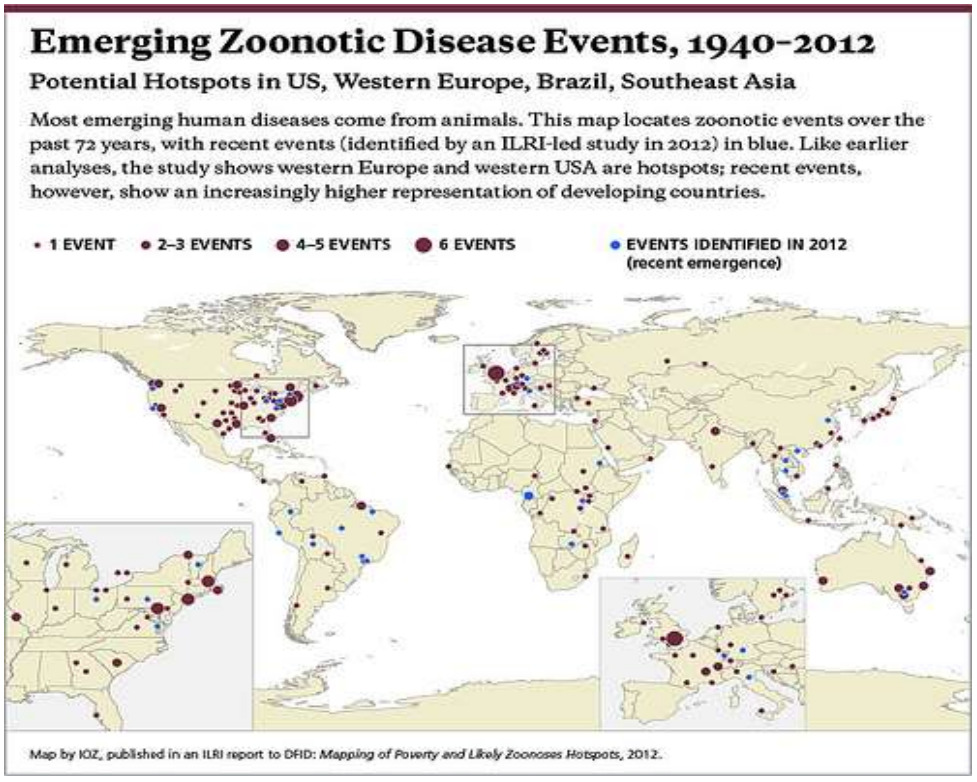
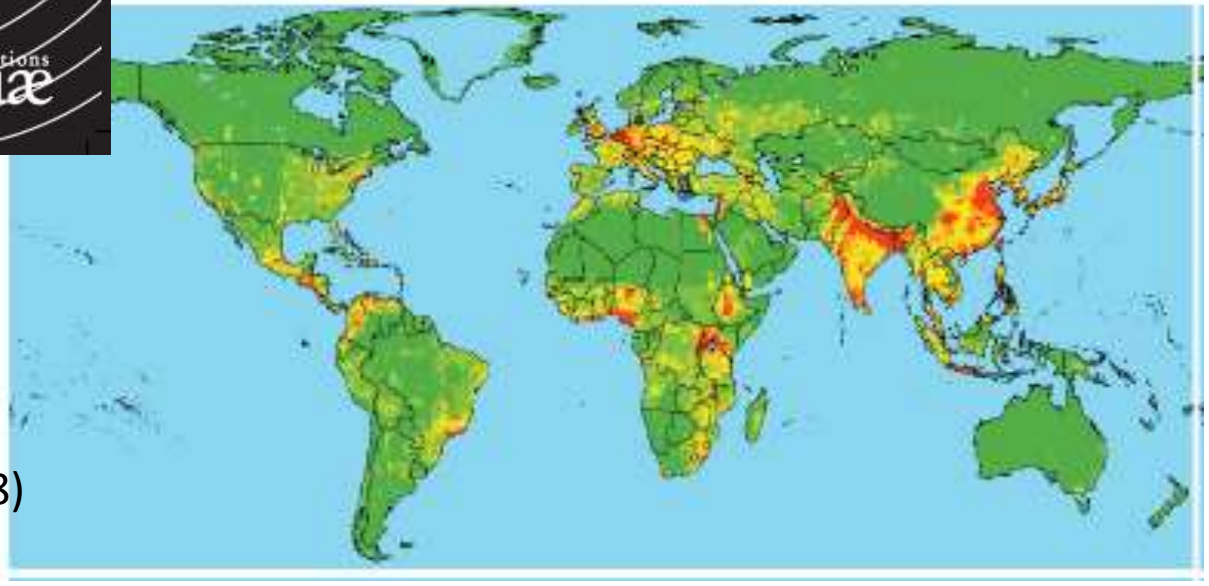
Antibiorésistance, émergences, pandémies : Pourquoi l'Asie du Sud-Est et la Chine du Sud

Serge Morand
Centre Infectiologie C Mérieux
Vientian, LAO PDR





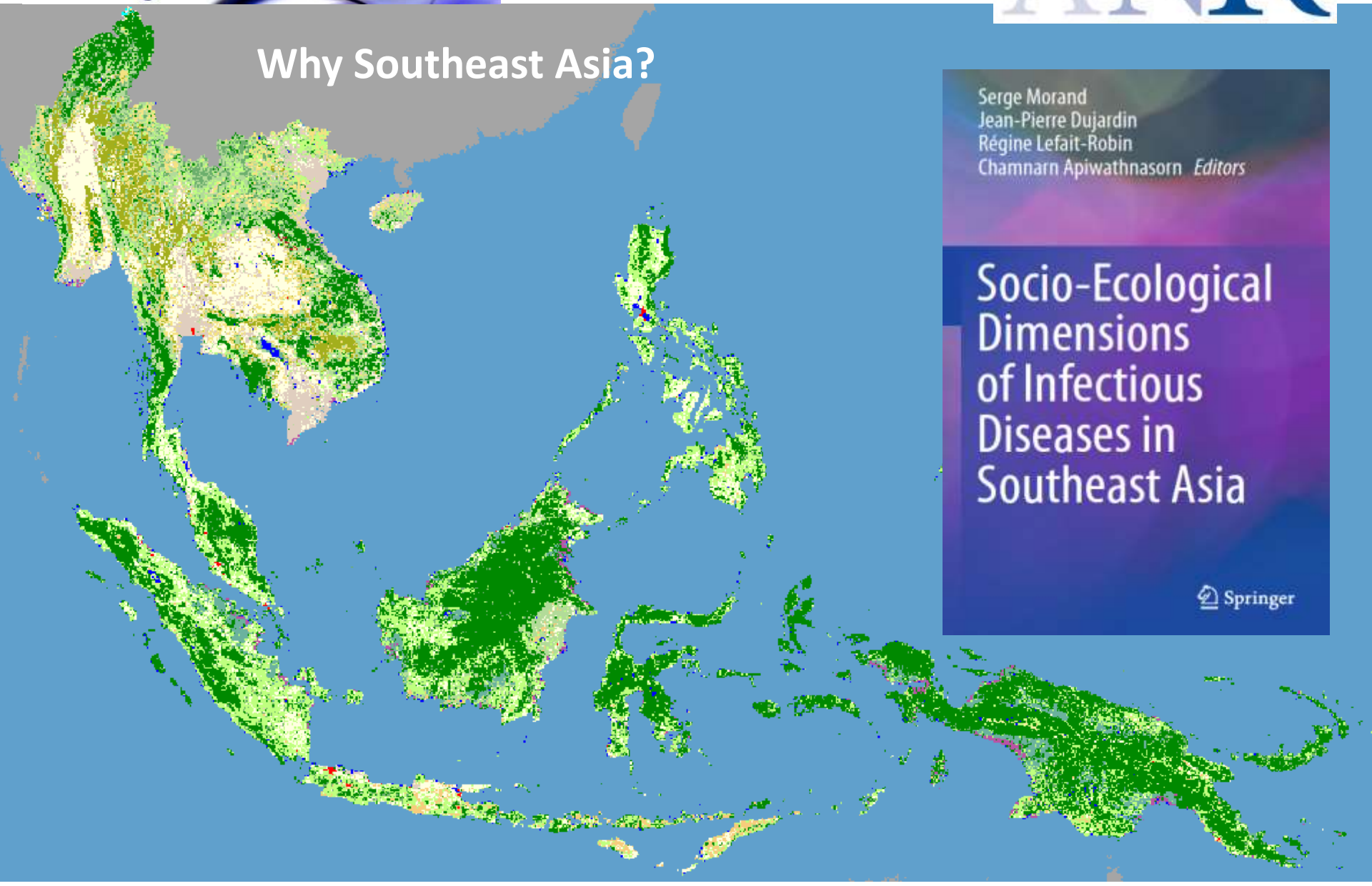
Emerging Zoonoses
From wildlife (Jones et al. 2008)

Biodiv HealthSEA .org

Local impacts and perceptions of global changes: Health, biodiversity and zoonoses in Southeast Asia

AGENCE NATIONALE DE LA RECHERCHE ANR

Why Southeast Asia?



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PLOS | ONE

Infectious Diseases and Their Outbreaks in Asia-Pacific: Biodiversity and Its Regulation Loss Matter

Serge Morand[1,2,3]*, Sathaporn Jittapalapong[4,5], Yupin Suputtamongkol[6], Mohd Tajuddin Abdullah[7], Tan Boon Huan[8]

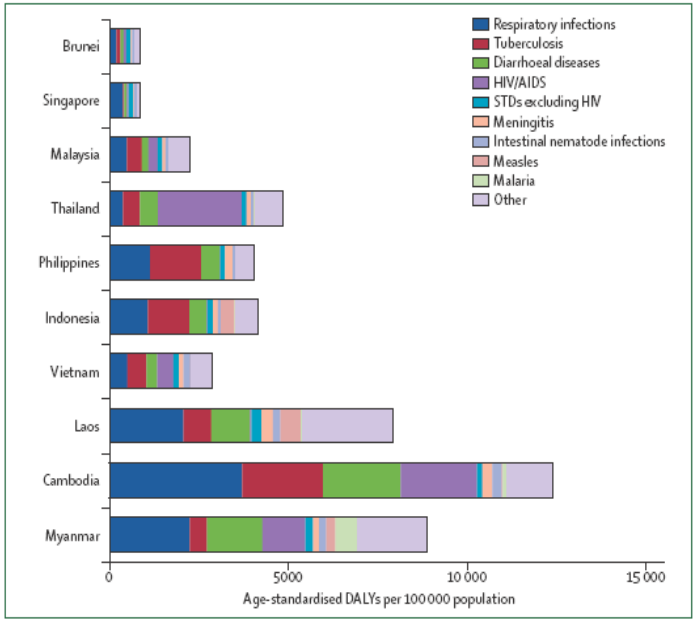
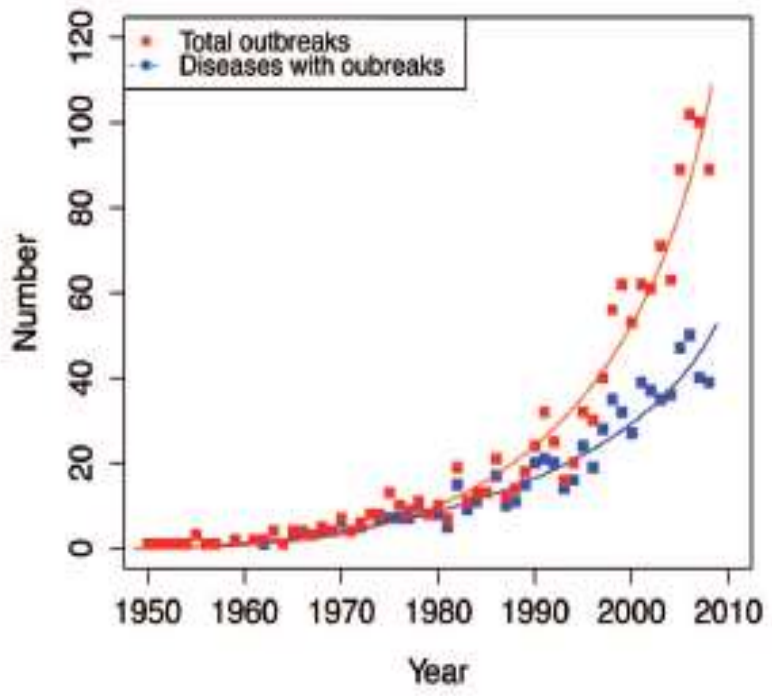


Figure: The burden of communicable disease in southeast Asian countries, 2004
Data are from WHO Global Burden of Disease, 2004 update.[1] DALYs=disability-adjusted life-years. STDs=sexually



Emerging infectious diseases in southeast Asia: regional challenges to control

Richard J Coker, Benjamin M Hunter, James W Rudge, Marco Liverani, Piya Hanvoravongchai

Global trends in antimicrobial use in food animals

Thomas P. Van Boeckel[a,1], Charles Brower[b], Marius Gilbert[c,d], Bryan T. Grenfell[a,e,f], Simon A. Levin[a,g,h,1], Timothy P. Robinson[i], Aude Teillant[a,e], and Ramanan Laxminarayan[b,e,j,1]

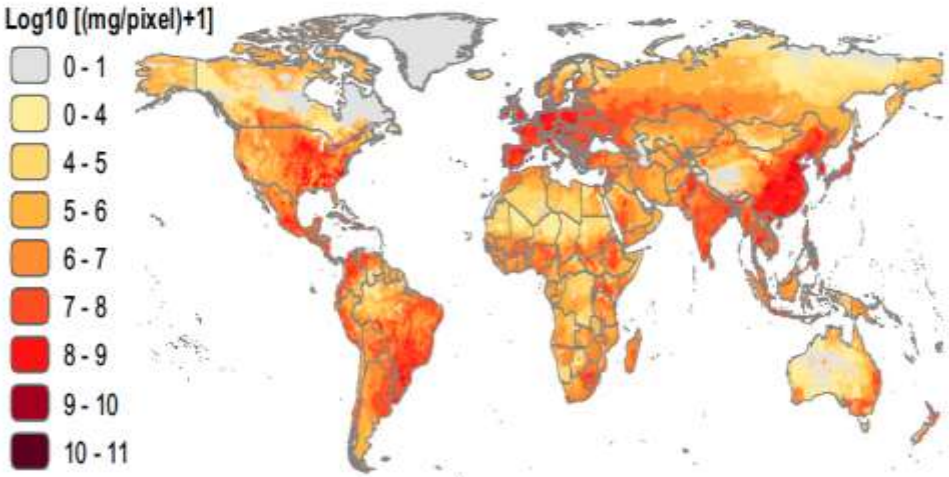


Fig. 3. Global antimicrobial consumption in livestock in milligrams per 10 km^2

PHARMACEUTICALS

China's lakes of pig manure spawn antibiotic resistance

Researchers begin to size up a public health threat from burgeoning pork production

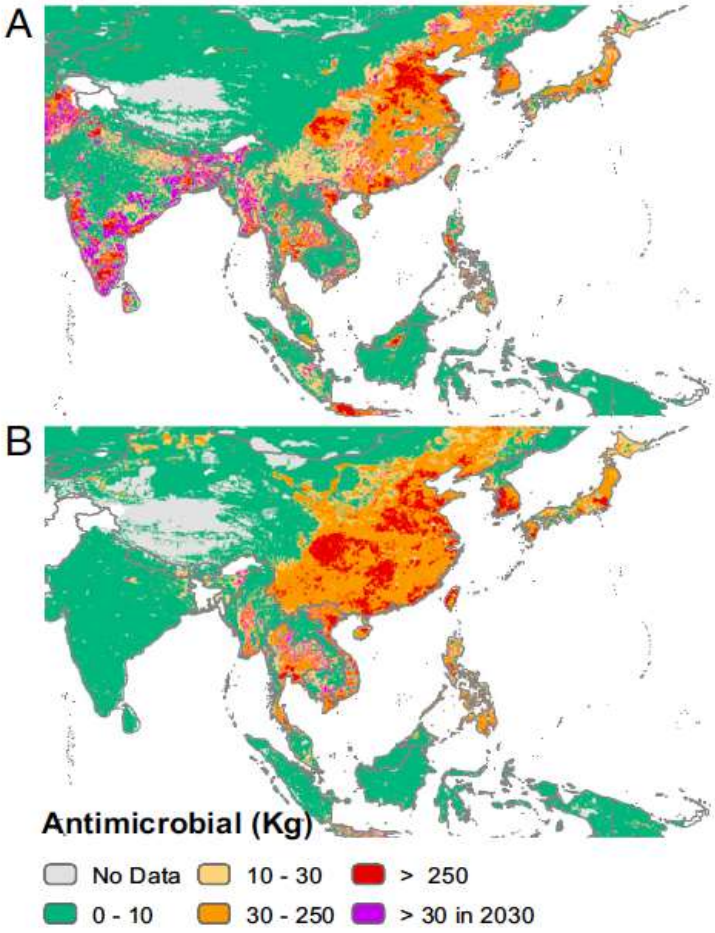
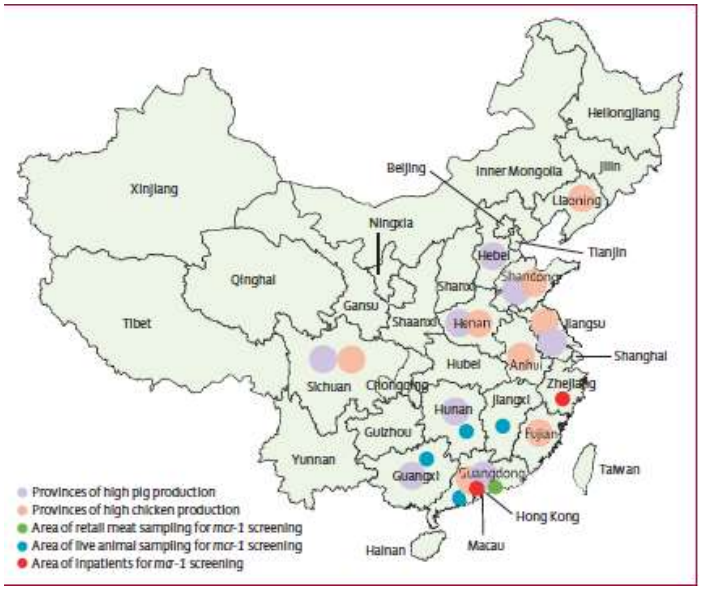


Fig. 4. Antimicrobial consumption in chickens (*A*) and pigs (*B*) in 2010. Purple indicates new areas where antimicrobial consumption will exceed 30 kg per 10 km^2 by 2030.

Emergence of plasmid-mediated colistin resistance mechanism MCR-1 in animals and human beings in China: a microbiological and molecular biological study

Yi-Yun Liu, Yang Wang*, Timothy R Walsh, Ling-Xian Yi, Rong Zhang, James Spencer, Yohei Doi, Guobao Tian, Baolei Dong, Xianhui Huang, Lin-Feng Yu, Danxia Gu, Hongwei Ren, Xiaojie Chen, Luchao Lv, Dandan He, Hongwei Zhou, Zisen Liang, Jian-Hua Liu, Jianzhong Shen*



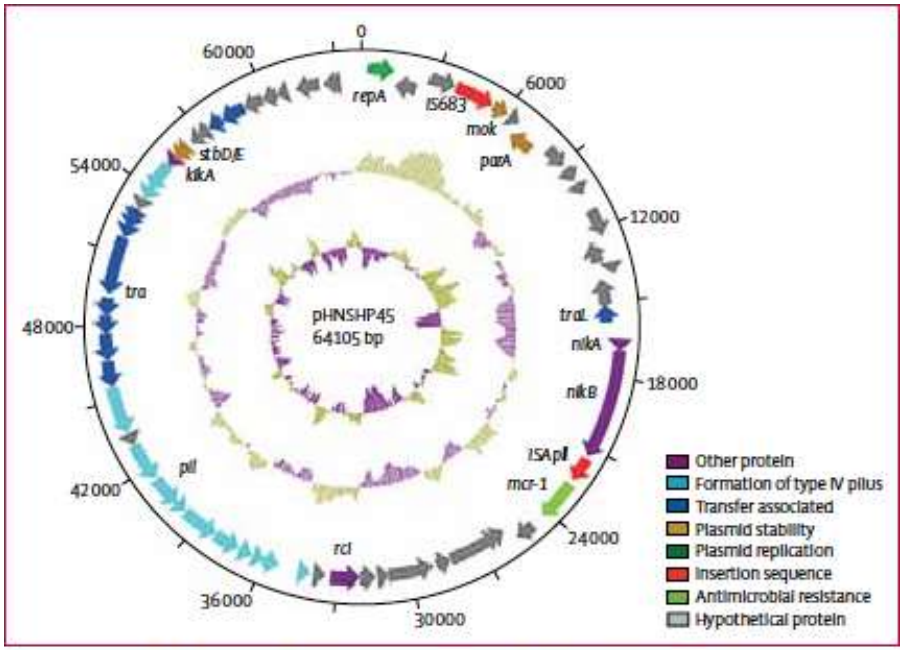
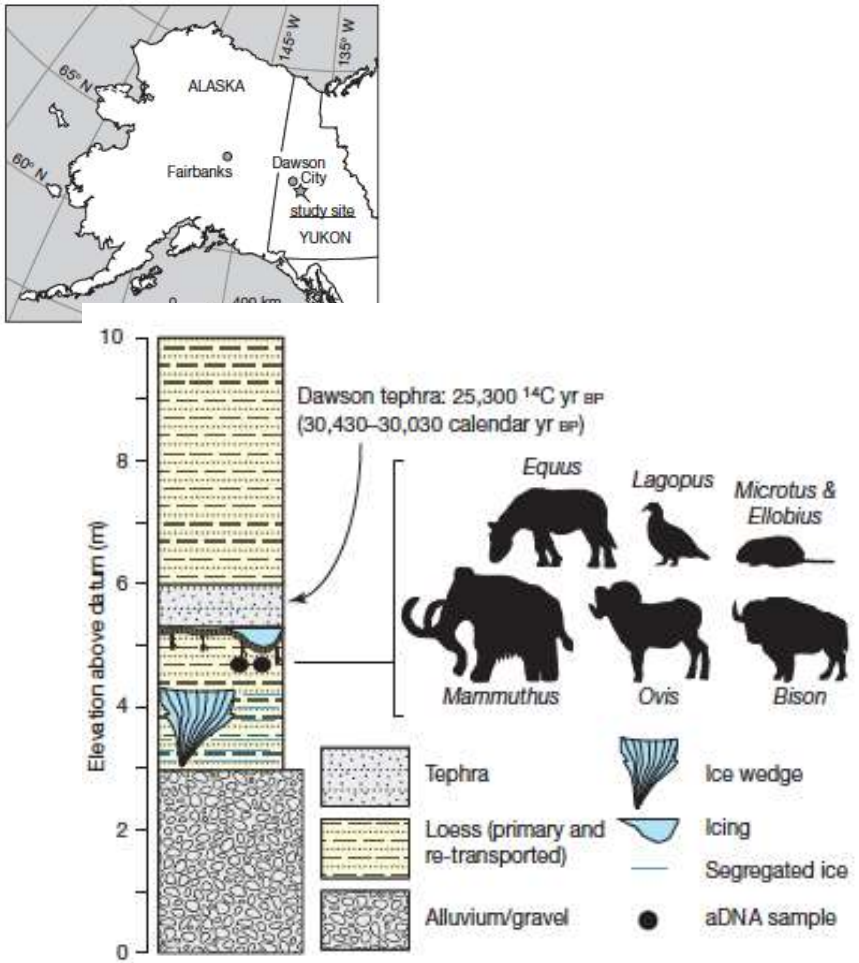


Figure 2: Structure of plasmid pHNSHP45 carrying *mcr-1* from *Escherichia coli* strain SHP45

www.thelancet.com/infection **Published online November 18, 2015** http://dx.doi.org/10.1016/S1473-3099(15)00424-7

Antibiotic resistance is ancient

Vanessa M. D'Costa[1,2]*, Christine E. King[3,4]*, Lindsay Kalan[1,2], Mariya Morar[1,2], Wilson W. L. Sung[4], Carsten Schwarz[3], Duane Froese[5], Grant Zazula[6], Fabrice Calmels[5], Regis Debruyne[7], G. Brian Golding[4], Hendrik N. Poinar[1,3,4] & Gerard D. Wright[1,2]



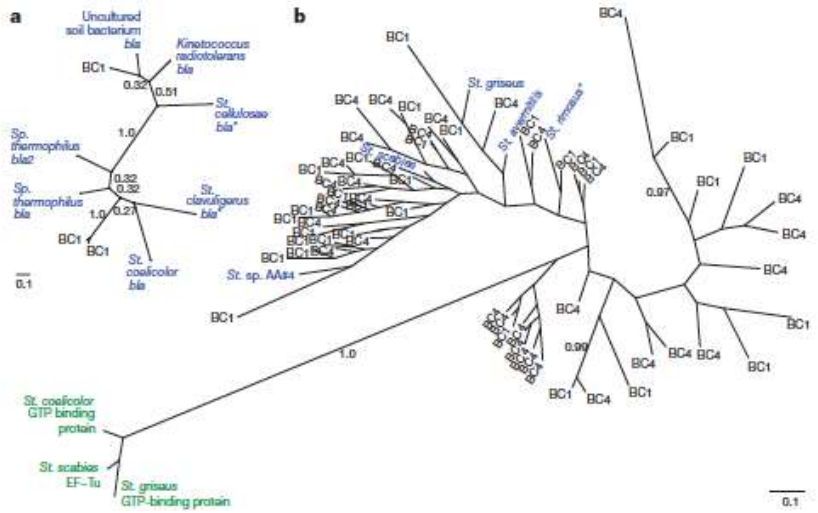
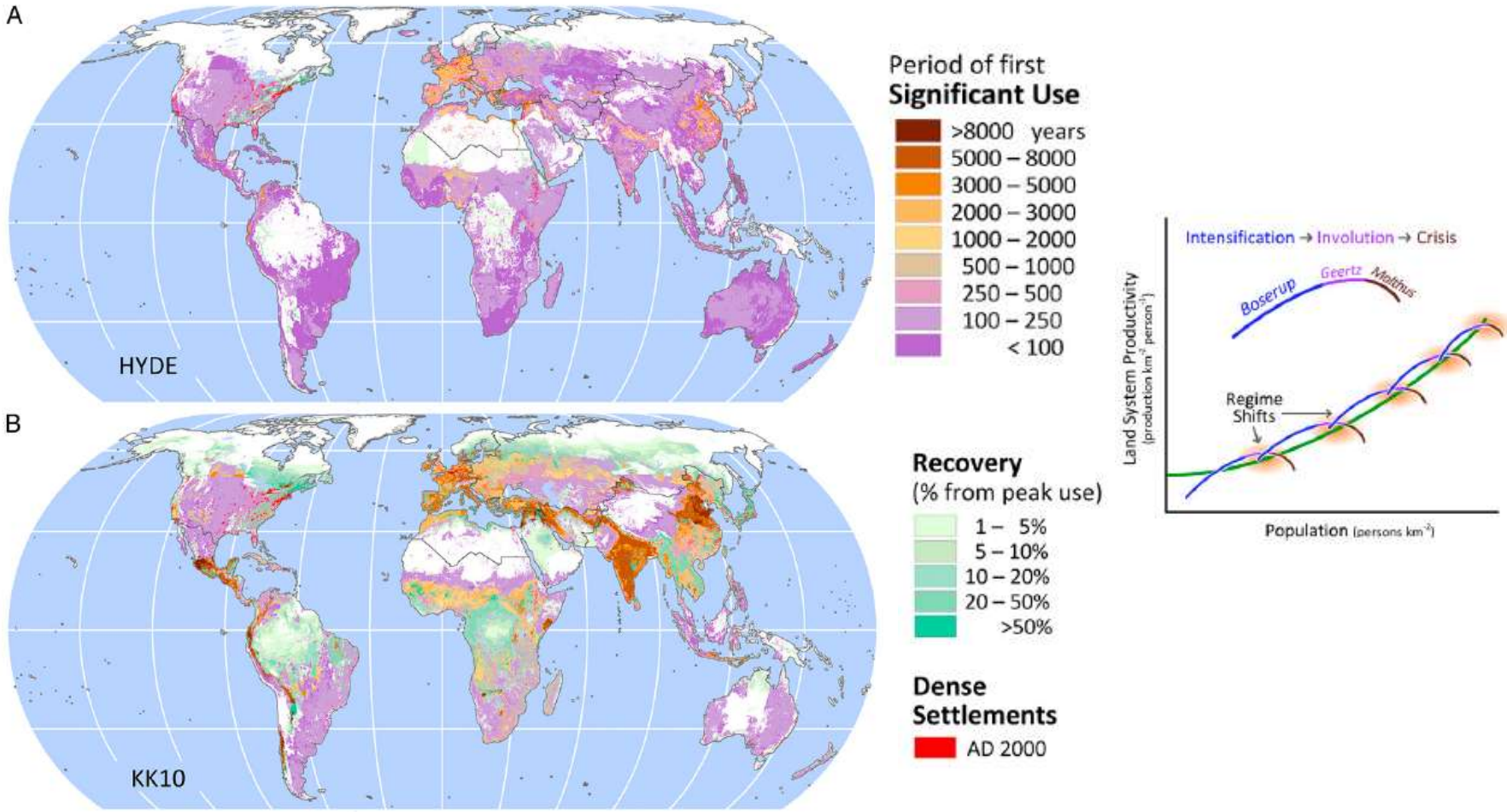


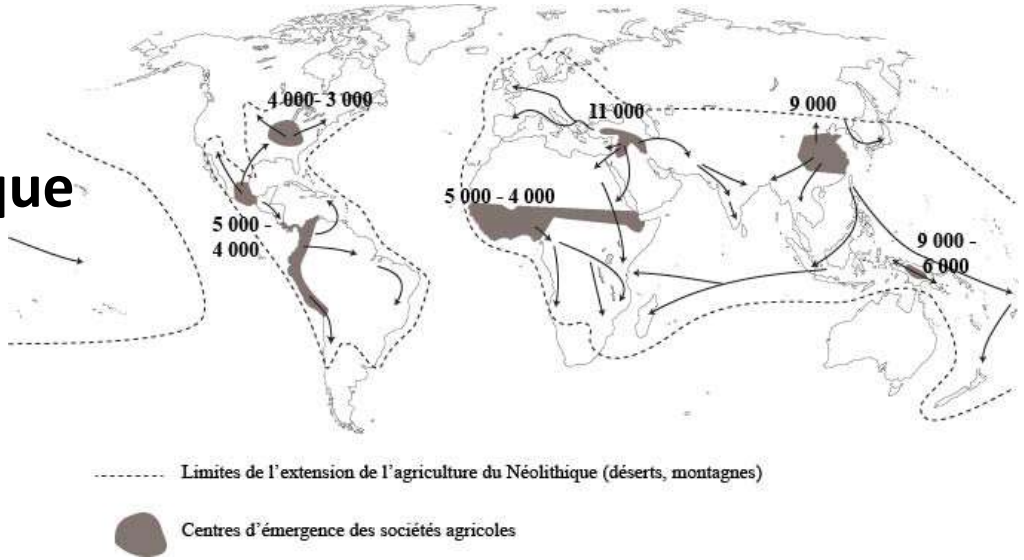
Figure 2 | Genetic diversity of ancient antibiotic resistance elements. **a**, **b**, Unrooted Bayesian phylogenies of translated β-lactamase (*bla*) (**a**) and tetracycline resistance (*tetM*) (**b**). Blue denotes predicted resistance enzymes,

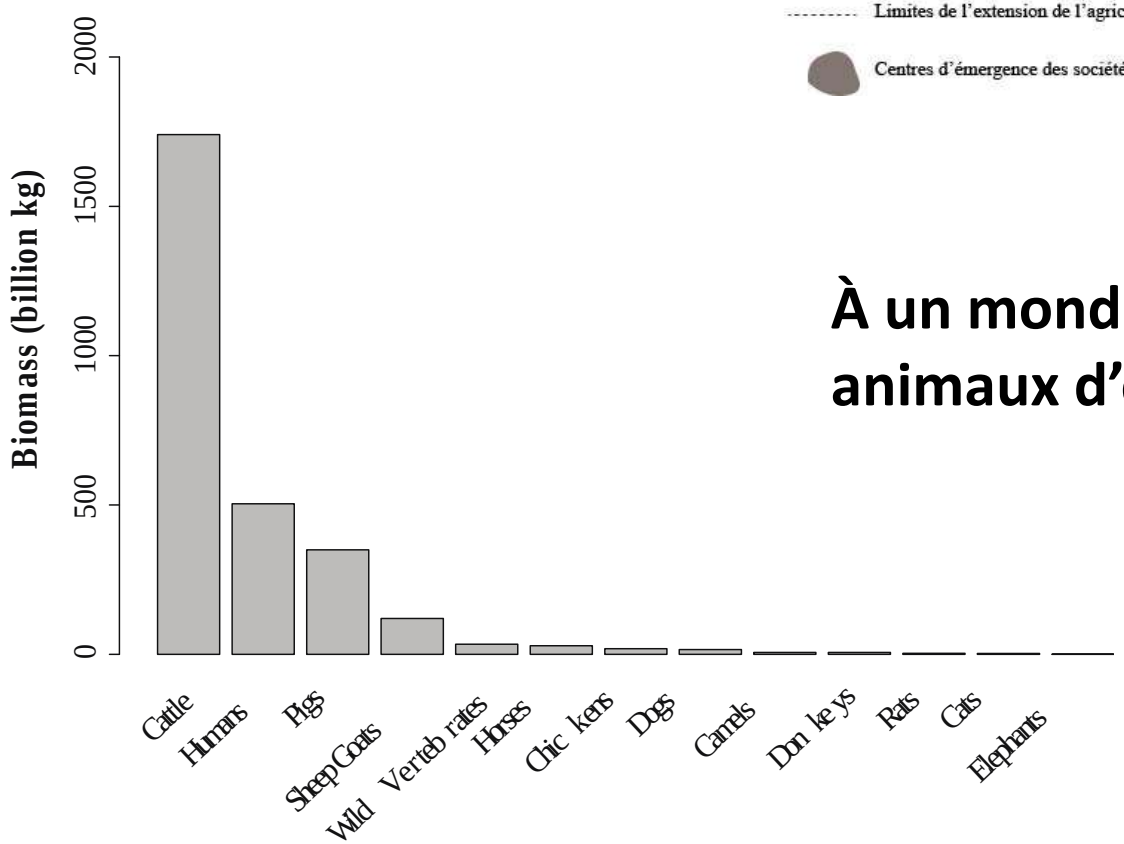
Used planet: A global history

Erle C. Ellis[a,1], Jed O. Kaplan[b], Dorian Q. Fuller[c], Steve Vavrus[d], Kees Klein Goldewijk[e], and Peter H. Verburg[f]



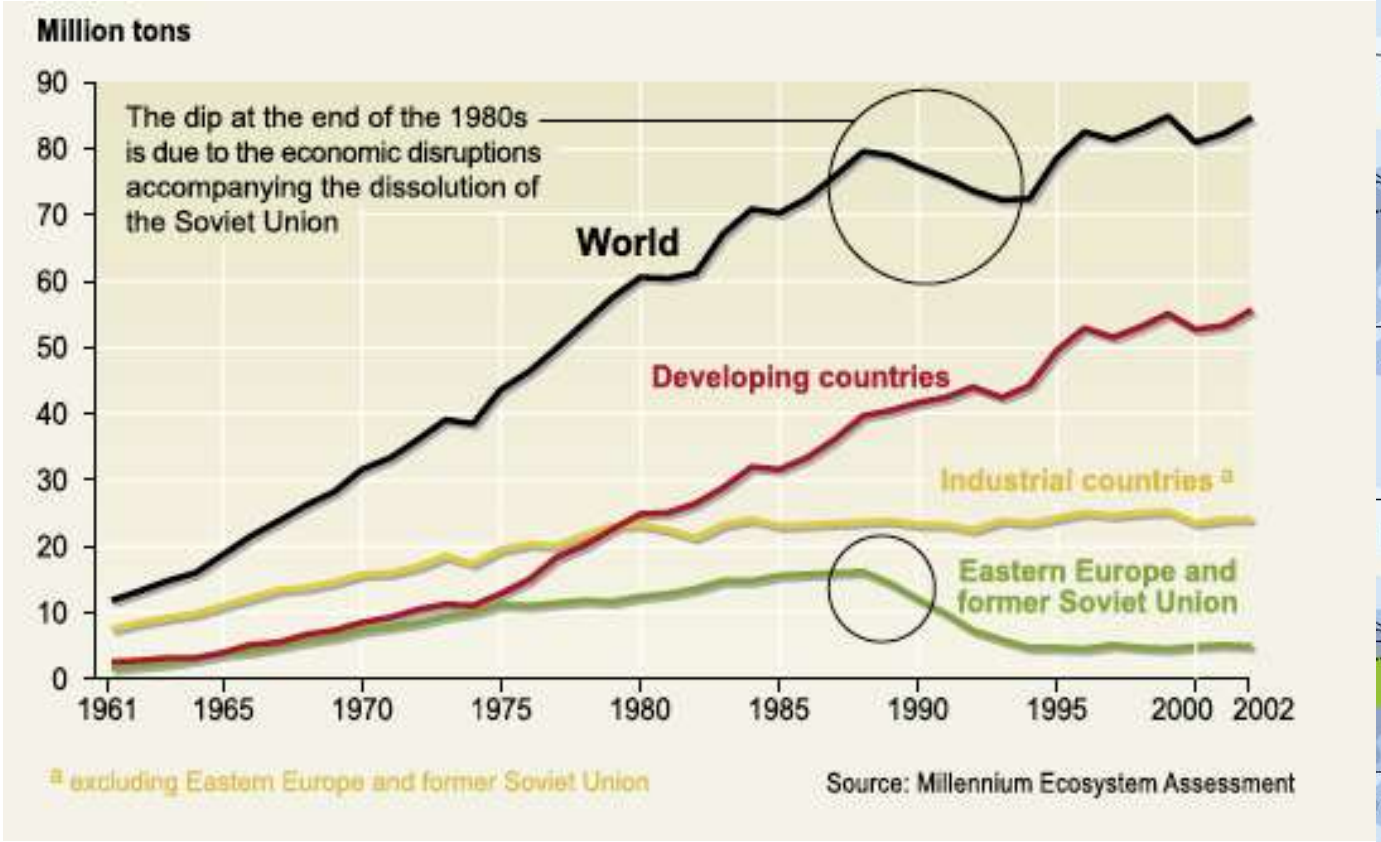
De la révolution néolithique ….

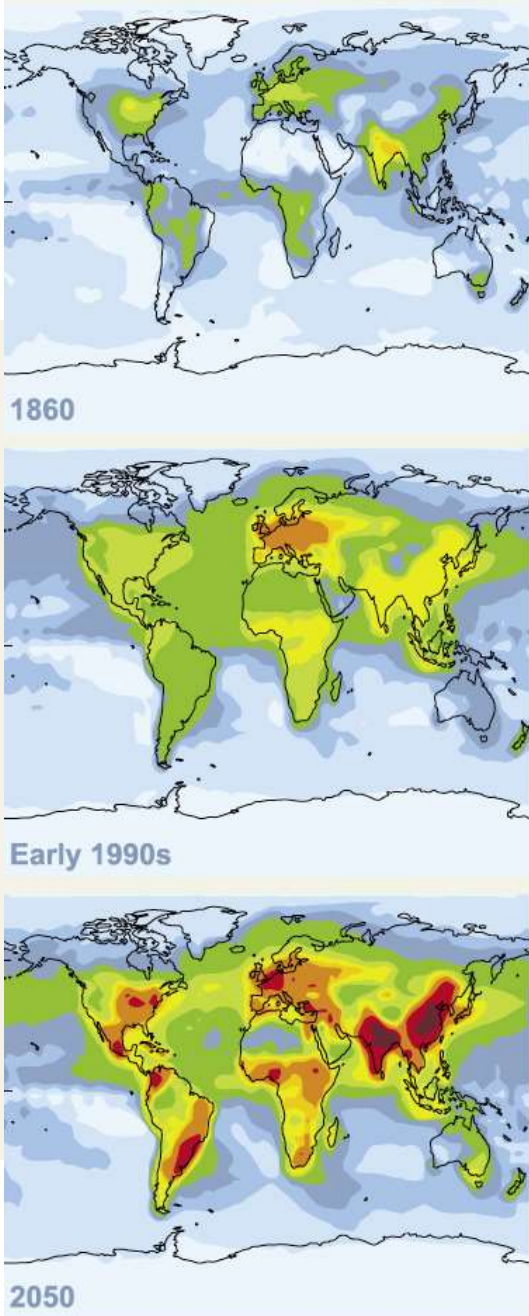




À un monde dominé par les animaux d'élevage

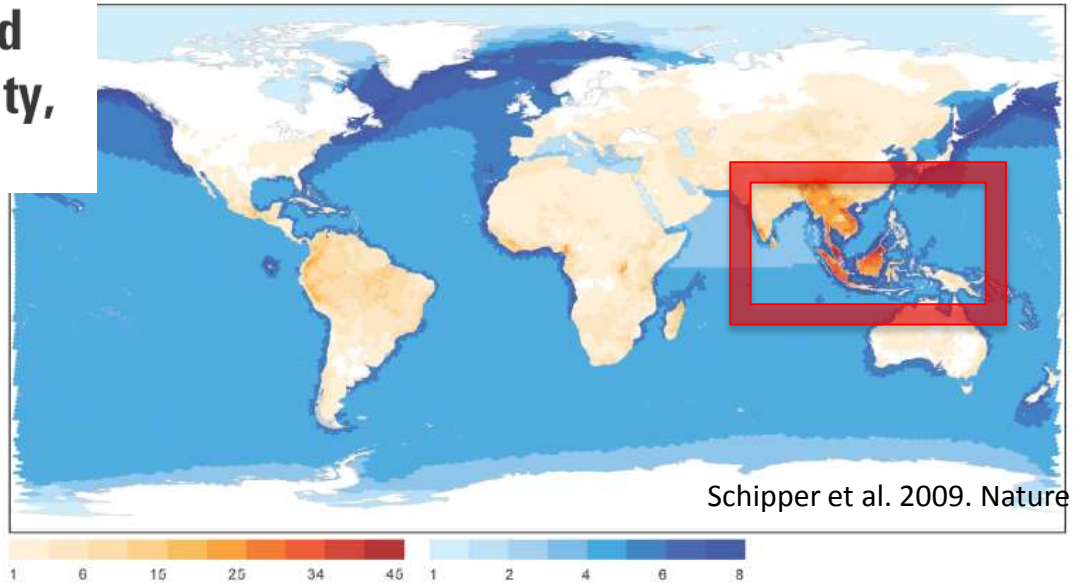
Trends in Global Use of Nitrogen Fertilizer, 1961–2001 (million tons) (S7 Fig 7.16)



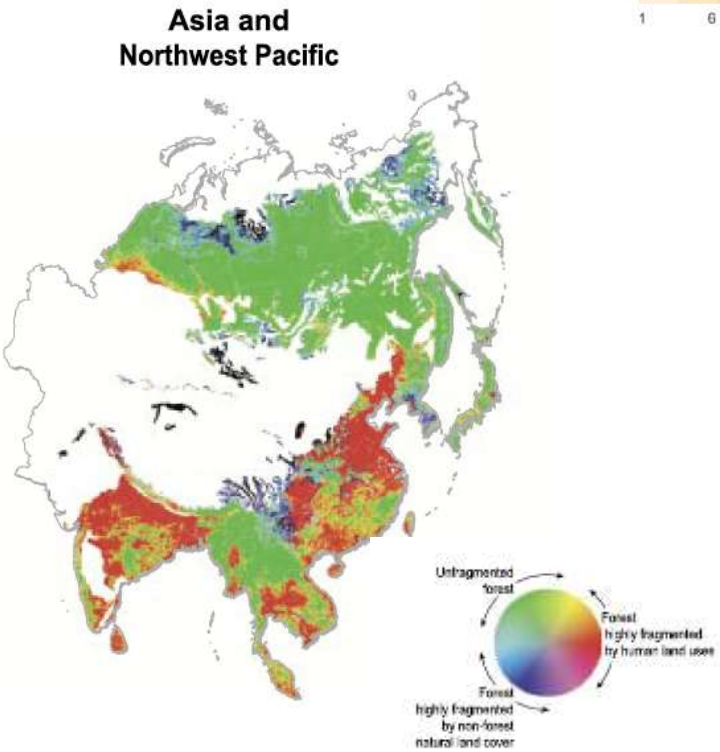


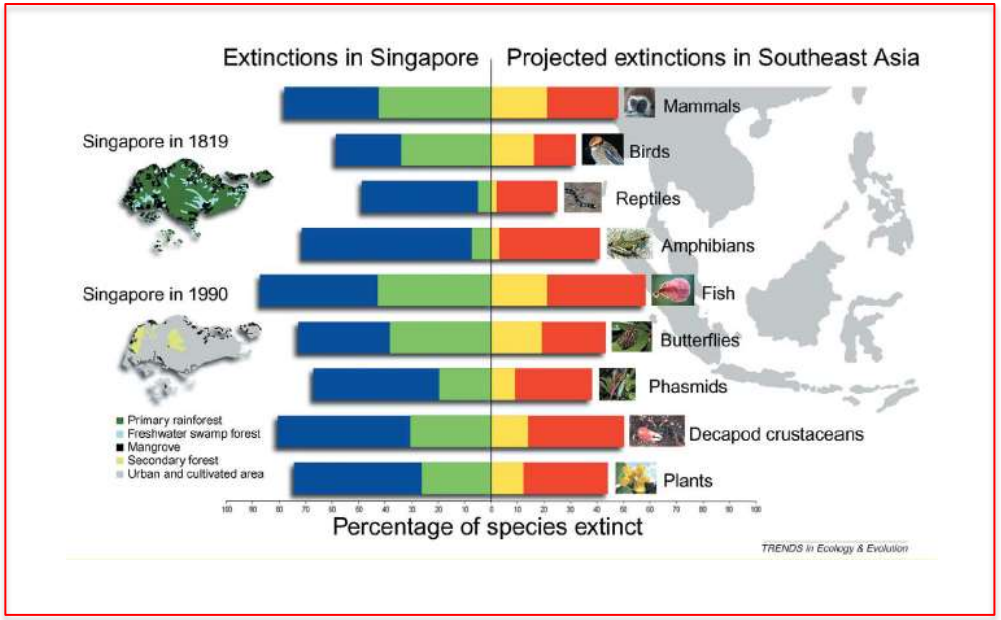
The Status of the World's Land and Marine Mammals: Diversity, Threat, and Knowledge

Species at threat



Schipper et al. 2009. Nature

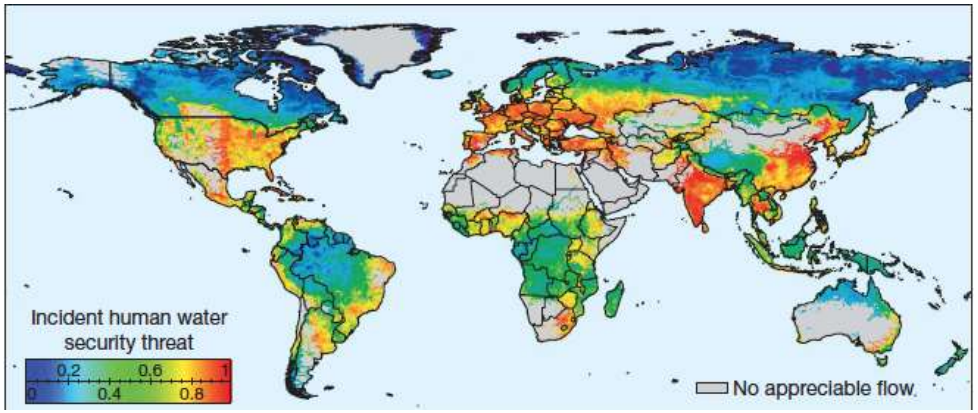


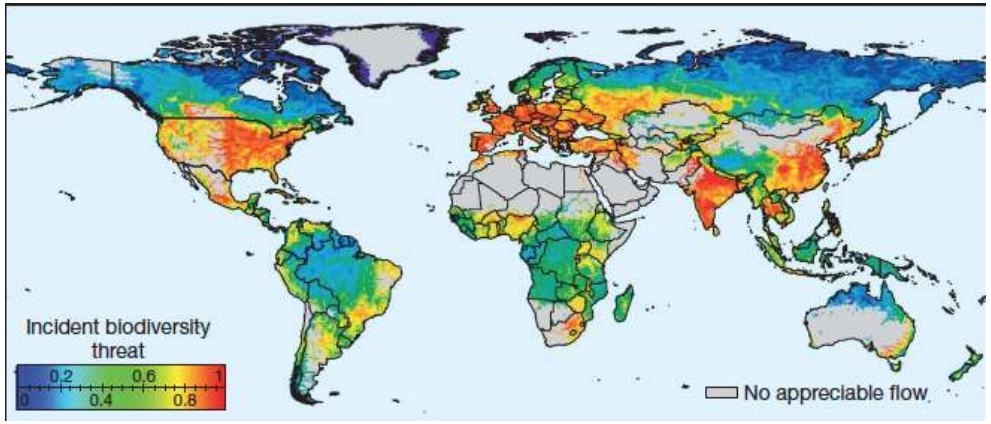


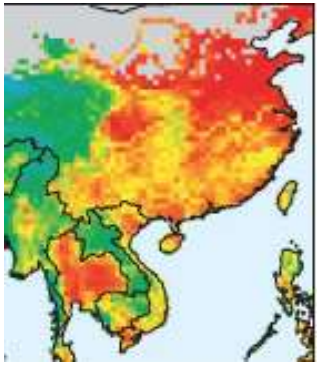
ESTIMATES OF FOREST FRAGMENTATION DUE TO ANTHROPOGENIC CAUSES

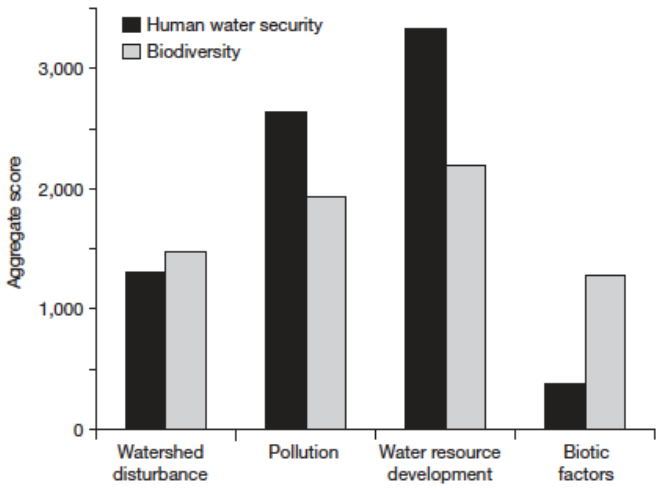
Global threats to human water security and river biodiversity

C. J. Vörösmarty[1]*, P. B. McIntyre[2]*†, M. O. Gessner[3], D. Dudgeon[4], A. Prusevich[5], P. Green[1], S. Glidden[5], S. E. Bunn[6], C. A. Sullivan[7], C. Reidy Liermann[8] & P. M. Davies[9]

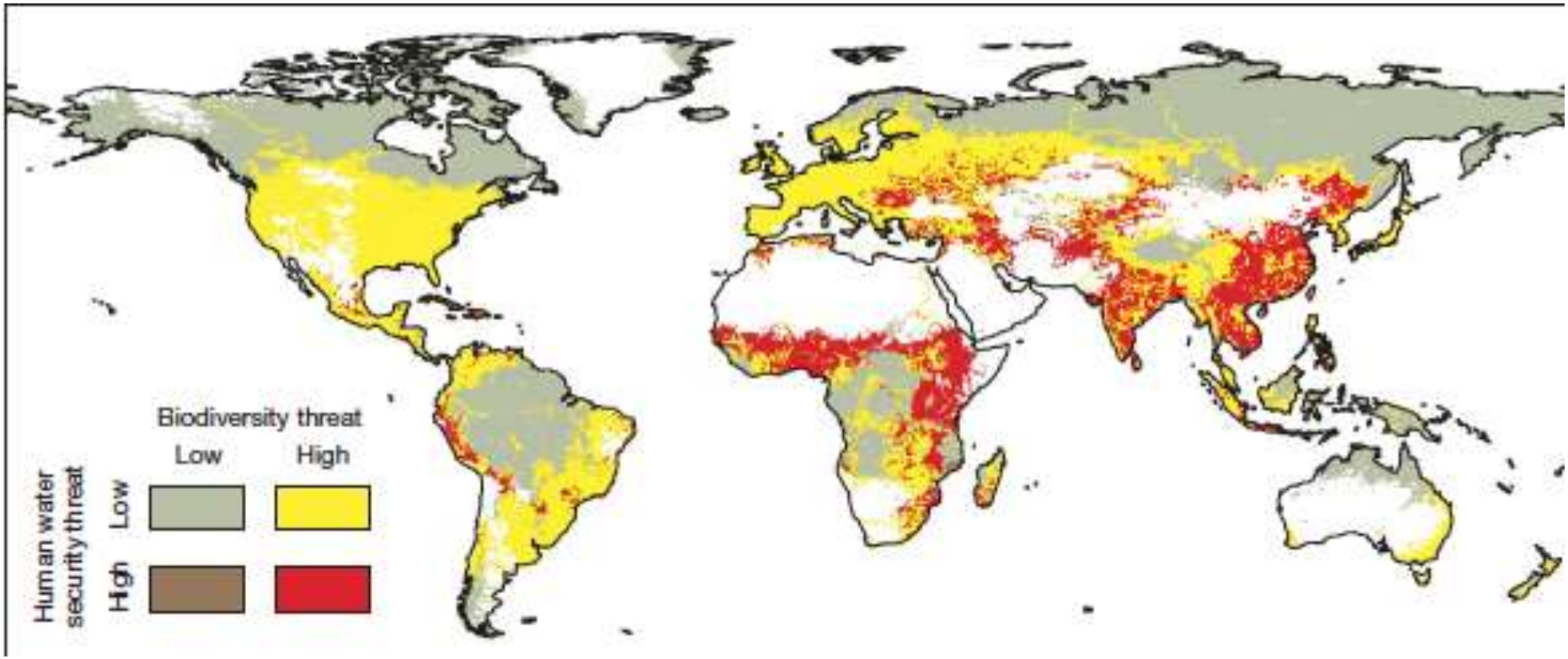








Prevailing patterns of threat to human water security and biodiversity.



The developing world shows tandem threats to human water security and biodiversity

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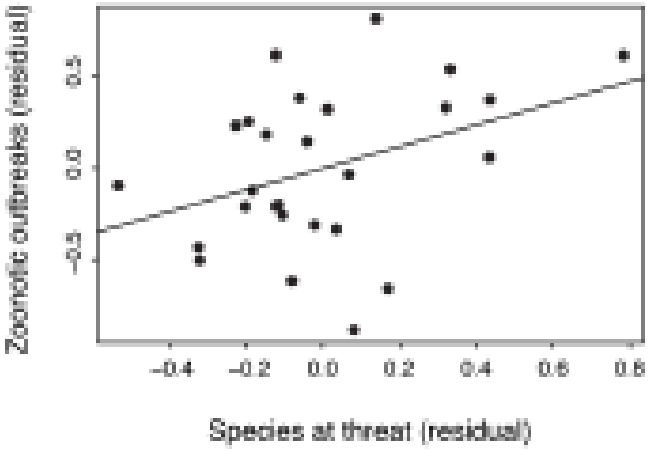
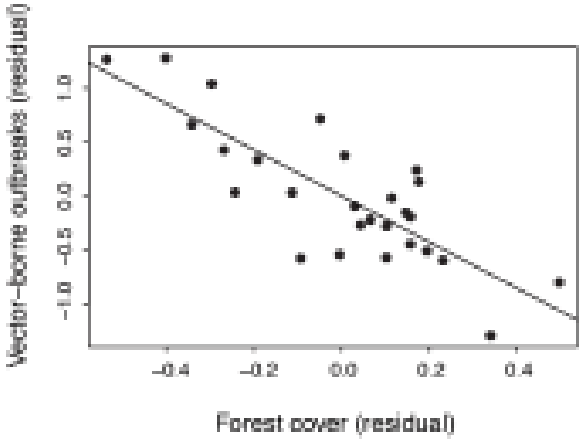
Infectious Diseases and Their Outbreaks in Asia-Pacific: Biodiversity and Its Regulation Loss Matter

Serge Morand[1,2,3]*, Sathaporn Jittapalapong[4,5], Yupin Suputtamongkol[6], Mohd Tajuddin Abdullah[7], Tan Boon Huan[8]

Zoonoses outbreaks and species at risks

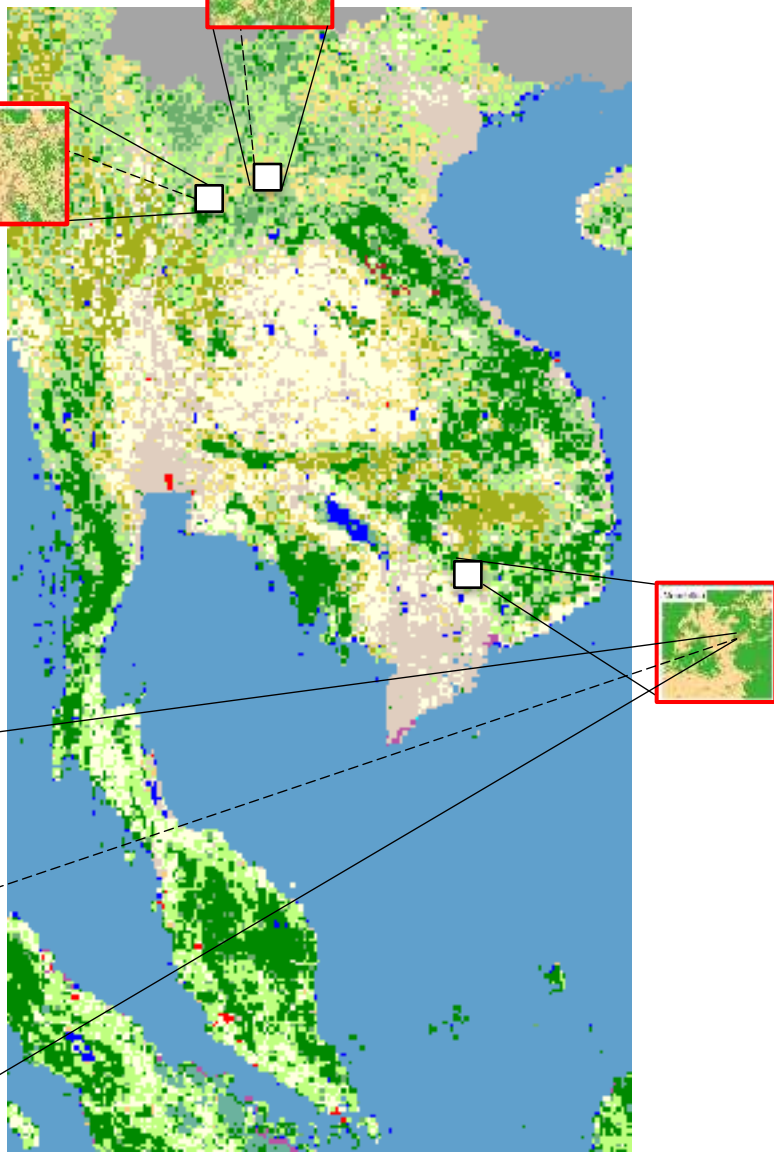


Vector-borne diseases Outbreaks and forest cover



Ban Huay Muang

Laksip

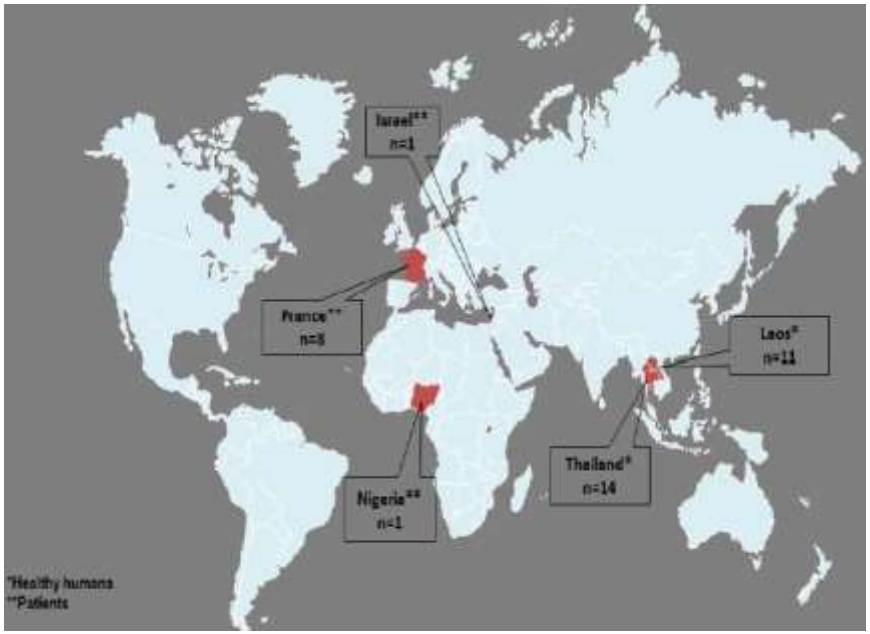


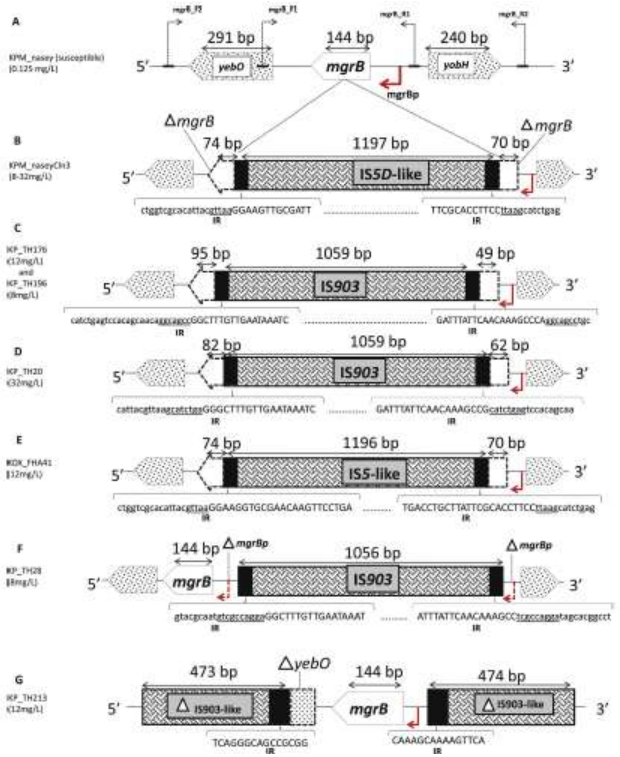
- Human diseases (stool investigation)
- Livestock
- Wildlife (rodent-borne diseases)
- Antimicrobial resistance

Social representation and knowledge

Worldwide emergence of colistin resistance in *Klebsiella pneumoniae* from healthy humans and patients in Lao PDR, Thailand, Israel, Nigeria and France owing to inactivation of the PhoP/PhoQ regulator *mgrB*: an epidemiological and molecular study

Abiola Olumuyiwa Olaitan[a,1], Seydina M. Diene[a,1], Marie Kempf[b], Meryem Berrazeg[a], Sofiane Bakour[a], Sushim Kumar Gupta[a], Boupha Thongmalayvong[c], Kongsap Akkhavong[c], Silaphet Somphavong[d], Phimpha Paboriboune[d], Kittipong Chaisiri[e], Chalit Komalamisra[e], Olawale Olufemi Adelowo[f], Obasola Ezekiel Fagade[f], Omowunmi Abosede Banjo[f], Adeyeye James Oke[g], Amos Adler[h], Marc Victor Assous[i], Serge Morand[j], Didier Raoult[a], Jean-Marc Rolain[a,*]

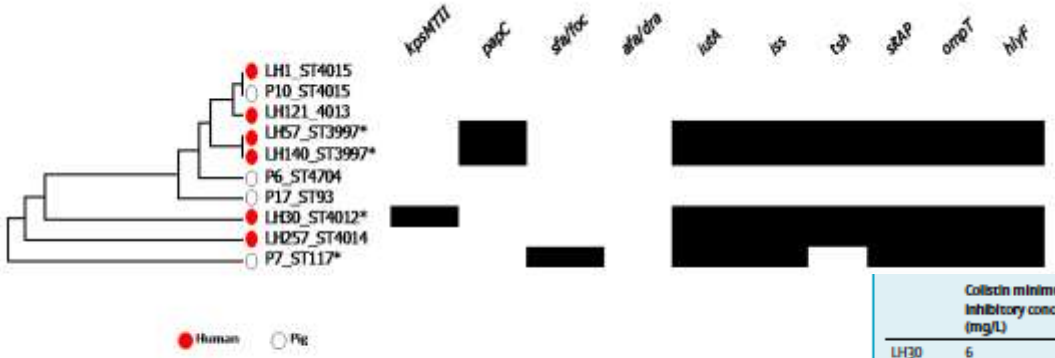




J Antimicrob Chemother
doi:10.1093/jac/dkv252

Clonal transmission of a colistin-resistant *Escherichia coli* from a domesticated pig to a human in Laos

Abiola Olumuyiwa Olaitan[1], Boupha Thongmalayvong[2], Kongsap Akkhavong[2], Silaphet Somphavong[3], Phimpha Paboriboune[3], Syseng Khounsy[4], Serge Morand[5] and Jean-Marc Rolain[1]*



Dissemination of the mcr-1 colistin resistance gene

Abiola Olumuyiwa Olaitan, Selma Chabou, Liliane Okdah, Serge Morand, *Jean-Marc Rolain

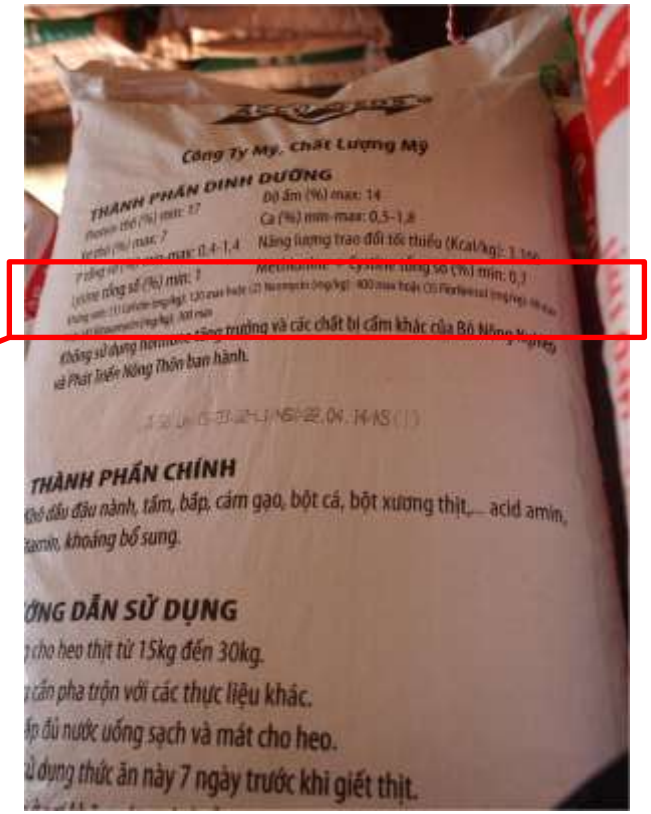
Lancet Infect Dis 2015

	Colistin minimum inhibitory concentration (mg/L)	Year	Source	Country	mcr-1
LH30	6	2012	Human	Laos	+
LH57	8	2012	Human	Laos	+
LH1	6	2012	Human	Laos	+
LH121	16	2012	Human	Laos	+
LH140	12	2012	Human	Laos	+
LH257	12	2012	Human	Laos	+
P10	6	2012	Pig	Laos	+
P6	6	2012	Pig	Laos	+
P17	4	2012	Pig	Laos	+
P7	4	2012	Pig	Laos	-
TH176	6	2012	Human	Thailand	-
TH214	6	2012	Human	Thailand	+
TH99	4	2012	Human	Thailand	+
FHM19*	12	2012	Human	France	-
FHA102†	12	2012	Human	France	-
FHA113‡	12	2012	Human	France	-
NH945	12	2012	Human	Nigeria	-
235	4	2015	Chicken	Algeria	+
249	3	2015	Chicken	Algeria	-

Mutations in PmrB sensor kinase of the two-component system: *Pro7_Gln12del (deletion of 6 aminoacids); †Ala159Val; ‡Thr156Lys; and §Ile91_Thr92insIle (insertion of isoleucine at position 92).

Table 1: Colistin-resistant *Escherichia coli* with the associated mcr-1 gene isolated from different sources

What's on the menu?



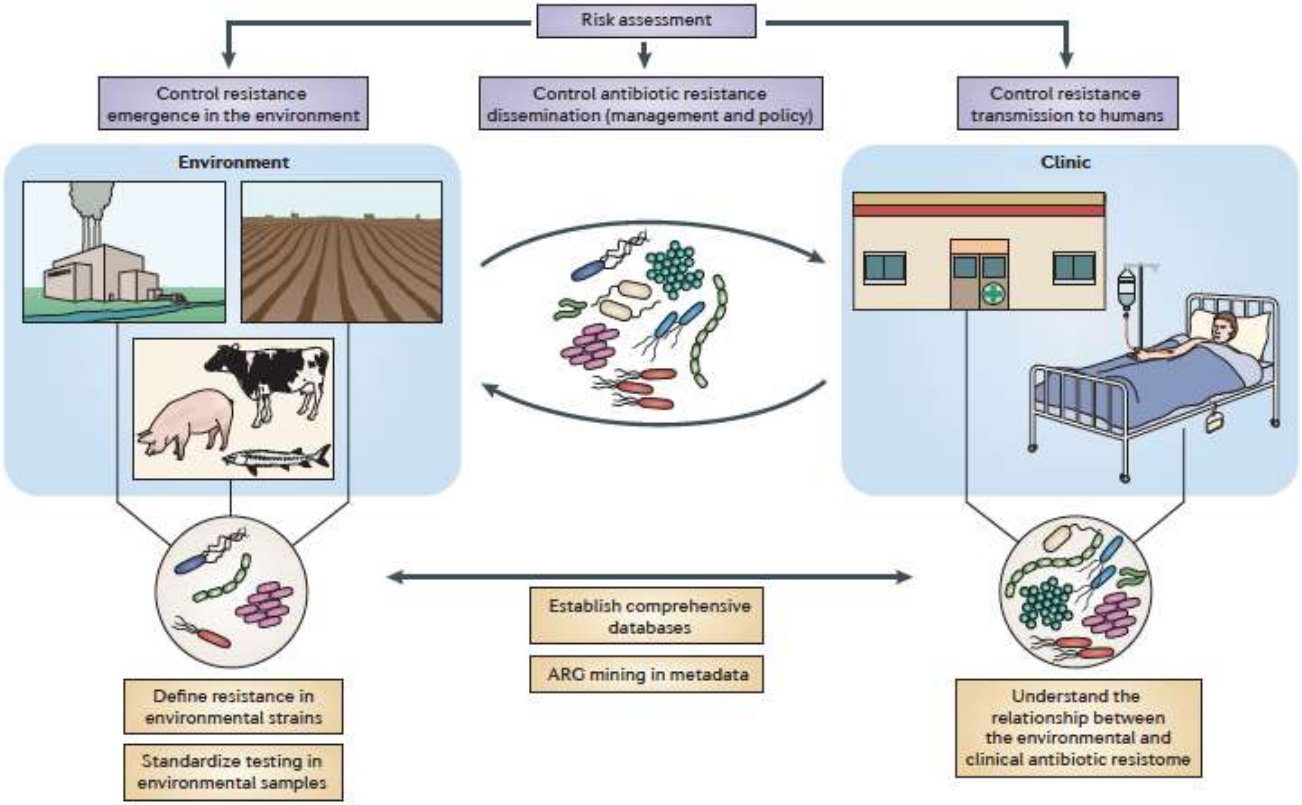
Colistin: 120 mg/Kg
Neomycin: 400 mg/Kg
Florfenicol: 60mg/Kg
Kitasamycin: 300 mg/Kg

In Vietnam, most commercial animal feed rations are medicated

(Juan Carrique-Mas, OUCRU Vietnam)

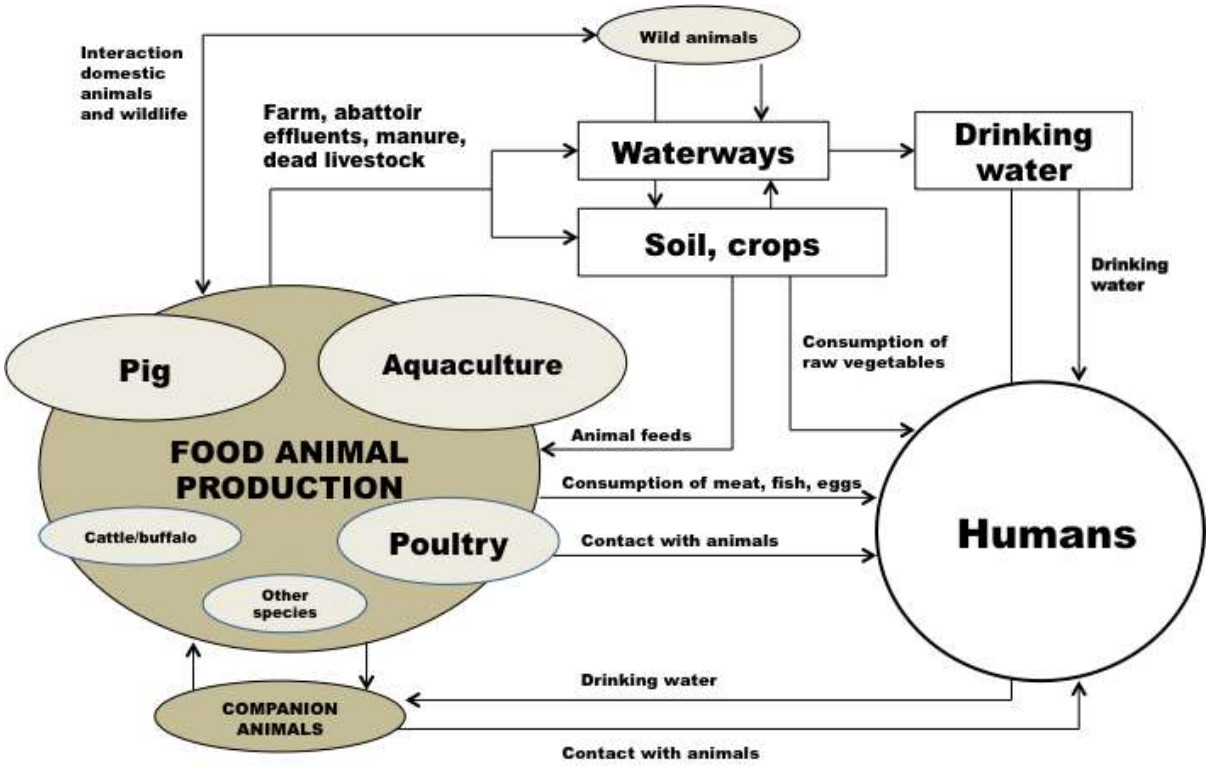
Tackling antibiotic resistance: the environmental framework

Thomas U. Berendonk, Célia M. Manaia, Christophe Merlin, Despo Fatta-Kassinos, Eddie Cytryn, Fiona Walsh, Helmut Bürgmann, Henning Sørum, Madelaine Norström, Marie-Noëlle Pons, Norbert Kreuzinger, Pentti Huovinen, Stefania Stefani, Thomas Schwartz, Veljo Kisand, Fernando Baquero and José Luis Martinez



Biodiversity and health: Lessons and recommendations from an interdisciplinary conference to advise Southeast Asian research, society and policy

Bruno Andreas Walther [a,*], Christophe Boëte [b], Aurélie Binot [c,d], Youlet By [e], Julien Cappelle [c,f], Juan Carrique-Mas [g,h], Monidarin Chou [i], Neil Furey [j], Sothea Kim [i], Claire Lajaunie [k], Sovan Lek [l], Philippe Méral [m,n], Malyne Neang [n], Boon-Huan Tan [o], Catherine Walton [p], Serge Morand [c,q,r]

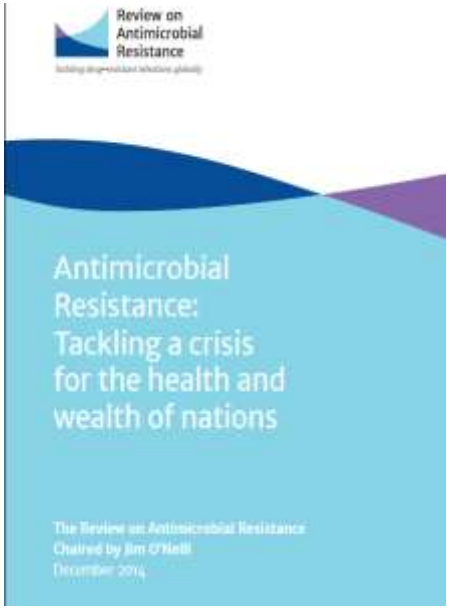


Surveillance
Intervention?

Infection, Genetics and Evolution 40 (2016) 29–46

Que faire ? ….


NATIONAL ACTION
PLAN FOR COMBATING
ANTIBIOTIC-RESISTANT
BACTERIA
MARCH 2015


Review on
Antimicrobial
Resistance
Antimicrobial
Resistance:
Tackling a crisis
for the health and
wealth of nations
The Review on Antimicrobial Resistance
Chaired by Jim O'Neill
December 2014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Pays
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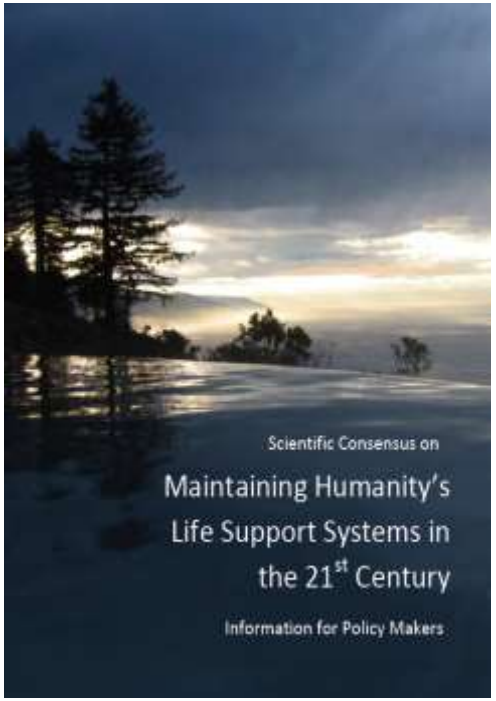
Accueil > Médias > Nouvelles
La FAO appelle à une action internationale face à la résistance aux antimicrobiens
Review of Evidence on
Antimicrobial Resistance and
Animal Agriculture in
Developing Countries
Delia Grace
June 2015

Que faire ? ….



Earth human/domesticated domination

Biodiversity

Decrease the fragility of socio-ecosystem
- **Increase Resilience**
- **Functional Redundancy**

Maintain Optionality

MAHIDOL UNIVERSITY *Wisdom of the Land*
Faculty of Tropical Medicine

SEA
Biodiversity and Health

2nd Symposium

11-13 July 2016, Bangkok

WHO – Global Health
FAO, OIE, IUCN, WWF …

1. Biodiversity and infectious diseases
2. Antimicrobial resistance
3. Pollutants and the trophic web
4. Ecosystem services, conservation and health
5. “One Health” and biodiversity
6. Laws and ethics for biodiversity and health

CNRS, CIRAD, IRD, Pasteur Institute, NU Singapore, CDC-USA, Duke University
Mahidol University, Kasetsart University, Chulalongkorn University, Mahidol University

Thank you!


CERoPath
Community Ecology of Rodents
and their Pathogens in South-East Asia
Effects of biodiversity changes
and implications on health ecology