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Pressure





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Demographic and economic development and the quest for animal-source food

The end of the twentieth and the beginning of the twenty-first century are characterized by significantly increased pressures on the earth's natural resource base. Two main forces drive this process: demographic and economic development. The world population has grown exponentially, from about 4 billion in 1975 to more than 7 billion today. By 2050, this number is expected to increase to about 9.6 billion (UN, 2012). Since May 2007, there have been more urban than rural people, and progressive urbanization will increase the number of megacities (with at least 10 million residents) in the future. The world economy has also been growing dramatically over recent dec-

ades, with a twentyfold increase in global gross domestic product (GDP) between 1970 and 2012 (World Bank, 2012). The world economy is projected to nearly quadruple by 2050, leading to a very significant increase in the demand for energy and natural resources (Organisation of Economic Co-operation and Development (OECD), 2012). Agriculture, particularly livestock production, accounts for a major share of these resource-use dynamics, as rising income levels tend to shift dietary patterns towards increased milk, meat and egg consumption.

Agricultural land pressures are generally high throughout the developing world, and are particularly high in Asia, although a major increase in arable land pressure is also projected for Africa in the decades ahead. At the local scale, land pressures are highest in and around urban agglomerations and densely settled areas. In many countries, land resource conflicts are greatest at the perimeters of urban areas. The social marginalization of people is also most visible in slums and peri-urban settings that lack proper shelter, sewers and drinking-water. In these settings, people bear the cumulative brunt of insufficient food, income and

health security. The incidence of food- and water-borne diseases and respiratory infections is highest where basic sanitation and other conditions for adequate living are lacking, leaving people both more vulnerable and more exposed to disease agents and pollutants. In addition, large numbers of livestock congregate in peri-urban areas, at collection sites, wet markets and local butcheries where they provide urban consumers with fresh daily supplies of meat and

dairy products, often without formal quality assurance.

The risk of animal-to-human pathogen shifts varies greatly according to the type of livestock production and the presence of basic infrastructure and services. This variation is illustrated by contrasting the demographic, socio-economic, agricultural and dietary changes in South and East Asia, two areas with very high pressures on land and a close human–livestock interface.

TABLE 2

TOP 20 WORLD URBAN AGGLOMERATIONS* IN 2025, RANKED ACCORDING TO THE ESTIMATED AMOUNT OF URBAN FOOD WASTE NOT COLLECTED

URBAN AGGLOMERATION, COUNTRY	PROJECTED 2025 POPULATION (millions)	ESTIMATED PERCENTAGE OF URBAN FOOD WASTE NOT COLLECTED (%)	URBAN FOOD WASTE NOT COLLECTED (thousand tonnes/day)
Mumbai, India	26.4	46	3.1
Dhaka, Bangladesh	22.0	54	3.1
Kinshasa, Democratic Republic of the Congo	16.8	70	3.0
Delhi, India	22.5	46	2.7
Kolkata, India	20.6	46	2.5
Karachi, Pakistan	19.1	46	2.3
Lagos, Nigeria	15.8	45	1.8
Shanghai, China	19.4	28	1.5
Manila, Philippines	14.8	39	1.5
Cairo, Egypt	15.6	34	1.4
Lahore, Pakistan	10.5	46	1.3
Chennai, India	10.1	46	1.2
São Paulo, Brazil	21.4	17	1.1
Mexico City, Mexico	21.0	17	1.1
Jakarta, Indonesia	12.4	35	1.1
Beijing, China	14.5	28	1.1
Bangalore, India	9.7	46	1.1
Hyderabad, India	9.1	46	1.1
Chittagong, Bangladesh	7.6	54	1.1
Kabul, Afghanistan	7.2	56	1.0

* The term “urban agglomeration” refers to the population contained within the contours of a contiguous territory inhabited at urban density levels, without regard to administrative boundaries. It usually incorporates the population in a city or town in addition to that in the suburban areas adjacent to the city boundaries.

Sources: Luck *et al.*, 2012; population projections – UNESA, 2008.

In *South Asia*, the urban population increased from 200 to 490 million between 1980 and 2010, while the rural population rose from 700 million to 1.14 billion. GDP per capita for this period (in constant 2000 United States dollars and at purchasers' prices) increased from US\$260 to US\$1 260. India is projected to surpass China as the world's most populous country by the late 2020s, with a population exceeding 1.5 billion by 2050. India occupies 2.4 percent of the world's land area and in 2010 supported 17.5 percent of the world's population. As shown in Table 2, half of the world's 20 largest urban mega-cities projected for the year 2025 are in South Asia; the ranking of these cities is based on the estimated amount of urban food waste not collected, which reflects the extent of scavenging by humans and animals on waste dumps. Food waste is left to saprophytes, insects, rodents, birds, stray dogs and cats, wild carnivores and – most important – socially deprived people, who are exposed to a long list of health threats in the process.

The livestock–human interface in South Asia is strongly influenced by the presence of ruminants. In 2010, the standing population of cattle and buffaloes had reached 439 million head, in addition to 471 million head of sheep and goats. For East Asia, these figures are 118 and 317 million head, respectively (FAOSTAT, 2012). In South Asia, buffaloes and bovines are kept for multiple purposes, traditionally for animal draught power and the supply of manure as fuel and fertilizer, and increasingly for milk production. Over recent decades, Operation Flood – a project operated by India's National Dairy Development Board and supported by the World Bank – has turned India into the largest global milk producer (FAOSTAT, 2012), with milk availability per person doubling between 1980 and 2010. Dairy production has become India's largest self-sustaining generator of rural employment. Operation Flood supported the creation of a national grid of village milk producers' cooperatives. This network has reduced seasonal and regional price variations and ensures

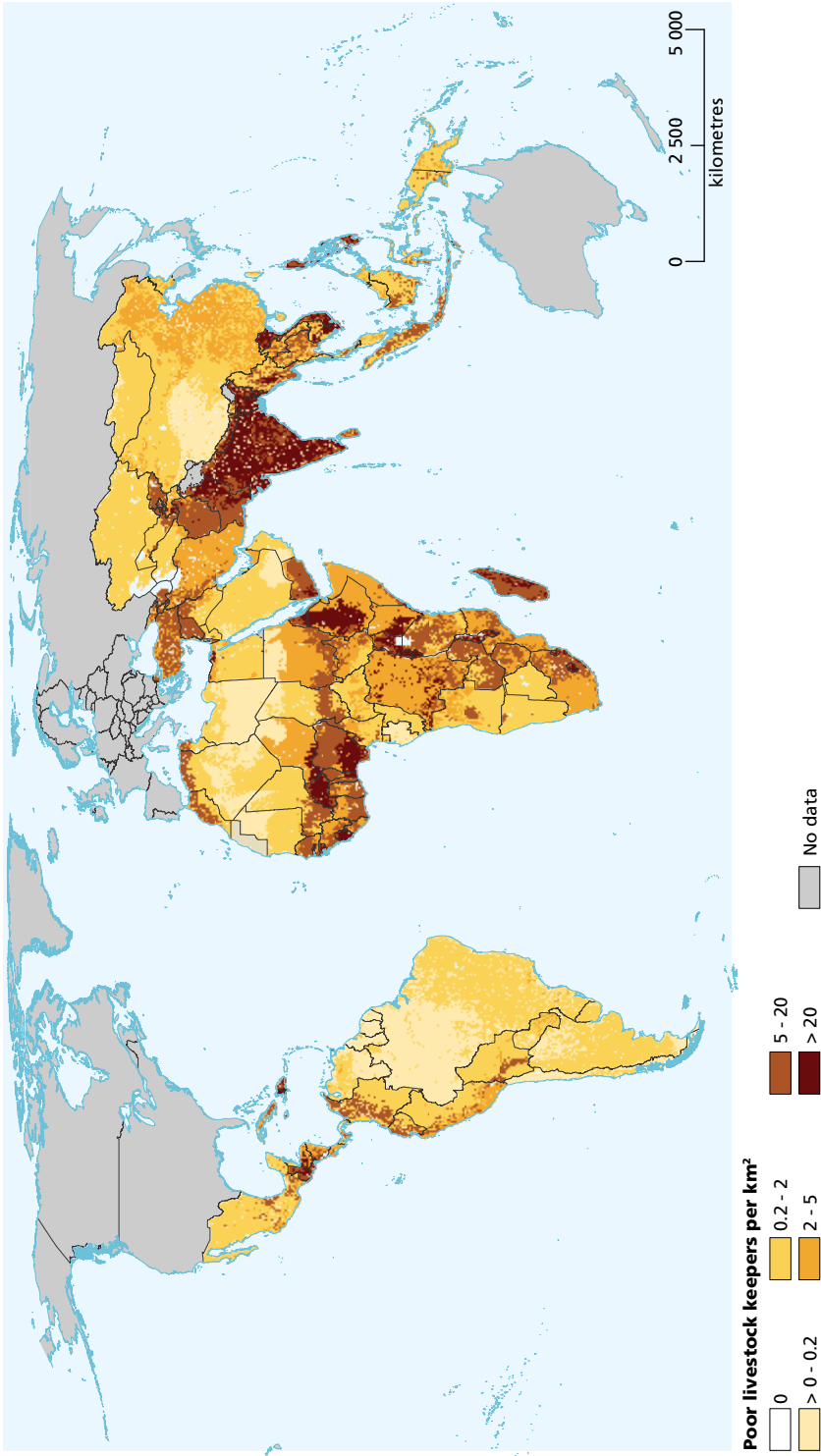
that producers participate significantly in the benefits of milk processing and retail.

Figure 2 shows the distribution of poor livestock keepers worldwide and the prominence of South Asia in this regard (FAO and ILRI, 2011). An estimated 75 percent of the world's poor live in rural areas, and at least 600 million of these people, mostly in South Asia, keep livestock that enable them to produce food, generate cash income, manage risks and build up assets. In South Asia, apart from a rapidly growing poultry sub-sector, milk production has become the major livestock sector activity, with more than 130 million farm households engaged in milk production and millions of small-scale rural processors and intermediaries. Milk consumption in South Asia grew by an average of 3 to 4 percent/year over the 1995–2005 decade, double the growth rates recorded for staple foods (FAO, 2010).

In *East Asia*, from 1980 to 2010, the urban population increased from 296 to 784 million people, while the rural population decreased from 863 to 779 million. In China, the urban population rose from 190 to 636 million people, while the rural population declined from 791 to 718 million. The GDP per capita (in constant 2000 United States dollars and at purchasers' prices) increased from US\$186 to US\$2 208; per capita animal protein consumption increased from 7.5 to 37 g/day. China's economy is expected to rank first in the world by about 2030. In East Asia, dynamics at the livestock–human interface are determined by the booming pig and poultry industries. In 2010, the standing population of pigs amounted to 498 million head, of which 476 million (95 percent) were in China. East Asia counted 5.04 billion chickens and 855 million ducks, of which 4.59 billion chickens (91 percent) and 835 million ducks (98 percent) were in China. In comparison, South Asia counted 2.32 billion chickens, 74 million ducks and a mere 11 million head of pigs, accounting for 46.1 and 0.02 percent of the respective standing populations in East Asia.

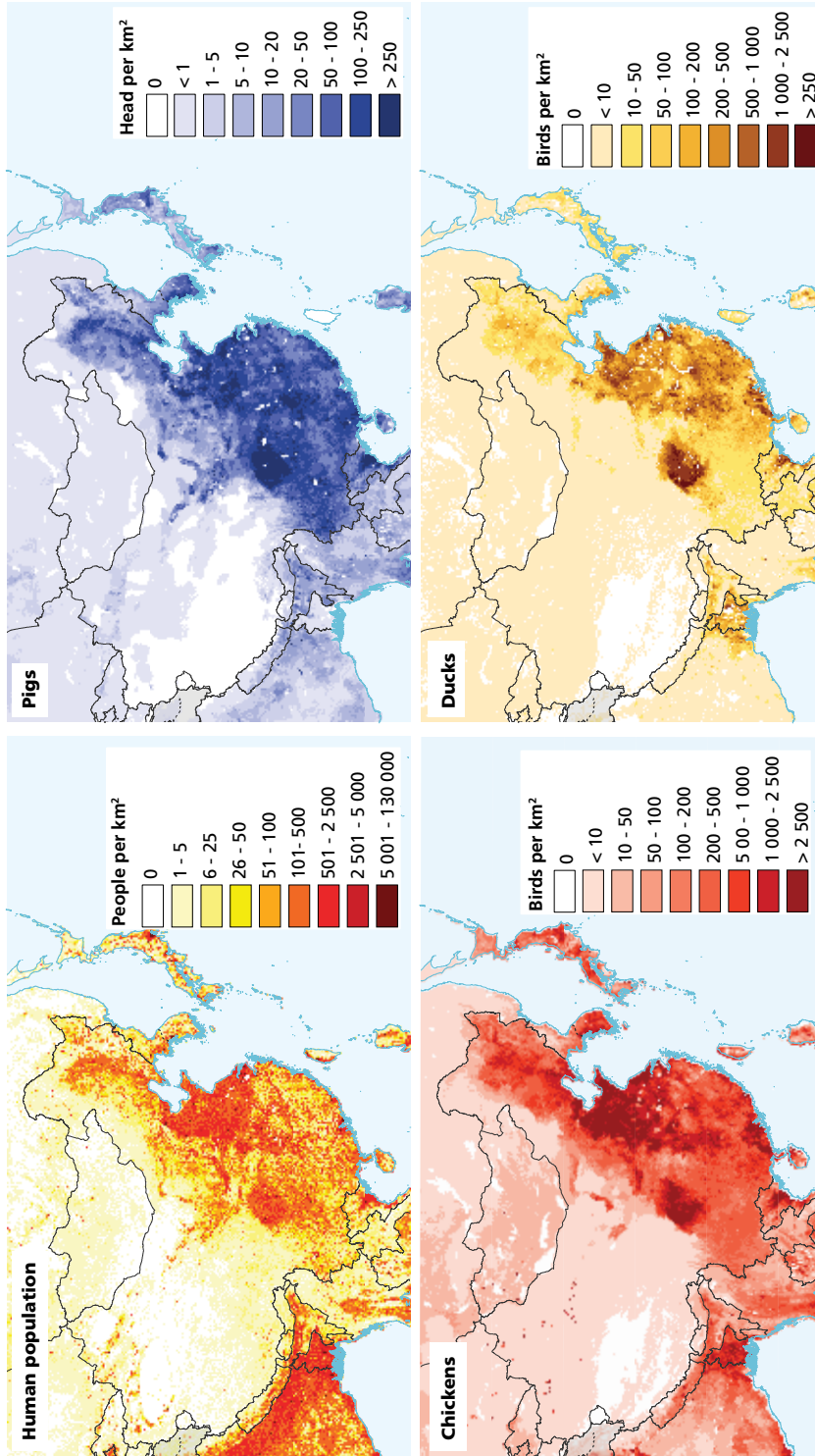
The perimeters of China's megacities usually feature a mix of both old and new poultry and

2 DENSITIES OF RURAL POOR LIVESTOCK KEEPERS (2010)



Source: FAO & ILRI (2008).

3 DENSITIES OF PEOPLE, PIGS, CHICKENS AND DUCKS IN PARTS OF EAST ASIA (2006)



Source: Bhaduri et al., 2002; *Pigs, chickens and ducks* – FAO and ILRI, 2011; map – T.P. Robinson, G.R.W. Wint, G. Conchedda, T.P. Van Boeckel, V. Ercoli, E. Palamara, G. Cinardi, L. D’Aletti and M. Gilbert (2013); unpublished data – T.P. Robinson, Fonds National de la Recherche Scientifique, Brussels; G.R.W. Wint, University of Oxford, Oxford, UK; G. Conchedda, V. Ercoli, E. Palamara, G. Cinardi and L. D’Aletti, FAO, Rome; T.P. Van Boeckel and M. Gilbert, Université libre de Bruxelles, Brussels.

pig production systems, which share live animal distribution and marketing channels. The poultry subsector has both an abundance of small to medium-sized holdings and a rapidly growing number of industrial-scale production plants. Millions of live birds are supplied to and slaughtered in live bird markets in urban centres every day. While most pigs are kept on small to medium-sized farm holdings, the number of large-scale farms is increasing rapidly. China's overlapping distributions of humans, pigs, chickens and

ducks are shown in Figure 3. The high animal densities, the mixing of farming systems and the preponderance of live animal-based food supplies together create ample opportunity for human exposure to pathogens of animal origin.

The complex demographic, economic, socio-cultural, agricultural and food system dynamics in South and East Asia justify focusing on animal-to-human pathogen shifts in the broad context of sustainable development.