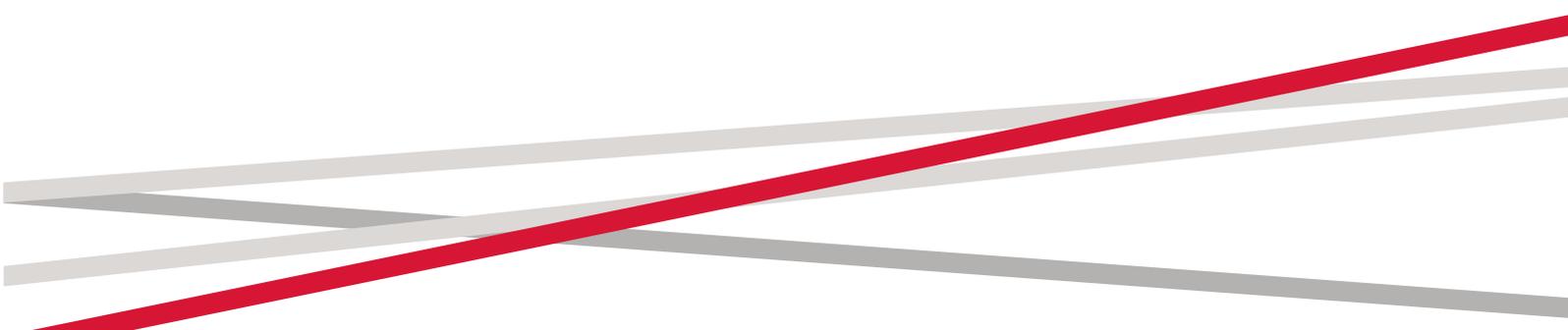


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February, 2021

For a Better Budget Management of Infrastructure Investments

Many developing countries rely on investment-to-GDP metrics as a sign of progress towards their development goals. Unfortunately, too often the focus on investment pushes aside the issues of adequately maintaining existing infrastructure. The result could be disastrous to human lives, health, and well-being. Lack of maintenance of existing infrastructure is a well-known problem, not only in developing economies, but also in some developed countries. However, how much the government should plan to spend on maintenance over the lifetime of infrastructure assets is neither a simple nor straightforward question. In this policy brief, we examine the cases of two transition economies – Georgia and Estonia – and provide a more general discussion of the challenges and possible solutions to infrastructure maintenance issues. We argue that relevant research along with properly aligned incentives could help the countries overcome these problems and optimize infrastructure spending.



Introduction

The efficiency of infrastructure investment has gotten quite some attention in the past years. A recent book by G. Schwartz et al. (2020) shows that countries waste about 1/3 (and some even more) of their infrastructure spending due to inefficiencies. With poor management, the major budgetary efforts undertaken to make room for infrastructure investments go to waste. The question of how much the country should plan to spend on maintenance over the lifetime of infrastructure assets is neither simple nor straightforward. In two recent ISET-PI blog posts, Y. Babych and L. Leruth (2020a, b) stress the importance of striking the right balance between new infrastructure investments and the rehabilitation and maintenance of existing infrastructure. Without this balance, the up-keep of public infrastructure could either be too expensive for the budget to handle, or, at the other extreme, would quickly deteriorate to the point where it is no longer operational and needs to be rebuilt from the ground up (which is the case in many developing countries, including Georgia, Armenia, Ukraine, and others). This policy brief focuses on the reasons why developing (and even some developed) countries tend to invest too little in public infrastructure maintenance and what can be done to solve this problem. We first examine the cases of Georgia and Estonia, two post-Soviet transition economies with different approaches to infrastructure maintenance financing. This analysis is then followed by a more general discussion about the infrastructure maintenance challenges and potential solutions.

Maintenance vs. Investment: the Cases of Georgia and Estonia

Developing countries tend to use investment (public or private) as a share of GDP to measure their economic progress and prospects. Georgia is one of the countries that has invested a lot in public infrastructure. Public investment grew

sharply between 2003-2007 to 8% of GDP and settled at 6% of GDP after 2017 (PIMA GEO 2018). The capital stock is about 90% of GDP. In comparison, in Estonia, another post-Soviet economy, public investment was about 4% of GDP, whereas the capital stock was 57% of GDP in 2015. Yet, the quality of Georgia's public infrastructure is much lower than in Estonia (Georgia is in 69th place globally according to Global Competitiveness Index 2017-2018, while Estonia is in 32nd place). The reason for this is quite simple: management, especially the maintenance of public infrastructure. Both countries recently went through a Public Investment Management Assessment (PIMA), a comprehensive framework developed by the IMF to assess infrastructure governance. The results suggest that Georgia is much weaker than Estonia in planning, budgeting, and maintenance. (A complete summary of the assessment results can be found [here](#)).

Georgia's case is far from unique. The country belongs to the vast majority of emerging economies that have not efficiently linked their medium- and long-term infrastructure plans within a sustainable fiscal framework. Moreover, infrastructure planning deficiencies spread way beyond the emerging markets: Allen et al. (2019) estimate that 56% of all world countries do not have a proper Public Investment Program.

Why is Infrastructure Maintenance a Challenge for Many Countries?

Even though maintenance, rehabilitation, and new investments are intrinsically linked, the practical process of integrating these three infrastructure components is complex. Blazey et al. (2019), for example, identify the following reasons:

- Political economy reasons—governments will opt for a ribbon-cutting rather than maintaining existing assets;
- Fiscal reasons—budget funding for operations and maintenance is prone to be cut when fiscal space is limited;



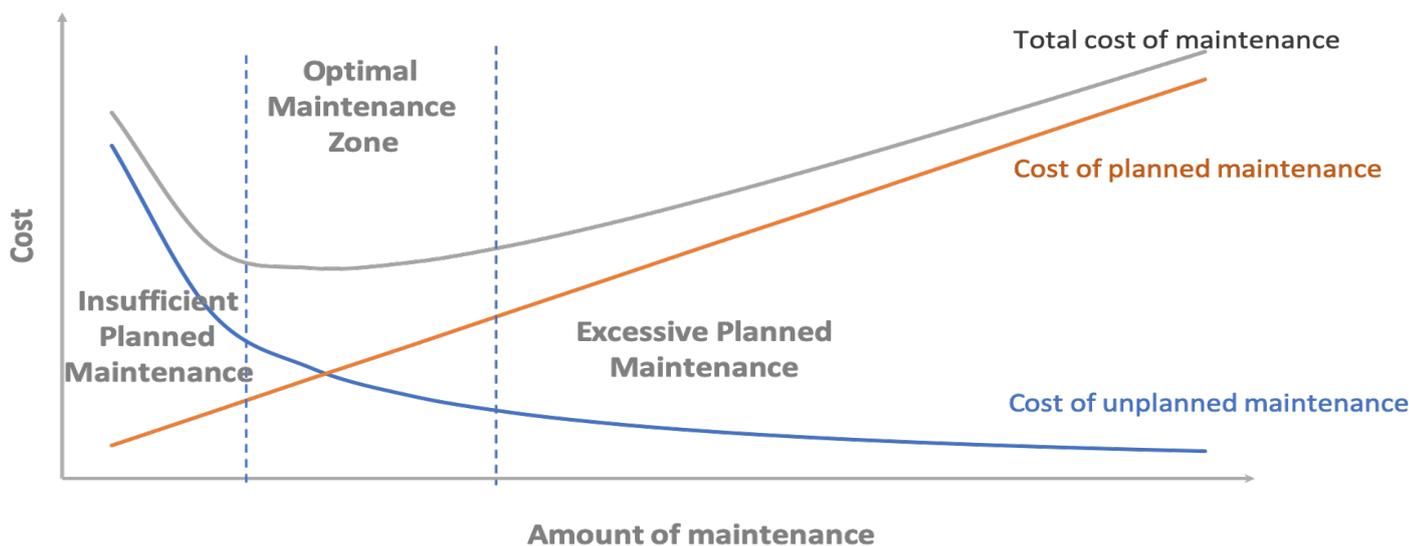
- Institutional reasons—in many countries, separate agencies still prepare investment and current expenditure budgets;
- Capacity reasons— up-to-date information on the state of assets may not be readily available.

A number of international studies (usually sectorial) point to the high cost of neglecting maintenance. A study on the upkeep of bridges and roads in the US shows that 1\$ of deferred maintenance will cost over 4\$ in future repairs. The same holds for airports. In Africa, the World Bank estimates that timely road expenditure of \$12 billion spent in the 80s would have saved \$45 billion in reconstruction costs during the next decade. It is not only rehabilitation costs that increase with poor maintenance: user costs can increase dramatically (Escobal and Ponce, 2003); health costs in terms of injuries or deaths; and

ecological costs (the water lost daily because of leaks could satisfy the needs of 200 million people according to the World Bank, 2006).

Conceptually, however, the link between maintenance, rehabilitation, and new investments is simple to understand. Figure 1 below, adopted from Thi Hoai Le et al. (2019), clarifies this point. As discussed in Babych and Leruth (2020b), when planned maintenance activities (such as planned repair, upkeep, etc.) are insufficient, then the rate at which infrastructure is deteriorating will be high, and the unplanned maintenance costs will increase as well. This response would, in turn, result in a higher total cost. If the amount of planned maintenance activities is excessive, then the unplanned costs may be low, but the total cost is higher than optimal. In order to strike the optimal balance, there need to be just enough planned maintenance activities.

Figure 1. Optimal zone of maintenance.



Source: Thi Hoai Le et al., (2019).

Conceptually simple maybe, but the devil(s) is (are) in the details. We have already listed above some of the reasons why integration is complex. Data availability is another issue raised by numerous Public Investment Management Assessments made by the IMF. The reporting

standards are simply not built in a way that would allow for the compilation of maintenance and rehabilitation data (although aggregate estimates of investment data are available). In any case, the Government Finance Statistics Manual of the IMF (2014) does not separate maintenance expenditure,



which is undoubtedly an area that requires further deepening. More fundamentally perhaps, as pointed out long ago by Schick (1966), there is an additional issue relating to governance philosophy: "planning and budgeting have run separate tracks and have invited different perspectives, the one conservative and negativistic, the other innovative and expansionist ...". Finally, with governments looking for the 'cheap' route through public-private partnerships (PPPs) to finance infrastructure development, fiscal risks have increased in advanced and emerging economies in the early 2000s (IMF, 2008). To our knowledge, there have been no systematic assessments of PPP-related fiscal risks since IMF's report in 2008, but as fiscal positions have deteriorated with the Covid-19 pandemic, PPP projects are likely even riskier today.

What Can Be Done to Improve Infrastructure Maintenance?

Leaving the data, PPPs, and inter-departmental culture issues aside, several considerations that emerge from a closer look at Figure 1 can feed the policy discussions. Let us first consider the notion of *planned maintenance* (the orange line). In principle, as a project is developed, the cost of maintenance is projected over its life cycle. If the infrastructure is maintained accordingly, its life span may even exceed the projections. At the time the project is conceived, a schedule of maintenance expenditure is also planned and integrated into the analysis. In the figure above, one would expect that these cost assumptions are located in the 'optimal maintenance zone' with a limited amount to be spent on unplanned maintenance later on. This level of planned maintenance should then be integrated as a 'given' in all subsequent budgets. Usually, as we have already mentioned, it is not.

If we now move to '*unplanned*' maintenance (the line in blue), we are really referring to situations when infrastructure must be brought back to shape after months (or even years) of neglect. In some cases, this can no longer be labeled as maintenance, and it becomes rehabilitation.

Reduce regular maintenance a bit more and the authorities must start over.

Finally, the continuity of the curves is misleading: it is wrong to say that things are necessarily smooth even in the optimal zone.

Let us look more closely at the leading causes and the ways to overcome the problems that arise when optimizing maintenance expenditure.

Setting benchmarks: One explanation for the shortage of maintenance planning outlined above is the lack of information on the practical implementation of such planning. There are too few studies on maintenance expenditure for policymakers to set benchmarks and develop reliable estimates. The existing studies in this area tend to focus on OECD countries (where data availability is less of a constrain) and on the transportation sector (roads, rail, etc.) perhaps because the private sector is more often involved (see, for example, the American Society of Civil Engineers from 2017, that concluded that 9 percent of all bridges are structurally deficient). Some studies have looked at buildings (e.g., Batalovic et al., 2017 or the Ashrae database, 2021) and unsurprisingly concluded that the age of the construction and its height are significant variables to explain maintenance outlays. However, we are not aware of studies that would, for example, distinguish between different types of maintenance in order to limit overall costs. We are neither aware of studies investigating which organizational arrangements are the most efficient (as discussed by Allen et al., 2019). The bottom line is that there is not much to use as a benchmark, and an effort must be made to build reliable estimates.

Policy dialogue on maintenance is needed: The abovementioned considerations of the consequences of delayed, unplanned, and sometimes unexpected maintenance bring us to our next point. Things break down when they are not maintained (and sometimes break down when they are maintained too), and such long-term aspects must be more present in the policy



dialogue with developing countries. Clearly, delaying maintenance increases fiscal costs in the short- and longer-term (Blazey et al., 2019).

The smoothness of the curves in Figure 1 can be misleading because insufficient maintenance may suddenly trigger a major problem (a bridge or a dam can collapse, as it happened in **Italy** and in **India recently**.) and this will entail high costs, even disasters involving in human lives. The major collapses of nuclear plants (as in Chernobyl, Ukraine and more recently in Fukushima, Japan) are other examples of the same problem. In addition, studies estimate that poor maintenance of transmission lines could be one of the reasons for electricity blackouts (Yu and Pollitt, 2009). In fact, the lack of maintenance increases the speed at which the value of the existing capital of infrastructure is eroding. While politicians may well hope that this will not happen during their tenure, the probability of a failure increases as maintenance decreases.

On top of the above, inefficiency in maintenance expenditures can be aggravated by wrongly set incentives, both for domestic actors and foreign donors. Indeed, the latter play an important role in infrastructure investment in many developing countries. In Georgia, for example, 40% of infrastructural projects are funded by foreign donors. Setting the right incentives for both parties, as well as their interplay, are thus of immense importance.

Aligning the incentives: Incentives are against maintenance. As pointed out by Babych and Leruth (2020a), capital investment and rehabilitation look good on paper. Maintenance, on the other hand, is considered a current expenditure item in the Government Finance Statistics (GFS) (IMF, 2014). Spending more on maintenance will therefore not look good since 1) more maintenance will reduce government savings in the short term; 2) spending less on maintenance will increase the need for virtuous-looking investment expenditure in the medium and long term. Yet, in spite of the lack of clear benchmarks, donors can play an essential role by

stressing the need to systematically integrate maintenance in the budget and in the Medium-Term Expenditure Framework (MTEF). To some extent, it is already the case. In Georgia, projects that are funded by donors tend to follow better appraisal procedures. However, ex-post audits are irregular – e.g., no individual projects audits were completed by State Audit Office during 2015-2017 (PIMA GEO, 2018). If donors could include these audits in their dialogue, it would clearly be helpful. Training subnational governments in proper maintenance management would be even more critical as capacities tend to be weaker than in the center.

Overcoming a potential moral hazard problem of donor involvement: Excessive donor involvement in new investments could also be counterproductive. Donors should carefully examine the need to build new infrastructure and first consider the possibility of performing some rehabilitation while holding the authorities accountable for the maintenance of existing ones. If the authorities are expecting a donor to eventually replace a piece of infrastructure that does not function, the incentives to maintain it are greatly reduced.

Conclusion

- Developing economies, but also emerging ones like Georgia, as well as Armenia, Ukraine and others, would benefit from proper incentives and support from the international donors to integrate maintenance into the infrastructure planning framework;
- This is especially important for local governments, who lack the financial and human capital resources to maintain local infrastructure properly, making regions outside of the capital city less attractive places to invest or live in;



- Given the absence of transparent and comparable sources of information about the composition of maintenance expenditures - for example, the Government Finance Statistics (IMF), which does not distinguish between maintenance and rehabilitation expenditures, - donors could insist that governments compile these expenditures and report on them, at least for the major projects;
- The culture of maintaining rather than rehabilitating or replacing is directly linked to the sustainable development goals and the circular economy concept. In light of their commitment to Agenda 2030, the international community and the national governments in countries like Georgia should consider prioritizing and implementing the set of reforms suggested in their respective PIMAs.

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