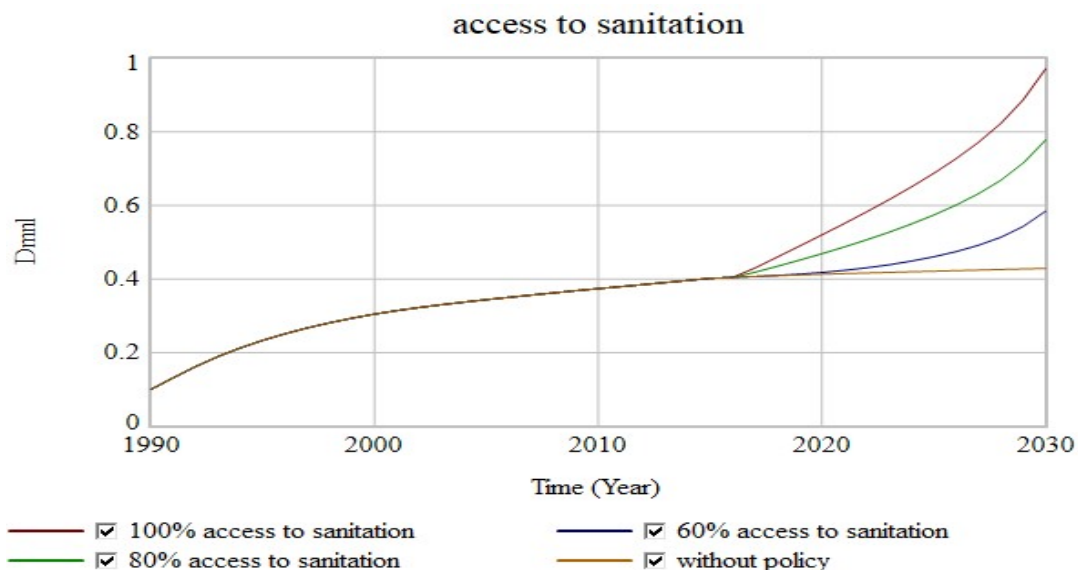


Graph 1. High-level casual loop diagram

With a purpose of helping government to improve the serious sanitation situation there, firstly was built an explanatory system dynamics model to find out the cause of the problematic behavior in the past and then designed a policy model to assist the government reach the SDG 6 in 2030. Just as is shown on the high-level causal loop diagram (graph 1), access to sanitation is mainly affected by two main balancing feedback loops (B1 and B2). The balancing loop B1 in the explanatory model limits the growth of pit latrines due to limited sanitation expenditure, while the balancing loop B2 which is designed in policy model will adjust the number of pit latrines to reach the goal—desired access to sanitation.

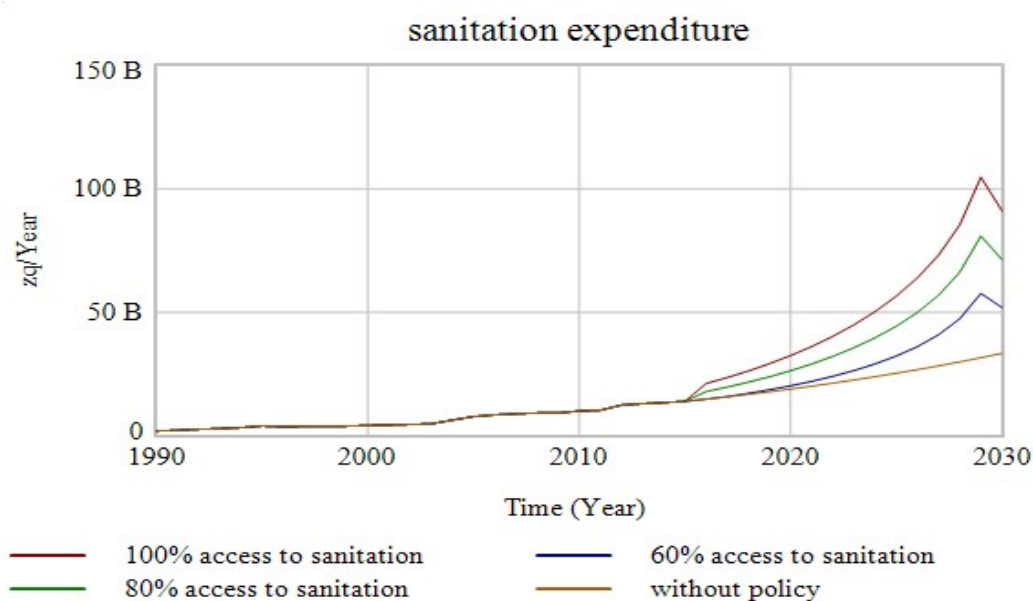
Regarding the policy model, a ‘mapping backwards’ method was adopted to adjust the number of pit latrines for the goal—desired access to sanitation. That is to say, a target was set for desired access to sanitation firstly, and then we can get the gap between the actual access to sanitation and the desired level. According to the gap and adjustment time, we can calculate the desired adjustment in pit latrines. Finally, we can get how much money the government needs to prepare for the construction of new pit latrines as this policy model only focuses on the construction of new pit latrines rather than the maintenance of existing pit latrines.

In order to gain a deep insight into the effects and cost of different policy choices, 4 kinds of policy scenarios (60%, 80%, 100% access to sanitation and without policy) have been adopted. In general, potential level of sanitation in 2030 depends mainly on government expenditure and more expenditure will contribute to higher access to sanitation.



Graph 2. Scenarios of access to sanitation

We can see from the above scenarios analysis that sanitation will reach different levels at the policy deadline: 2030 in different policy scenarios. In addition, the actual access to sanitation always cannot reach the desired policy level in 2030 as there is DELAY (delay time = 0.1 year) on the construction of new pit latrines. It takes time for the policy budget to get full effect which is quite reasonable in reality.



Graph 3. **Sanitation expenditure according different level of access to sanitation**

It is illustrated on graph 4 that with higher desired level of access to sanitation, sanitation expenditure is going to increase. However, under 60%, 80% and 100% policy scenarios, sanitation expenditure will decrease when time comes to deadline. The reason should be that as the actual access to sanitation has been quite approaching the goal in 2029, so it is unnecessary for the government to continue increasing sanitation expenditure as before. Otherwise, access to sanitation could generate overshoot in the end.

Some positive results of policy implementation for sanitation sector:

- higher desired access to sanitation will result in higher access to sanitation which will lead to higher wellbeing index and average life expectancy next;
- the firm sector will be also influenced by sanitation improvement. In general, sanitation has a positive impact on total factor productivity;
- higher access to sanitation will decrease dropout fraction on education sector.

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