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The sections of the Kerala budget 2021-2022 that pertain to 'Transforming Kerala into a Knowledge economy' contain vision of a knowledge economy which is both ambitious and laudable. This vision is unfolded in the budget speech by Dr. Issac and among various important elements, higher education and innovation features prominently. My intervention will be focusing on transforming higher education for the knowledge economy.

I saw this consultation as an opportunity to read through the budget speech and come with some quick thoughts. Importantly, when I hear the notion of the knowledge economy, then the question for me immediately is: knowledge for what and knowledge for whom? Certain types of knowledge, more important than others and certain types of knowledge are more strategic than the others in any given context and point in time.

From my perspective, starting from the societal challenges that Kerala is facing is critical. Both economic, social and environmental challenges. Thinking through these challenges and their implications for types of change that are needed can help us determine what kinds of knowledge that the Kerala knowledge economy should produce and diffuse and role that higher education can play in doing so. The strategy for the Kerala knowledge economy needs a clear identification of needs. The first step is mapping of challenges and prioritization of them. The next step is thinking about implications for innovations.

There was considerable attention paid to the need for transforming higher education in line with Kerala's recent achievements in school education. The speech emphasized that to make progress towards the knowledge economy, higher education is key:

Undoubtedly, transformation to a knowledge economy, requires a lot of investment - huge investments - in higher education. Investment in higher education will increase, as is clear from the budget. But how teaching and research will shift to a new paradigm and what the paradigm is, is less clear. Naturally, this is also something which is beyond the remits of the Ministry of Finance, but I think we should appreciate that it is highlighted in the speech.

I would like to propose the heading of a challenge-driven higher education system which plays an active part in mission innovation. It should include both teaching and research. It is about making closer connections to other stakeholders in key challenge-driven missions. When reading through the budget speech, a very good example of what such challenge-driven learning can achieve is the example of the bandicoot robot (page 35). From the starting point of a key challenge, which has to do with the sewage system in Kerala, a group of engineering students sat together to try to deal with the problem and invented this robot. They worked together with users, private sector stakeholders and others to produce this invention. This is exactly the type of challenge driven innovations I have in mind. It can be used for all sort of problems and include many different types of teaching and research.

What does it require for the higher education system to think in these terms, to reorient the entire curriculum towards such societal challenges? Now, of course, we cannot completely move away the existing curriculum elements. They have to be in place. But nevertheless, the ties with the users of university graduates - in public and private and social sectors - are very important. The ties should be built into teaching. University students working together on real-life problems are very important. And they should be students working from different disciplines. So, transformation of the curriculum is important, including also how students can work together across different disciplines and how they can connect much closer to the needs to 'burning platforms' of the private and public sectors. So, the key elements are: (a) forging closer ties with 'users' of university-graduates in private, public and social sectors and (b) transforming curricula, including interdisciplinary and project work. These could be fundamentals of a new paradigm university teaching.

Innovation efforts should not only seek to address local challenges but also to bring these innovations to markets with similar challenges. Research and teaching could connect closely to both local problem-solving and to national and global commercialisation of innovations. This is about how to enable the business side of local problem solving.

I am thinking about this in connection with some work we have been doing together with Xiaolan Fu who was speaking just a few minutes ago. We were looking at 'green windows of opportunity' in China: how Chinese enterprises were able to benefit economically from addressing local and global sustainability challenges. Government and other stakeholders implemented institutional and technological innovations to address of sustainability, local pollution challenges, energy security etc. Starting with local mission-driven innovation, the next step was exports of these green technologies to the rest of the world. Universities should

be engaged in both steps, working with the key stakeholders. They can play key roles in a challenge-led window of opportunity creation strategy for economic and social development.

In sum, I applaud the ideas in the budget and suggest that we think about how we can situate transformation of higher education to match with a strategy where key challenges and mission-driven innovation programs guide the transformation to a knowledge-based economy.