Woodrow Wilson International Center for Scholars
Environmental Change and Security Program

The World's Cities: Mapping Urban Growth in Developing Countries

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Edited Transcript— Mark Montgomery

I'd like to talk with you this afternoon about two of the great trends of our time: urbanization and climate change. These come together in interesting ways with -- and challenging ways that will present, to all of us, new demands of various sorts, included new demands for data and for methods.

We know from the United Nations that the era we're entering into is one in which there'll be enormous growth in the urban populations of poor countries. This is mainly growth that will be experienced in the poor countries of the world. From 2000 to 2024, those poor countries – LDCs, as in this slide -- added about 1.6 billion urban residents. And something of the same increase is in store for those countries in the quarter century following. Meanwhile, to judge from the forecast of the UN Population Division that informed this slide, the era of rural growth in these countries is evidently coming to an end, and even decline is evidently in store.

While this is happening, as we all know, the world will also, it seems, be undergoing a period of increase in global temperature and all the ramifications that follow from that. And poor countries will be challenged, we'll just say, euphemistically, by both of these trends.

In those countries, a number of levels and units of government, ranging from the national to the regional or state down to the municipal and even below that, will need to formulate urban adaptation to climate change strategies that are spatially specific. They must be spatially specific if those needs are going to be addressed on the ground.

Now, in the natural sciences community, earth sciences and so forth, there's an enormous effort underway to document and refine estimates of exposure to climate risks that are increasingly on a more and more spatially refined basis.

But what about those of us in the social science community? What are we doing in a parallel fashion to document vulnerability to these risks, especially in the cities of poor countries? Well, at the moment we are doing very little in the social science communities, and that is, in a way, the larger theme of this talk, that it's time to get in gear. Just to draw the point out a bit further, a feature of urbanization is that over time, as countries become more and more urbanized, higher and higher percentages of the populations of those countries will be found in relatively small, dense units.

In the world of demography -- I'm an economist and demographer, myself -- we've, for the past 30 years relied, now it appears to a fault, on national-level representative sample surveys. They tell us what is happening within a given country in terms of demographic behavior, health behavior and outcomes, and so forth. Now, those national-level surveys are helpful; they do have something to say that's useful about the determinants of city growth, but we really cannot ask nationally representative surveys to tell us anything very meaningful about individual cities and, of course, the neighborhoods within those cities. That's not the point -- the purpose for which these surveys are designed.

So if we are to ready ourselves to meet an era in which climate change joins with urbanization, we'll have to do two things within the social sciences at a minimum. First, let's make use, in order to understand the sources and the likely implications, rates, and so forth of urban growth -- let's use what we have at hand. There is, as I'll tell you in a few moments, a wealth of information that's been amassed over the last 20 to 30 years that will be useful in this regard, that will help us specify and better forecast models of city growth.

The second large task that awaits us in the social science community is, again, to work with data we either have or shortly will have in the next round of censuses, that is, to disaggregate these censuses, to get them broken down. It's very simple, I think, to do, in principle at least. Get them disaggregated down to the levels that are politically, bureaucratically, and programmatically meaningful, that is, to small political jurisdictions. This is not being done outside Latin America on a routine basis. There's nothing especially daunting about the task, but it needs to happen if we are to document vulnerability at a finely resolved spatial scale.

So, with that overview, [you know] what I'll talk about in the next few minutes -- and I think I have about 20 minutes in total. Let me give you a sense of the empirical materials that we have access to. I'll organize these materials, draw them together under the heading of climate change with two particular ecosystems or zones we have in mind: one, the low-

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elevation coastal zone, on which CIESIN has done a great deal of work; the second, not as much discussed in the literature, but I think very interesting to think about, are the urban populations residing in dry lands, which, as it will turn out, are, in fact, much more much more populous than the low elevation coastal zone. We'll go through a series of maps, that is, snapshots of a point in time, roughly 2000. I'll briefly describe what could be done to help forecast city growth by ecosystem and other parameters, and then conclude.

So the team that has produced this work is one that's been together for five or so years: Deborah Balk, formerly at CIESIN, now at Columbia; Thomas Buettner of the UN Population Division; Gordon McGranahan at IIED in London; and a number of others you'll see here are responsible.

So what we do in gathering together materials for this exercise is to draw on three enormous projects underway for at least a decade: first, the Global Rural-Urban Mapping Project, which is familiar to everyone in the first couple of rows, but which may not be known to all of you in the audience -- its elements I'll describe shortly -- second, the United Nations Cities Database; and third, an enormous mass of demographic surveys, collected, initially, by the World Fertility Surveys Program in the 1970s and then, since the mid-1980s, but the Demographic and Health Surveys Program. And, also, to give you at least a sense of how one might begin to quantify vulnerability, we'll take a look at yet another spatially specific exercise in which CIESIN's been engaged along with the World Bank: the Small Area Poverty Mapping Project.

So GRUMP, or the Global Rural-Urban Mapping Project, for those of you who don't know it, I briefly describe it here. The essential point is that this project provides the essential, spatial frame for our analysis. And GRUMP really has no counterpart at the moment; it is essentially a unique resource and one that's unusual in the world of population, I must say. The UN Cities Database provides the time series aspect of the project. It has collected, since the 1970s, short time series on thousands of cities in developing countries. And the third source of information, as I mentioned, is an enormous collection of nationally representative population surveys under the DHS and WFS programs. These help us to understand the sources of city growth by documenting urban fertility rates, which I find are surprisingly seldom thought about as drivers of city growth rates. In fact, they're extremely important in driving city growth. Migration is well-recognized as important in city growth. Yet, in these surveys, unfortunately it's very crudely measured, to say the least. There's also -- some of

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you may know of UNICEF's Multiple Indicators Cluster Surveys, another large program. We'll be adding those to our set.

Well, to draw together, then, these materials in a discussion of urbanization and climate change. The low elevation coastal zone, that is, the area contiguous to the ocean, in this instance, within ten meters of sea level; that is -- the LECZ, as it's known, can be thought of as a proxy for the risks that populations will be exposed to that have a seaward character: sea level rise, storm surges, precipitation, landslides that sometimes produces, and so forth.

This picture, derived from GRUMP, is of southern Vietnam, and you can see, in light blue, the ocean, in slightly darker blue, the low elevation coastal zone. And what you see under that blue is practically the entirety of southern Vietnam, including about half of Ho Chi Minh City, lies within this low elevation coastal zone.

If we look elsewhere in Asia and ask, "Does climate change put economic assets at risk?" Well, here is a snapshot of China's immensely powerful economic engine -- much of which is, for example, in Shanghai, Shenzhen -- is located in the low elevation coastal zone and will thus be exposed, increasingly, it seems over the years, to storm surges, typhoons, and so forth.

A low elevation coastal zone is, in a way, an obvious arena in which climate change will be linked with urbanization. Less often talked about is the ecosystem known as a dry lands ecosystem, which, in brief, is much more populous than the low elevation coastal zone; [and] is about half urban, and, as the name suggests, is the kind of ecosystem in which we expect to see increasing water stress, water scarcity. Much of the literature is about the implications of those developments for the rural populations of the dry lands: perhaps increased migration and so forth. Much less has been written about the urban implications. What does it mean to be a resident of a city in the dry lands? Does it mean increasing water scarcity, less by way of hydropower? Does it mean an influx of short-term or longer term migrants from rural areas of the zone?

So, to give you an image of where the dry lands are, well, we see, among other things, northern Mexico, southern Africa, parts of Argentina, west Asia, and so forth. And if we draw specific attention to India -- I hope this is reasonably clear -- the darker areas are the more arid areas of that country. Delhi lies in the dry lands zone, as does Hyderabad. This picture also, although you can probably only dimly make this out, shows us Mumbai and

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Calcutta, which have large portions of their populations in the low elevation coastal zone. So India offers, you know, the full menu of risks here.

I'll briefly put up this slide and leave it for those interested to take a look at later. What we have done, using the materials provided by GRUMP, the UN, and so forth, is to simply quantify the numbers of people in this case in Asia, the numbers of urban residents in Asia and also the amount of land, the number of people who reside in the LECZ, and the numbers residing in the dry lands. And, although I doubt you can see any of that detail from where you are, if you look at the numbers involved, the basic message of this table is that numbers of urban residents in dry land systems is much larger than is the case with the low elevation coastal zone. So this is in the area -- this is a kind of ecosystem -- in which I think we need to take an interest, even if our interest is mainly the implications for urban residents.

We can also, using these spatially specific materials, go down from the country level to the level of cities or urban agglomerations. There's a map, shown here, of the third largest city in Indonesia, Medan. The outlines that you see are from the satellite imagery, the night time lights imagery, that indicate outlines of the urban agglomeration, where population and production are likely to be concentrated. Beneath that, the ocean is to your upper right. The low elevation coastal zone is the green area, and beneath that are various administrative units that -- on which CIESIN, in this GRUMP project, has gathered information on population. All those irregularly shaped shapes beneath the low elevation coastal zone, we can add up, if we like, the population living in those areas, and get an estimate of the numbers of people exposed to this particular kind of climate-related risk.

But, having got this spatial frame that GRUMP has made available for us, we can also put other spatially coded information into it. A number of you may know of the World Bank's Small Area Poverty Mapping Project that involved a combination of census data, micro-census data, and other kinds of data, which produced, at the level of relatively small geographic units, estimates of the number and proportion of poor in what amounts to, I think, about 50 to 60 countries by now. So we have one of these Small Area Poverty Maps available to us for Medan, and you can see here the low elevation coastal zone. Beneath that is an indicator of the proportion poor in the neighborhoods that are at risk. And, if we like, we can switch our analysis to the numbers of people who are poor. And so for various types of work, it's this kind of information. The poor are likely to be, of course, more vulnerable to climate related threats. We can at least begin to quantify the numbers involved.

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And here -- I'll pass through this quickly -- for the cases where it can be done, much as here, we try to give an indication of poverty rates within the low elevation coastal zone and outside that…

Okay, let me turn now to the last major point, which is, if we've seen snapshots of climate related risk zones circa 1995, 2000, 2005, what about the future? Do these materials, if combined, offer us a better understanding of the likely evolution of city sizes and city growth rates, in the years to come? And here we'll need to rely on the United Nations Population Division's Cities Database for the time series dimension -- without which forecasting would not be a sensible exercise.

As discussed in this rather technical slide, among the data that need to be fed into such estimates and forecasts, we must have, I would say, information on urban fertility rates -- "total fertility rates" is what's said here -- because these are demonstrably a very important determinant of rates of city growth. We must also have other kinds, and it would be desirable to have a great range of such other information, including information on eco zones and ecosystems and other geographically related variables.

I'll just briefly show you, for those whose lunch would not be complete without an equation -- the kind of thing -- the kind of model that we have estimated: a regression model that's suitable for longitudinal data. And from that kind of exercise, we can come away with these sorts of illustrative forecasts. What I'm showing here is for Asia. Based on the inputs you've seen just very briefly there, and based also on the United Nations forecasts of total fertility rates over the next decades, what would we produce by way of forecasts of city growth? The red line shows you, on the panel on the left, the forecast -- the median forecasted city growth rate over that -- over the period in question, which ranges from over three percent, about three-and-a-half percent in 2000, down to two-something percent by the end of the forecast period. Now, what is pulling down the rate of city growth over time? It's the declining fertility.

In this comparison, we ask, "Well, are city growth rates forecasted to be higher in the low elevation coastal zones than elsewhere?" And the answer is, although there is a barely discernible difference between the two, it really -- the difference doesn't amount to much as the forecast horizon increases. So, as best we can tell at the moment, cities in those low elevation zones are growing no more rapidly nor less rapidly than are cities located elsewhere, with other things held constant.

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So, to conclude, we need to ask the question, I think, about trends, about forecasts, because forecasts are, of course, essential to planning and to devising urban adaptation strategies. And one question of interest to those of us here on the User Working Group in particular is, "How ambitious should these forecasts strive to be?" I think it was Sam Preston, a noted, quite eminent demographer, who wrote about 30 years ago that projection of city populations is fraught with hazards, impossible to predict precisely, and, as he said, "National and local planners will have access to more detailed information about a particular place than we do," those of us who are involved in international datasets. He also wrote that -- with reference to Mexico City, which back then was forecast to reach a total of 31 million persons by the year 2000, which, of course, never happened, "Whether such size can actually be attained is, of course, questionable," he says, pointing to issues with water supply, tree cover, and other sorts of natural or environmental factors.

So those are sound advice. You know, don't be too ambitious. And yet if you ask, "Well, what's happened in the 30 years since Sam Preston and the UN Population Division wrote those words?" Well, one of the things that has happened, and especially so in the last decade, is a remarkable outpouring of new data, some of which I've shown you, that if carefully, cautiously combined, might very well enable us to make better-informed forecasts of city growth than the best scientists of the 1980s could have imagined at the time.

There is a tendency to think that, surely, it really is the local specialists, local planners, who have information on the detail and will know -- and they will know, of course, far more than we, about the prospects of certain neighborhoods and cities in their areas. But I think there's a tendency to overstate what is known locally, right? In some countries in Latin America, South Africa, a few countries, a few poor countries, there is and has been a lot of investment in the analysis and compilation of spatially detailed information. But in most of the countries in which we work local planners, even national planners, operate with the most rudimentary sorts of information about population and social and economic composition and with very little understanding, I think it's fair to say, of the roles that factors such as fertility rates may play in the future evolution of city sizes and growth rates. So I would concluded that there is, in fact, an urgent and an important role to be played by internationally assembled, spatially specific data sets, such as those that SEDAC and CIESIN have been involved in.

So let me conclude on that note. Thank you.

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