How to cope with the European migrant crisis? Exploring the effects of the migrant influx in Bayern, Germany

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Abstract

Recently, Germany has experienced a huge influx of migrants. Most of these migrants enter Germany through the federal state of Bayern. The asylum procedure in Bayern has various bottlenecks at which migrants accumulate. This accumulation causes a lot of problems and increases local tensions, which in turn affects citizens and policy makers in both Bayern and the rest of Germany. This paper presents a system dynamics model with the purpose of identifying these bottlenecks and understanding their influence on the tensions among local citizens. In addition, it proposes a few policy measures which can streamline the process and thereby reduce tensions in Bayern. According to our findings, the biggest problems are caused by the slow outflow of migrants waiting in initial aid facilities for a more permanent residence to become available. The policy suggestions we propose performed robust under a wide range of parameter values. Moreover, they were able to reduce the average tension level by a factor of almost two.

1 INTRODUCTION

Since the beginning of Europe's migrant crisis, Germany has been the preferred destination in Europe for both refugees in need for protection and migrants in search of a better life. In 2015, more than a third of Europe's asylum applications were filed in Germany (Eurostat, 2015). According to German officials, Germany received almost 1.1 million asylum requests in 2015 (Thomas, 2016). Chancellor Angela Merkel's open-arms policy towards migrants has come under scrutiny as the country tries to cope with the huge migrant influx.

Most migrants take the popular Western Balkan route to Germany. As a result, about 50% of the migrants who enter Germany arrive in the federal state of Bayern. Tensions arise as Bayern struggles to process all the asylum seekers. Initial aid facilities become overcrowded, incidents spark outrage among local inhabitants and Germans are increasingly worried about the influx of many migrants. Research shows that these worries partially arise

from the fact that those seeking entry on the basis of asylum are believed to unsettle the cultural and political sovereignty of the state (Kofman, 2002).

Because of the increasing concerns, Germany needs more knowledge about the effect certain bottlenecks in the asylum procedure in Bayern can have on the tensions among citizens. This paper identifies the important bottlenecks and it proposes several indicative policy measures, which can help to streamline the process and thereby reduce the costs and stress experienced in Bayern. This paper focuses on the asylum procedure in Bayern. However, with minor modifications, the System Dynamics model presented in this paper can be applied to other states and even Germany as a whole.

2 SYSTEM BEHAVIOR

We chose to model the asylum procedure using system dynamics. The main components in system dynamics are stocks and flows (Forrester, 1996). These stocks and flows allow for the modelling of flows of migrants, who go through the many stages of the asylum procedure in Bayern. System dynamics can be used to gain a better understanding of the system, it can provide insight into why the migrant influx results in severe tensions. Moreover, it is an effective communication tool for policy advice.

2.1 THE SIMULATION MODEL

An aggregated version of our simulation model is displayed in Figure 1. This causal loop diagram (CLD), that contains the most important effects and feedback loops, will be used to explain the global structure of the constructed model. Influencing external factors are coloured red.

The bottom half of the diagram shows the standard asylum procedure (BAMF, 2016):

1. After the migrants arrive in Germany, they have to make an application for asylum. This takes place at an initial reception facility.
2. Next, the asylum seekers are transported to their allocated Initial Aid Facility (IAF).
3. After the asylum procedure, migrants are either accepted or rejected.
    - The rejected migrants stay in the IAF until they return to their home country.
    - The accepted migrants stay in the IAF until a more permanent residence is available.

The arrival of migrants is based on a lookup function that simulates the expected arrival of migrants. This lookup function is contained within the variable *'expected arrival of migrants'*. The expected inflow is weakened within the variable *'arrival of migrants'*, as a result of the effects of various feedback loops. Note that, for the purpose of this research, effects from developments outside Germany on the arrival of refugees were not taken into account.

Central to the feedback loops that influence the arrival of refugees, is the variable *'stresslevel Bayern'*. An increase in stress leads to an increase in (political) resistance against the arrival of refugees. This in turn has a decreasing effect on the arrival rate of refugees. The stress level is influenced by the media attention as a result of the not accommodated migrants (that are: migrants who are visible on the streets), and the total costs of both the asylum procedure and the housing of migrants. The media attention as a result of the accommodated migrants is implicitly taking into account within the effect of the total costs on the stress level. The underlying assumption is that not accommodated migrants have a much higher impact on the media attention. That is why only the media attention as a result of the not accommodated refugees is modelled in a separate feedback loop.

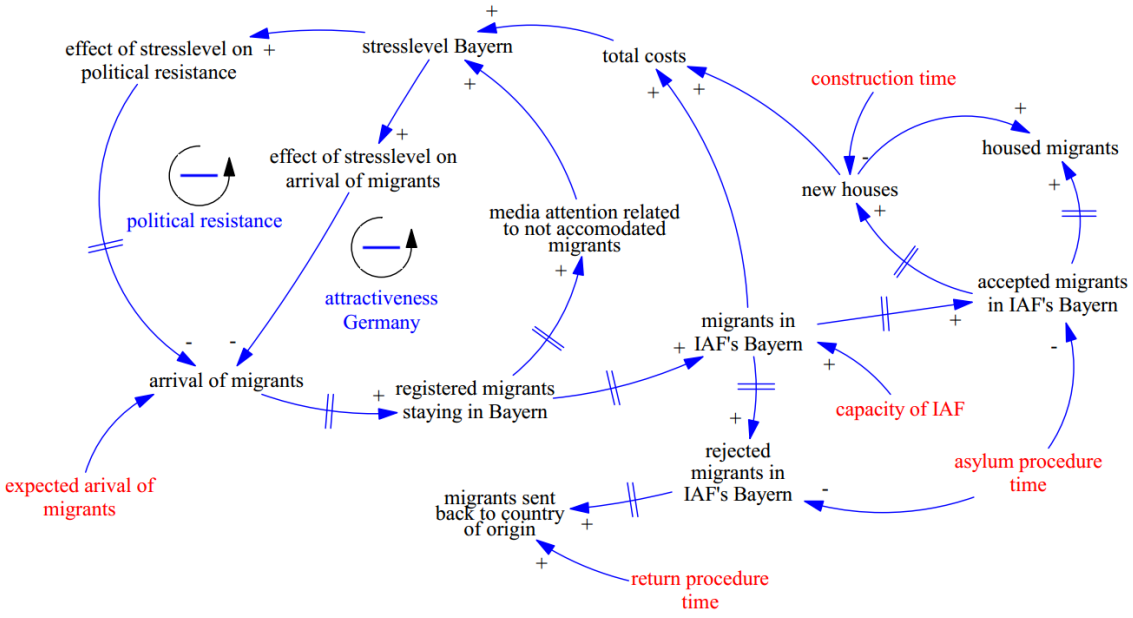

Figure 1: Causal loop diagram

As mentioned above, the arrival of migrants is influenced as a result of different feedback loops. These different feedback loops are discussed below:

- Attractiveness of Germany: this feedback loop is concerned with the effects of the tensions among the local inhabitants. When tensions in Bayern increase, local

inhabitants adapt a more negative attitude towards migrants. As a result, the inflow of migrants decreases.

- Political resistance: this feedback loop is concerned with the effects of the tensions among local policy makers. When tensions in Bayern increase, policy is made in an attempt to decrease these tensions. Decision makers will be likely to adopt measures which reduce the inflow of migrants.

Since the CLD serves to explain the global structure (Pruyt, 2013), the full model is not discussed here. A plot of the SFD is displayed in Figure 2.

2.2 KEY PERFORMANCE INDICATORS

As explained in section 2.1, the CLD in Figure 1 addresses the importance of the stress level, as it can be held responsible for the balancing effect on the arrival of refugees. In addition, the stress level is an important variable since it is a measure for the total amount of tensions perceived in Bayern and policy measures should aim to decrease this stress level. Therefore, the factor *'stresslevel Bayern'* should be considered as a key performance indicator (KPI) of the system. Other factors that can be marked as KPI's are:

- Migrants in IAFs Bayern
- Accepted migrants in IAFs Bayern
- Rejected migrants in IAFs Bayern

The above factors are important because they can be used to identify the bottlenecks in the asylum procedure. In combination with the stress level in Bayern, these factors should be able to indicate where an increase in migrants leads to the most stress and hence, where intervention is needed the most. These are points in the asylum procedure where policy measures should be introduced. Finally, the variable *'not accommodated migrants'* is also considered as a KPI since it can be used to analyse the effects of the media attention related to these migrants.

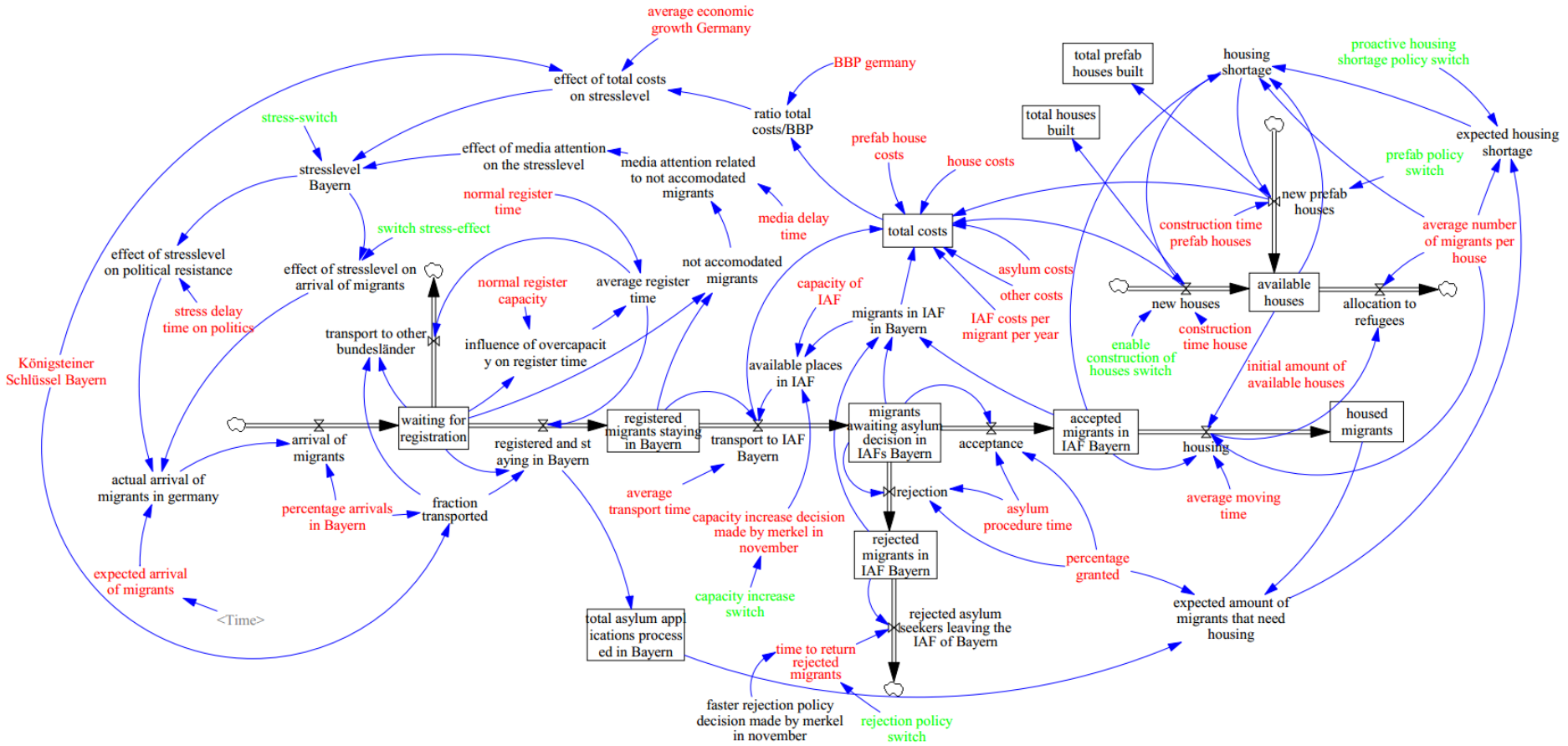

Figure 2: plot of the SD model

2.3 BASE CASE ENSEMBLE

The base case behaviour of the model is discussed in this section. To reproduce the result, the model has to run with only the '*stress switch'* and '*switch stress-effect'* on. All other policy measures, which are coloured green in Figure 2, are set to zero. The base case behaviour is shown for each of the five KPI's mentioned in section 2.2. Since there is little research or data concerning the values of the input parameters, the model was simulated under a high range of values for the external factors present in the model. The results of these simulations are shown in Figure 3. We chose to present our base case behaviour as the outcome of a sensitivity analysis. We are interested in the behaviour of the system under a wide range of parameter values, because the proposed policies need to perform well under the uncertainty of many parameters.

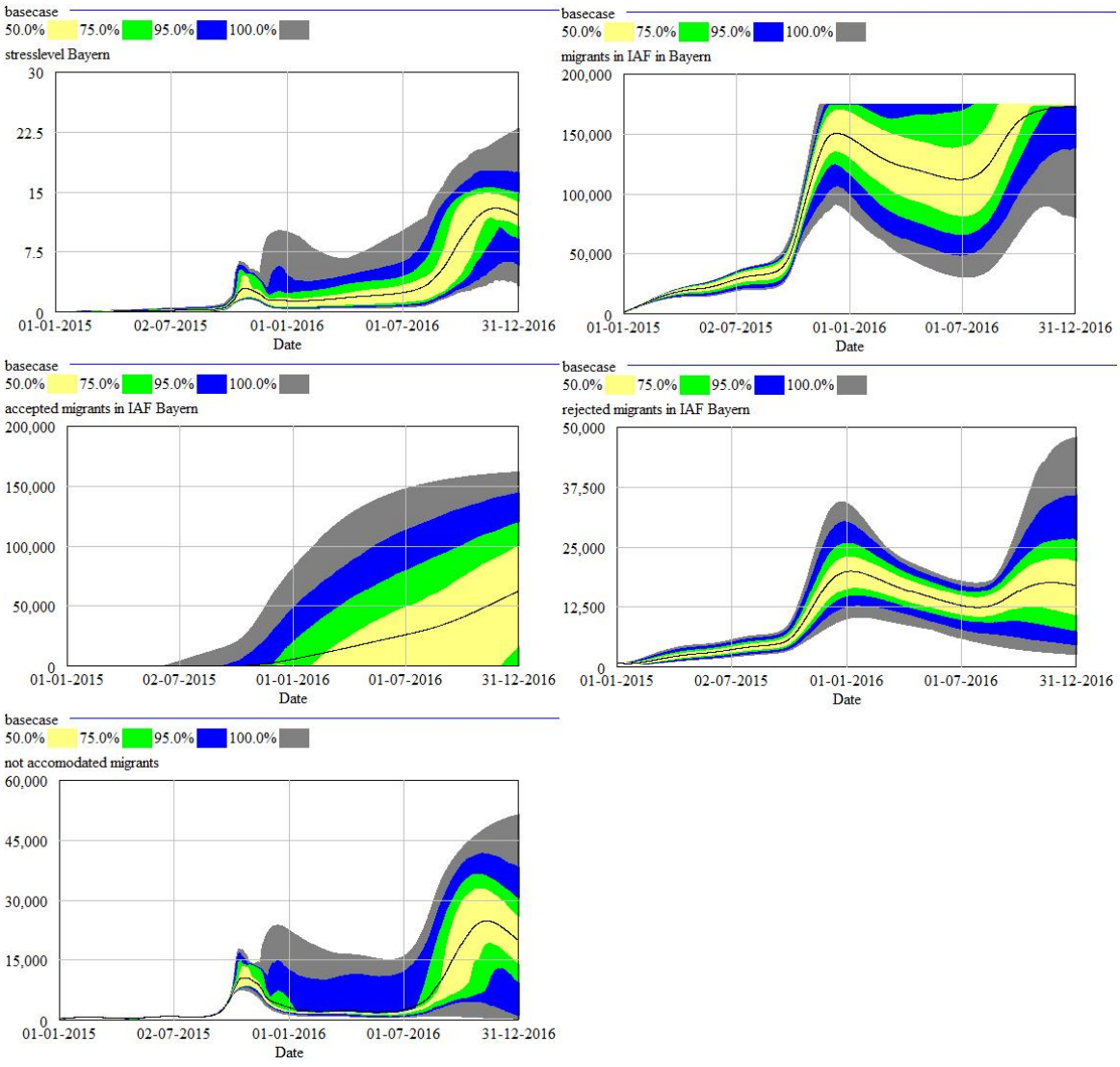

Figure 3: base case ensemble

The external input of migrants, as displayed in Figure 4, reaches its first peak just before one year passed in the simulation run (October 2015). Near the end of the simulation (October 2016), the external arrival of migrants reaches its second peek. Those peeks are clearly visible in all the KPI's. The first graph in Figure 3 shows the perceived tensions in Bayern. The two peaks are mainly caused by the peaks in the amount of not accommodated migrants. When no more migrants are allowed into the IAFs, they start accumulating at the stock: *'registered migrants in Bayern'*. Because most of them are not able to find a place to stay, these migrants are forced to stay on the streets of Bayern. Our assumption here is that unaccommodated migrants increase stress experienced by the local inhabitants and authorities, due to incidents that occur and the media attention they receive. The steady increase of the perceived tension level throughout the simulation is caused by the increasing costs.

The remaining three graphs in Figure 3 show the amount of accepted and rejected refugees in the IAFs, as well as the total amount of refugees in the IAFs. From these graphs can be concluded that most migrants actually do not need to be in an IAF, because their asylum decision is already made. These migrants are either accepted or rejected migrants in the IAFs (graphs 3 and 4). The accepted migrants have to wait much longer in the IAFs after they receive their decision than those who are rejected. A partial reason for this is that there are no houses available for migrants and it takes too long to build these houses. There is much room for improvement here. The load on IAFs would significantly decrease when outflow rate of the rejected or the accepted migrants is increased. Increasing the outflow rate of the accepted migrants would be more effective since there are more accepted than rejected migrants staying in the IAF's, as can be concluded from Figure 3: base case ensembleFigure 3.

The count of accepted migrants in the IAF builds up very slowly. This is partly the case because of the long *'asylum procedure time'*, which is implemented in the sensitivity analysis using a random uniform distribution between 50 and 150 days. It is also partly caused by the input, a relatively small amount of migrants entered Germany in the first half of 2015, as can be seen in Figure 4 (BAMF, 2015).

In short, the peeks in the stress level can be reduced by preventing the accumulation of not accommodated refugees. This can be done by reducing the amount of refugees in the IAFs. This in turn can be achieved by increasing the outflow rate of the accepted and rejected migrants in the IAFs. Therefore, policy measures should focus on these groups of migrants.

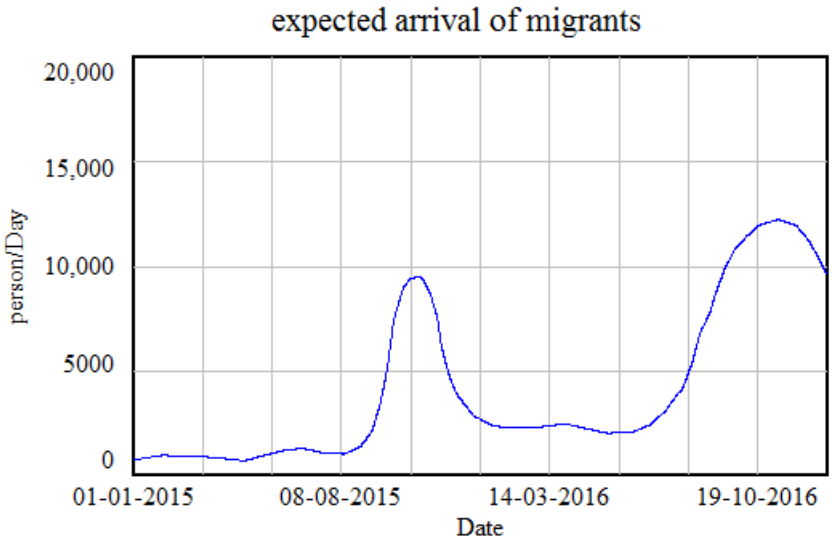

Figure 4: external time-series input of the expected arrival of migrants

3 POLICIES: REDUCING THE LOAD ON INITIAL AID FACILITIES

In section 2 we concluded that the main bottlenecks of the system are caused by the slow outflow of accepted and rejected migrants. Therefore, policy measures should focus on accelerating the outflow of migrants. In this section, several examples of policy measures are presented. The indicative policies modelled and analysed in this section demonstrate the potential of different kinds of policies to improve parts of the asylum process.

3.1 BUILDING HOUSES IN A MORE PROACTIVE MANNER

The expected housing shortage can be increased by building houses in a more proactive manner, that is, based on the incoming migrants instead of the migrants who are accepted after their asylum procedure. When the expected housing shortage increases, more houses will be made available for when the migrants are ready for housing. The effects of such a measure on the KPI's are shown in Figure 5. There are only small numeric changes and no significant behavioural changes in comparison with the base case ensemble.

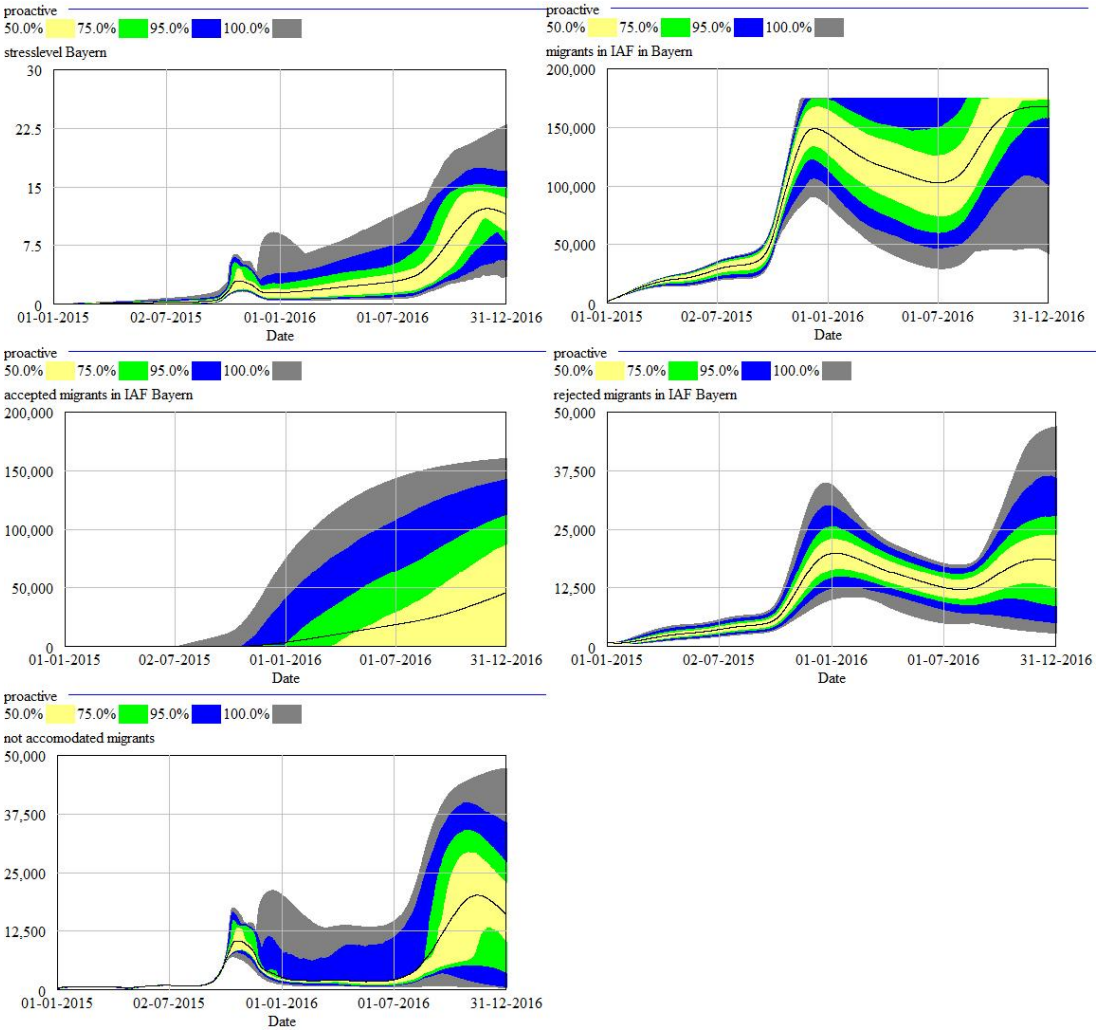

Figure 5: effects - building houses in a more proactive manner

3.2 INCREASING THE CAPACITY OF THE IAFS

Because the stress level increases exponentially when the IAFs are full, increasing the capacity of the IAFs can make a huge difference in the stress level. The effects of a capacity increase of 75.000 places are shown in Figure 6. Changes, in comparison with the base case ensemble, on most of the KPI's are numeric. However, it should be noted that initial aid facilities are overcrowded in less situations.

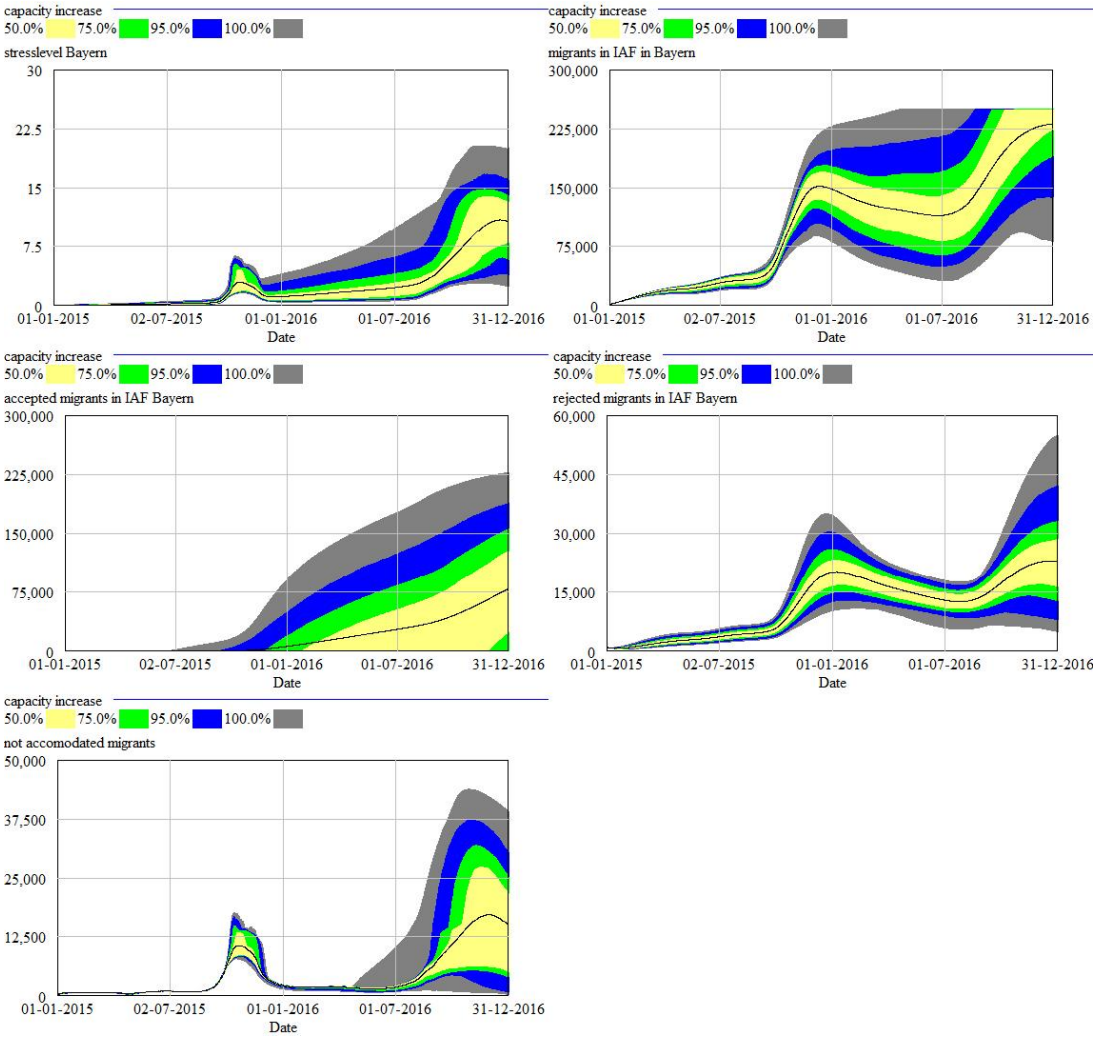

Figure 6: effects - increasing the capacity of the IAFs

3.3 BUILDING FASTER WITH PREFAB HOUSES

When houses are built faster, the outflow rate of the accepted migrants will increase. This can be accomplished by building prefabricated houses. These houses are much faster to build and cheaper in comparison with regular houses. The effects of building prefab houses instead of building regular houses are shown in Figure 7. It should be noted that although the behaviour of the stress level variable didn't change, the numerical changes are quite large. Besides that, a small behavioural change for the accepted migrants in IAF variable has occurred.

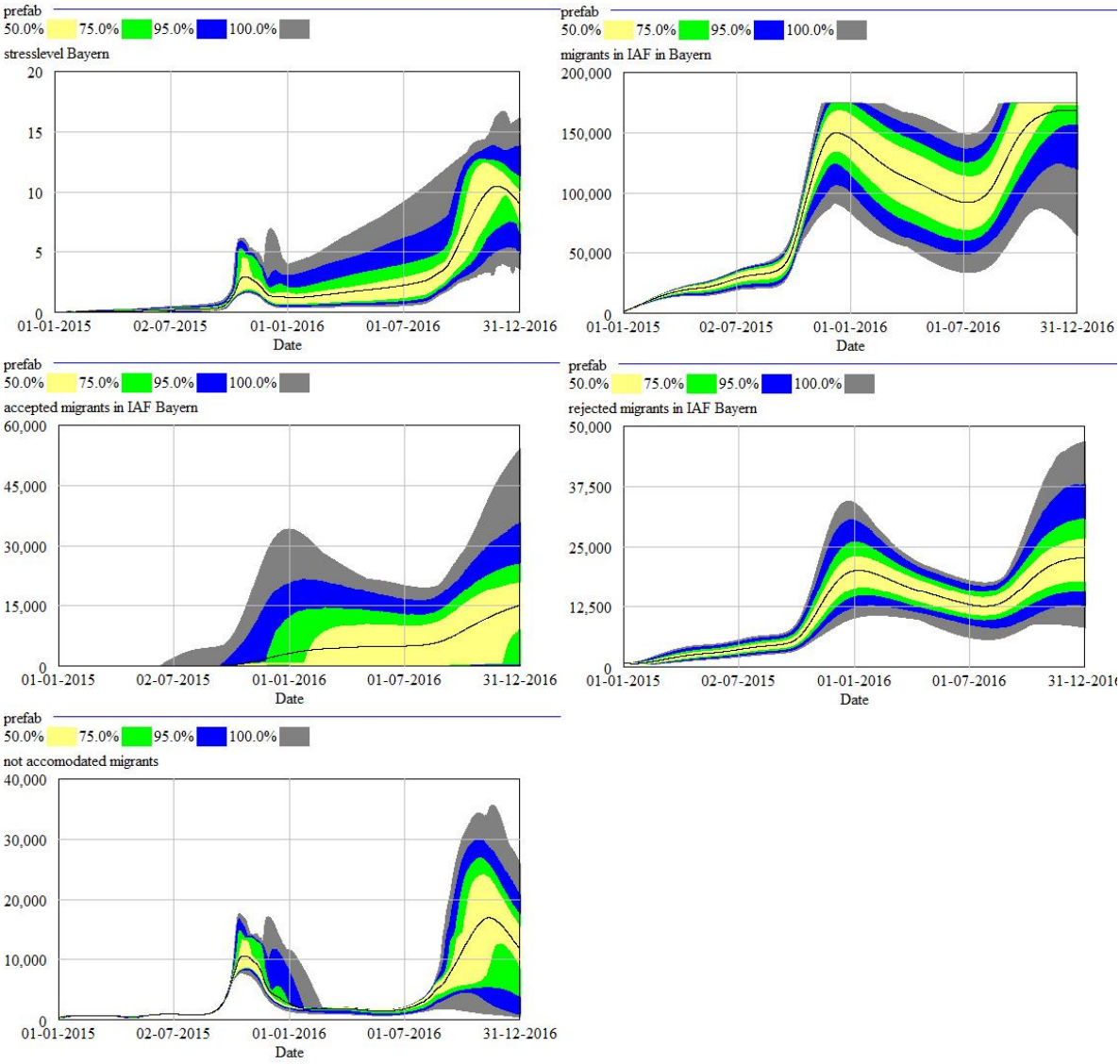

Figure 7: effects - building faster with prefab houses

3.4 FASTER RETURN OF REJECTED MIGRANTS

The German government recently implemented a policy that made it possible to send the rejected migrants to their country of origin faster. The effects of a similar policy, where rejected migrants are send back twice as fast, are shown in Figure 8. Changes in comparison with the base case behaviour are only numeric.

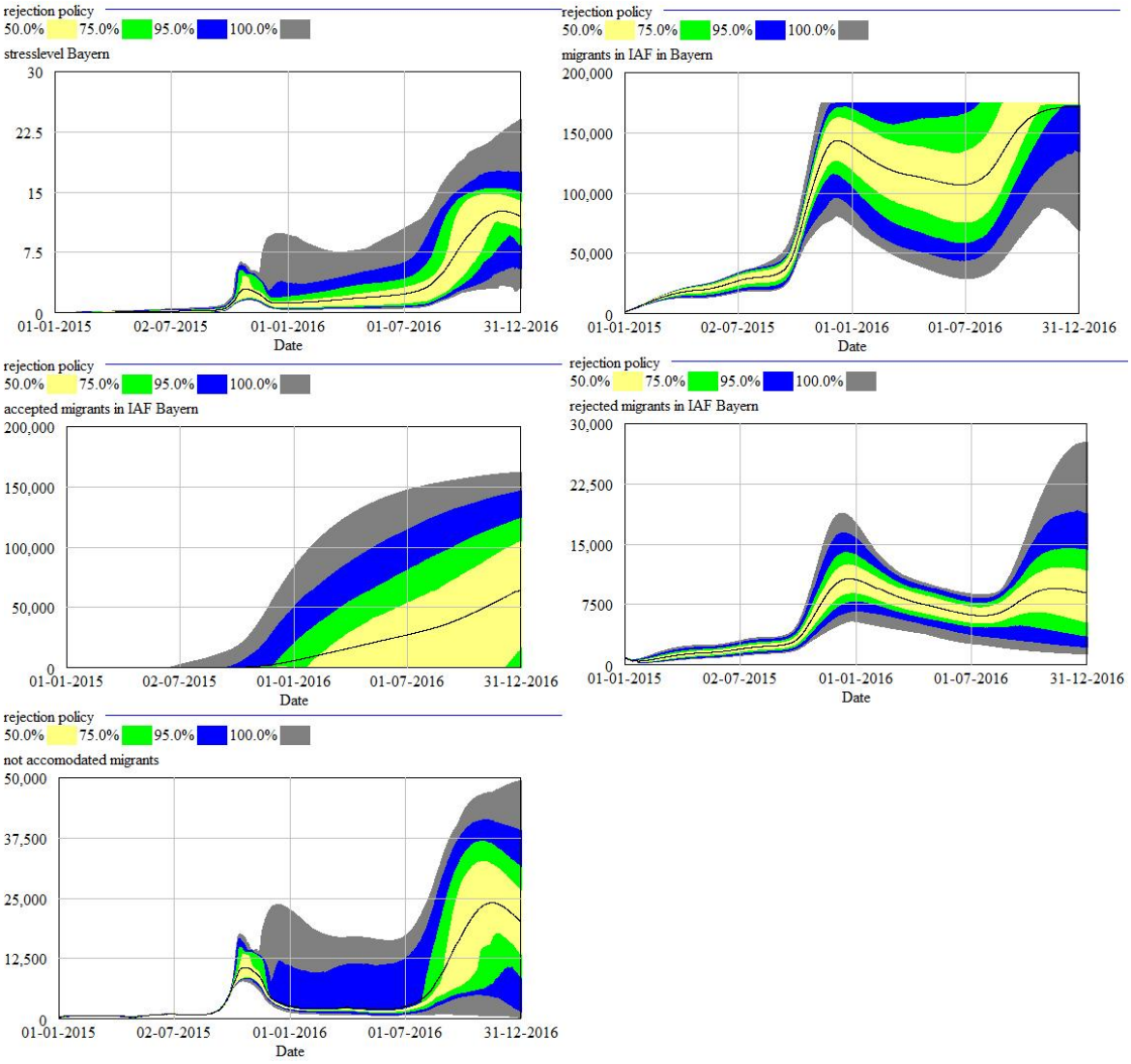

Figure 8: effects - faster return of rejected migrants

3.5 COMBINED POLICY EFFECT AND COMPARISON WITH BASE CASE ENSEMBLE

Combining al of the above produces the results shown in Figure 9. The maximum average stress level is reduced by a factor of almost 2, compared to the base case ensemble in Figure 3. Furthermore, the combined policy effect changed the behaviour of the stresslevel KPI. This is caused primarily by the increased outflow of accepted migrants since the average number of accepted migrants at the end of the simulation is reduced by a factor of 80 in comparison with the base case ensemble.

Figure 10 displays a comparison between all indicative policies and the basecase behaviour for a certain set of parameter values. From this graph can be concluded that just two policies really contribute to the improvements of the combined policy effect over the base case behaviour. These are the prefab housing policy and the capacity increase of IAFs.

It is also noteworthy that the proposed policies are very robust, they perform better than the base case ensemble over the whole range of uncertainty.

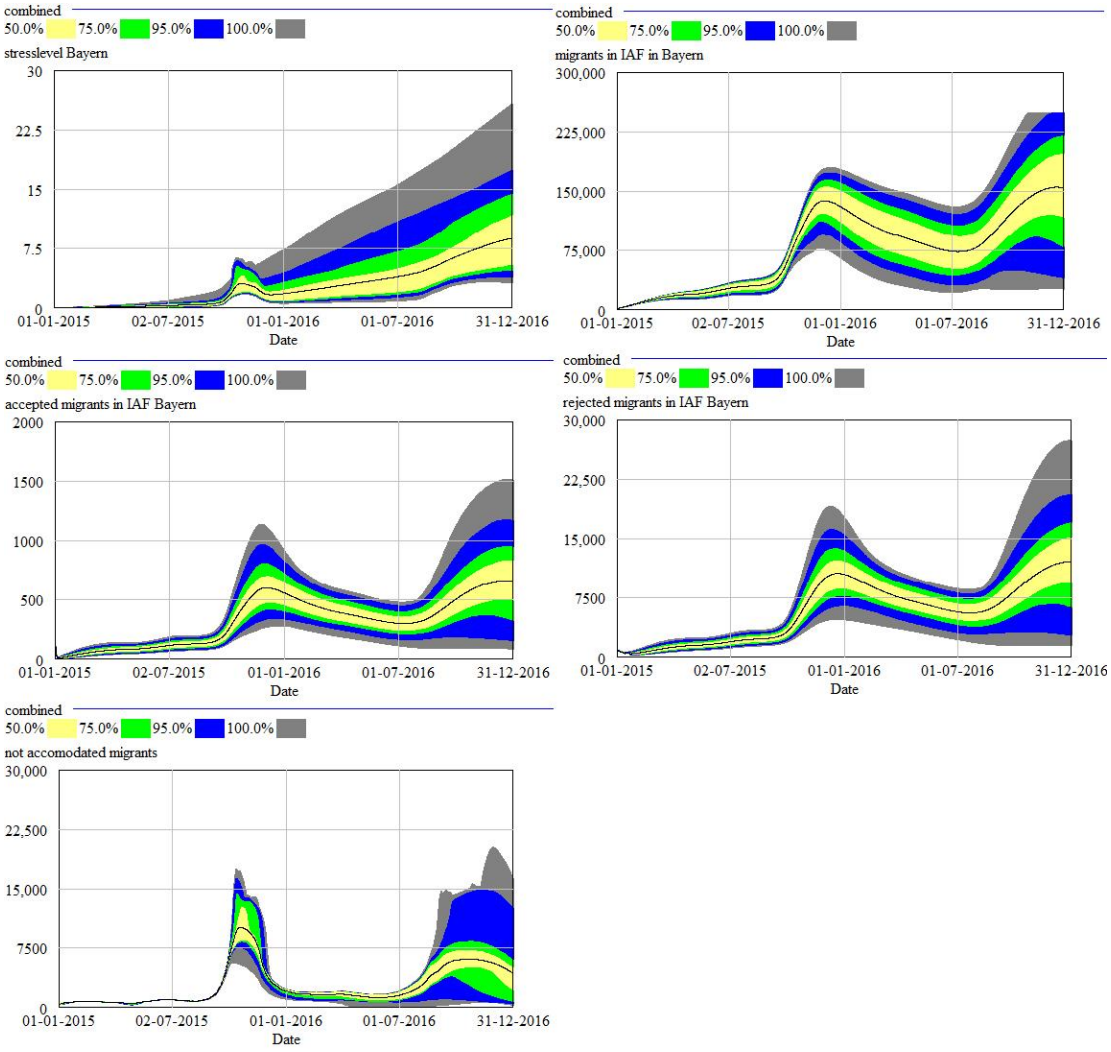

Figure 9: effects - all policies combined

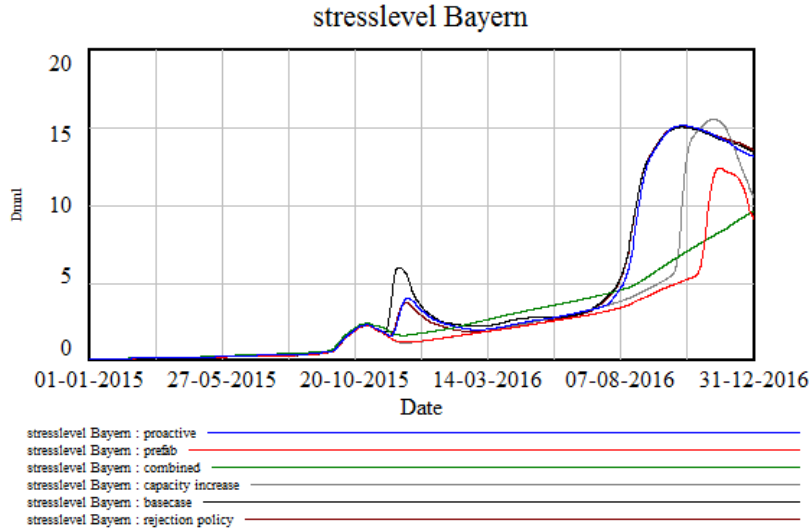

Figure 10: comparison of all policies

4 CONCLUDING REMARKS

4.1 CONCLUSION

This paper analyses the asylum procedure in Bayern and the effects overcrowded initial aid facilities can have on the perceived tension level of the local inhabitants. The IAFs in Bayern are the main bottlenecks in the asylum procedure. When their capacity limit is reached, new migrants have to stay on the streets. In combination with the media attention that not accommodated migrants are likely to get, this situation can significantly increase tensions in Bayern. To keep the stress level to a minimum, it is important to streamline the asylum procedure by reducing the load on the initial aid facilities. This can either be done by accelerating the outflow of migrants from initial aid facilities (sections 3.1, 3.3, 3.4) or by increasing the capacity of the initial aid facilities themselves (section 3.2).

According to our findings, the stress level increase as a result of the high amount of not accommodated refugees is significantly higher than the increase due to the costs associated with streamlining the asylum procedure. Therefore, streamlining the asylum procedure will be beneficial. The recent agreement between the EU and Turkey shows that progress regarding this objective is being made. An important notion is that, when the influx of refugees does not stop, the stress level will continue to rise as the costs of taking in the huge numbers of migrants' increase.

This paper shows that the biggest bottleneck in the asylum procedure is caused by the slow outflow of migrants in initial aid facilities who already have been either accepted or rejected asylum. The chance that an initial aid facility is overcrowded can be reduced if the outflow of these groups can be accelerated. Because accepted asylum seekers stay longer in the initial aid facilities than those who are rejected, they will accumulate in the IAFs a lot faster. As a result, the accepted asylum seekers cost the most and therefore contribute more to the increase of the tensions in Bayern. Therefore, policy measures should focus on increasing the outflow of the accepted migrants staying in the initial aid facilities.

To accomplish a faster outflow of this group, houses should be made available to accepted migrants as soon as possible. In the current situation, migrants have to wait in the initial aid facilities until a more permanent residence becomes available. An indicative policy measure that could decrease the waiting time for houses is building prefabricated houses for migrants. These houses have a small construction time and low costs. As a result, the building of prefabricated houses leads to a significant improvement on all the key performance

indicators. A capacity increase of the initial aid facilities also proved beneficial. Our research shows that a combination of these two policies (a capacity increase and the building of prefabricated houses) yields the best results. It is also noteworthy that all the proposed policies appeared to be very robust when tested under a wide range of parameter values.

Bayern faces a great challenge in processing the huge influx of migrants. Various bottlenecks in the asylum procedure pose the threat to highly increase stress on Bayern and Germany as a whole. The system dynamics model presented in this paper contributed to finding both the important bottlenecks and robust solutions to improve the asylum process, thereby reducing the tensions in Bayern.

4.2 DISCUSSION

In our research we focussed on the asylum procedure and the resulting stress during the migrant crisis. We have not taken into account short and long term consequences of taking in many migrants. Some experts believe for instance that the long-term economic gains of taking in refugees will far outweigh the massive costs of the crisis (Conolly, 2015).

Besides that, it should be noted that the stress level could not be properly validated because it is expressed in a relative way. We assumed that not accommodated refugees have a much higher impact on the stress level, that is why the not accommodated migrants influence the stress level through the *'media attention related to not accommodated migrants'* in a separate feedback loop. However, the corresponding lookup function proved to have a huge impact on the stresslevel. Therefore, a deep uncertainty analysis could contribute to a better supported conclusion.

Thirdly, it should be noted that discrete incidents covered by the media which could influence the stress level were not implemented in the model. The reason for this is that the system dynamics methodology is not meant to be used for modelling such individual details (Sterman, 2000). Besides that, balancing effect of the stress level on the actual arrival of refugees is modelled in a continuous way, because most policy measures will not have an immediate effect on the perceived tensions.

Fourthly, when the simulation starts at January 1st 2015, previous costs and stress are not taken into account. But we do assume initial values for the amount of migrants in each phase of the asylum process and for the initial amount of available houses.

Although the policies performed robust under various parameter values, the effects of the lookup functions on the model behaviour remain uncertain. This paper could be improved by performing deep uncertainty analysis on the model.

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