Tackling AMR in Food Supply Chains: Insights from a Project on UK Supermarket Responsibilities, and Proposals for New Research

Professor Alex Hughes

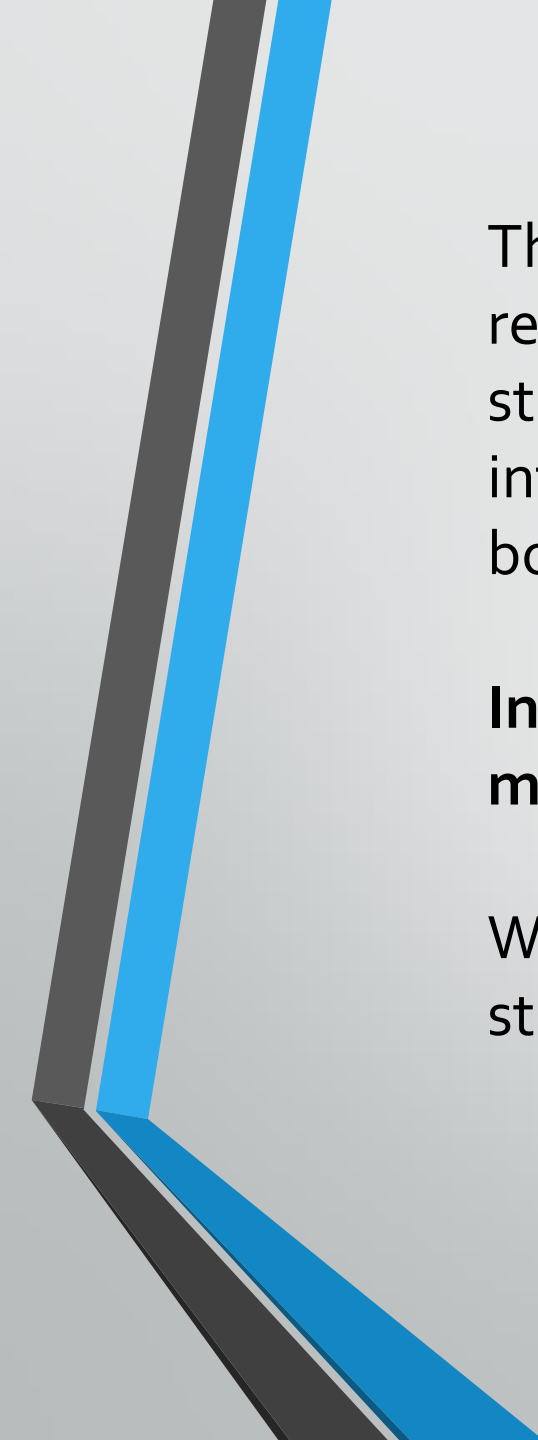**Dr Emma Roe, Dr Suzanne Hocknell, Professor Bill Keevil, Professor Neil Wrigley & Professor Michelle Lowe**

"AMR clearly involves biological processes, but the context which determines the operation of these biological mechanisms is shaped by social, cultural, political, and economic processes. **The most effective actions to reduce and control AMR will involve changes in social practices, including how farmers, vets, and regulatory systems manage livestock production for human consumption**; how regulatory and fiscal frameworks incentivise or deter antimicrobial development, production and use; and how public and healthcare professionals behave in relation to infection and use antimicrobials".

Anti-Microbial Resistance: Setting the Social Science Agenda
Report of an ESRC Working Group: July 2014: 1

Introduction

- **ESRC (with VMD) as part of a UK Research and Innovation (UKRI) Cross Council Initiative on 'Tackling Antimicrobial Resistance (AMR)'**

- **Aim of project to address responsibility of retailers in tackling the AMR challenge in the context of their chicken and pork supply chains**

- **Significant in light of the O'Neill (2016) report on *Tackling Drug-Resistant Infections Globally*, the *Government Response to the Review of Antimicrobial Resistance* in 2016 & recommendations regarding targets for reduction of antibiotic use and antimicrobial stewardship**

The O'Neill Report (2016: 29) called for "producers, retailers and regulators to agree standards for 'responsible use'. These standards could then be developed and implemented as an internationally recognised label, or used by existing certification bodies."

In UK: Top 5 supermarket chains hold just over 75% of grocery market share

Workshop at FSA on 25th November 2016, with NAMRIP, provided starting point

Project design (June 2017-June 2018)

- **Phase One**

  - a. Interviews with 9 of the UK top ten supermarkets (17 people working as agricultural managers, technical directors, microbiologists, product safety and quality assurance directors and managers, and corporate responsibility and sustainability management)

  - b. 4 interviews with nine people from 8 industry bodies, including those tasked with developing, communicating or monitoring AMR related policies in practice

  - c. Consultations with seven staff from 3 policy-making bodies.

- **Phase Two**

  - d. 13 interviews with farmers via the Farm Business Survey

  - e. 3 interviews with processors including representatives working across production, health and welfare, research and development, and technical

  - f. 2 telephone meetings with two of the trade bodies for manufacturers

  - g. 3 other meetings, including with representatives of a consultancy firm working across meat supply chains, and a campaigning organization

  - h. 5 conferences attended at which we met and interacted with people working on AMR across human and animal health, in industry, in policy and in academia

Responsible antimicrobial stewardship: the role of collaboration

Findings

- **Greatest strides made in reducing antibiotic use in domestically produced, fresh meat.** Meeting targets recommended by the O'Neill (2016) report, committed to by DEFRA and supported by the FSA, two years ahead of schedule without impacting on animal health, welfare or productivity is significant achievement. [Target of reducing antibiotic use in livestock and fish to 50 mg/kg]

- Central to the success of antimicrobial stewardship programmes in the poultry and pork sectors to date has been the treatment of AMR as a pre-competitive issue. **Collection & analysis of large datasets concerning on-farm antibiotic use & antimicrobial stewardship programmes have been managed effectively through food supply chain coordination, partnership and corporate responsibility, and via investment in training and infrastructure.**

Responsible antimicrobial stewardship: the role of collaboration

Recommendations

- Effective work has been conducted across food supply chains, including but not limited to RUMA, BPC, NPA, Red Tractor & AHDB, in rolling out platforms, guidance & training enabling data collection on antibiotic use. **Would be useful if the same platforms could be standardized to allow more research into any patterns that are emerging.**

- **Data collection on antibiotic use needs to be comprehensive, collaborative, standardized and shared, whilst remaining pre-competitive.** Companies should be able to use such data for their own benchmarking, and data can be anonymized and not made publicly available.

Complex risks of AMR in the food system & the challenges of consumer engagement

Findings:

- **Consumers have limited knowledge of AMR**

- **Consumers are also already overwhelmed by the volume of conflicting information** they are bombarded with around food and health.

Recommendations:

- AMR raises important questions about public health, local practices & global connectivity, animal welfare, and household budgeting. **At school level, AMR is potentially a productive lens to cut across disciplines such as geography and biology, but also food technology and citizenship classes in order to address public awareness through education.**
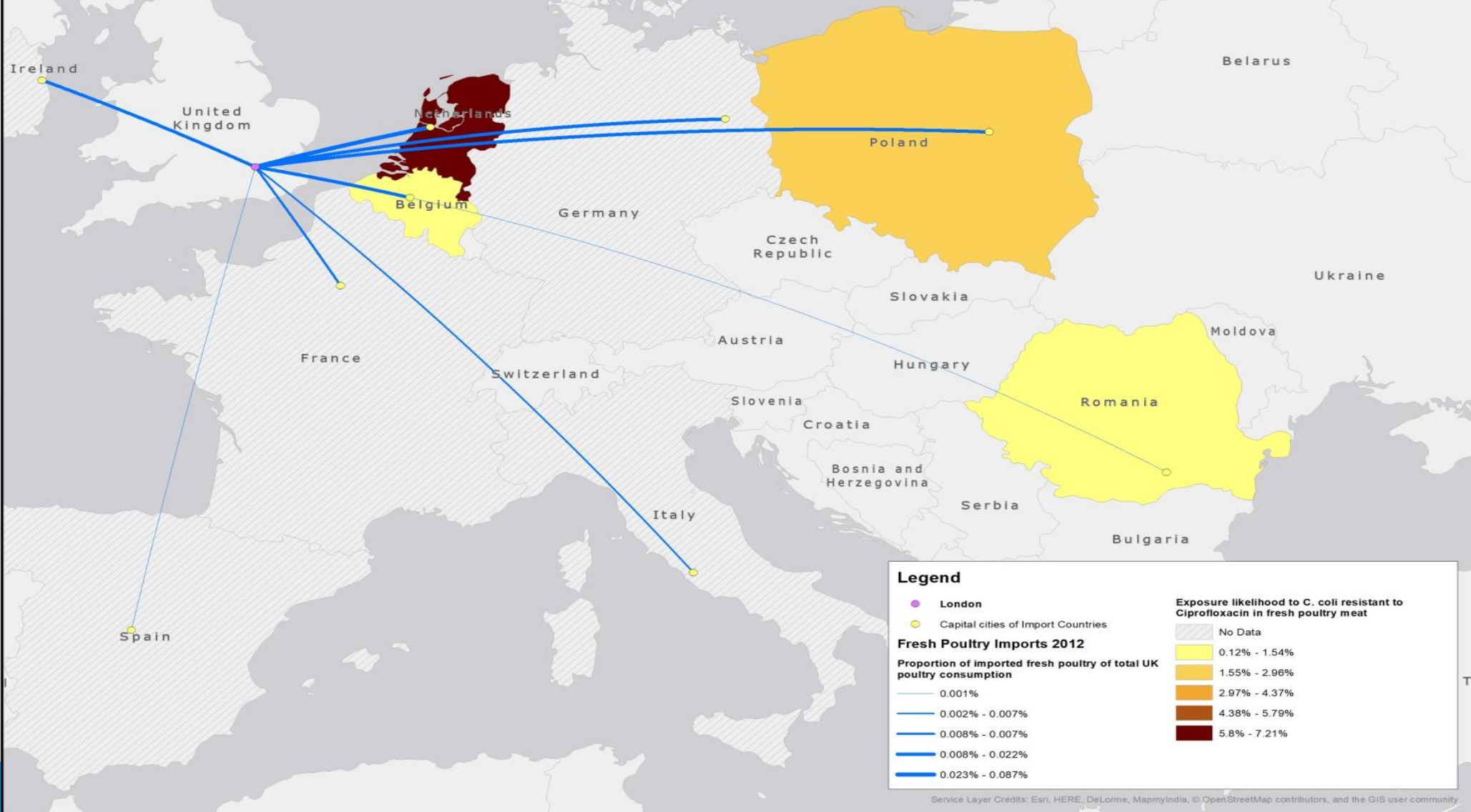
New horizons and the mapping and tackling of AMR risk in food systems
# Findings

- Whilst monitoring & recording of antibiotic use in domestically-sourced fresh meat products to address the challenge of AMR is becoming more rigorous, robust and transparent, **calculation by UK retailers and processors of AMR risk associated with imported and processed meat products is at a much earlier stage of development.**

- **Environmental reservoirs, human-food pathways through handling foodstuffs and food animals (alive/dead) barely featured in discussion with the retail sector.**

- Combining publicly available trade and AMR risk data, the project **demonstrates the potential use of maps in depicting AMR risk in international meat supply chains**. The maps illustrate what might be achievable if granular data were available to industry practitioners.

Likelihood of exposure to *C. coli* resistant to Ciprofloxacin in fresh poultry meat imported into the UK 2012

Legend

- 🟣 London
- 🟡 Capital cities of Import Countries

Fresh Poultry Imports 2012
Proportion of imported fresh poultry of total UK poultry consumption
- 0.001%
- 0.002% - 0.007%
- 0.008% - 0.007%
- 0.008% - 0.022%
- 0.023% - 0.087%

Exposure likelihood to C. coli resistant to Ciprofloxacin in fresh poultry meat
- No Data
- 0.12% - 1.54%
- 1.55% - 2.96%
- 2.97% - 4.37%
- 4.38% - 5.79%
- 5.8% - 7.21%

Service Layer Credits: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

Likelihood of exposure to *C. coli* resistant to Ciprofloxacin in processed poultry meat imported into the UK 2012

Legend

- London
- Capital cities of Import Countries

Processed Poultry Imports

Proportion of imported processed poultry of total UK poultry consumption
- 0.002% - 0.003%
- 0.004% - 0.006%
- 0.007% - 0.01%
- 0.011% - 0.016%
- 0.017% - 0.064%

Likelihood of exposure to *C. coli* resistant to Ciprofloxacin in processed poultry meat
- No Data
- 0.18% - 0.41%
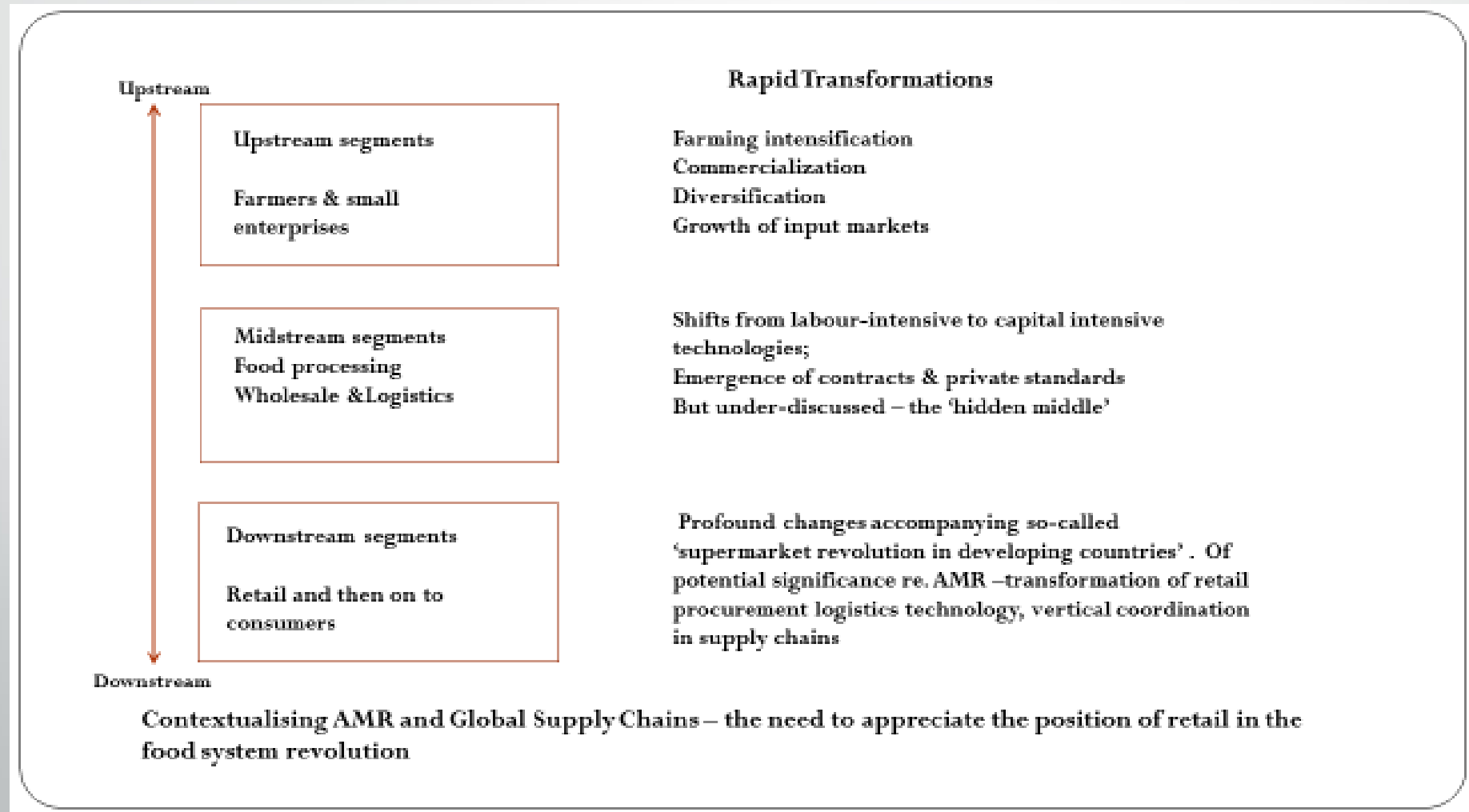- 0.42% - 0.64%
- 0.65% - 0.87%
- 0.88% - 1.1%
- 1.11% - 1.33%
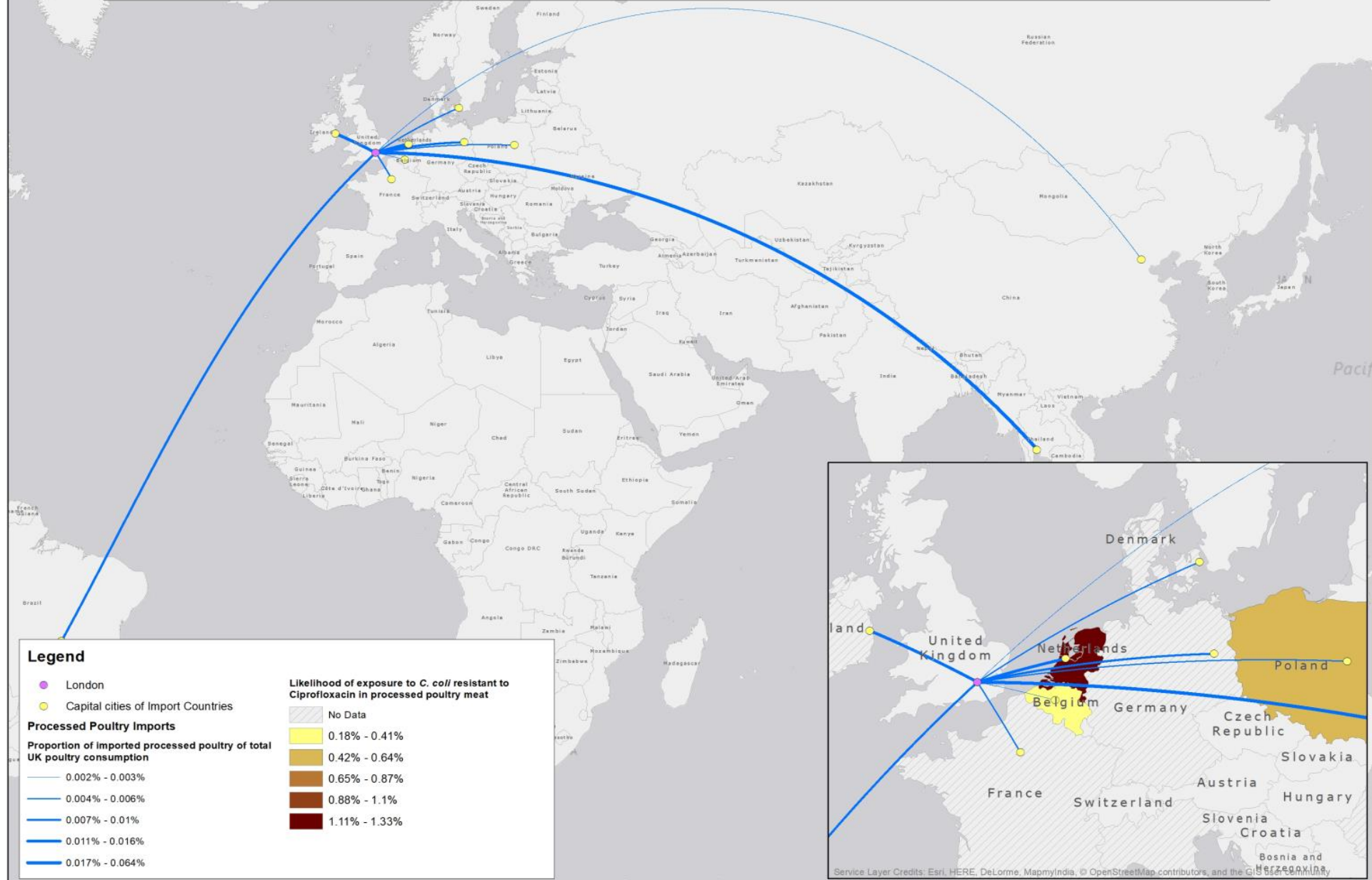
New horizons and the mapping and tackling of AMR risk in food systems
Recommendations

- **Mapping AMR risk is likely to become particularly important,** as the FSA highlights (Advisory Committee on the Microbiological Safety of Food, 2018), in the context of Brexit and should therefore be explored further.

- **Routes of AMR transmission beyond food itself represent important areas for future attention.** Pathogens resistant to antimicrobials, resistance genes and antimicrobial residues can travel and persist in soil, in water, and through direct contact with people including farmers, farm labourers, & abattoir workers. These routes require further research to inform evolving codes and standards for antimicrobial stewardship in food systems.

- **Important for Codex Alimentarius Guidelines for Integrated Monitoring and Surveillance of Foodborne Antimicrobial Resistance, into which the FSA is crucially feeding, to address environmental reservoirs and internationally-sourced processed, as well as fresh, foods**. These pathways are structured by the architectures of the global food system, coordinated in part by retailers and processors.

The challenge - addressing the flows of AMR in context of key transformations in food system, including not only upstream segments in a domestic context, where antimicrobial stewardship is currently focused, but also a wider set of AMR transmission vectors throughout food system, 'hidden middle' & accompanying environmental reservoirs.

Rapid Transformations

Upstream

Upstream segments

Farmers & small enterprises

Farming intensification
Commercialization
Diversification
Growth of input markets

Midstream segments
Food processing
Wholesale &Logistics

Shifts from labour-intensive to capital intensive technologies;
Emergence of contracts & private standards
But under-discussed – the 'hidden middle'

Downstream segments

Retail and then on to consumers

Profound changes accompanying so-called 'supermarket revolution in developing countries'. Of potential significance re. AMR –transformation of retail procurement logistics technology, vertical coordination in supply chains

Downstream

Contextualising AMR and Global Supply Chains – the need to appreciate the position of retail in the food system revolution

Recommendations

- Scientific research on AMR in food should be conducted in collaboration with social scientific study of the organizational geographies of food supply chains. These global supply chains cross borders of national and regional regulatory systems. For antimicrobial stewardship to be implemented effectively, it is vital to grasp how responsibility is, and can be, practiced in different geographical contexts and through border-crossing commercial realms.

Future Research

- International comparative study of national AMR strategies and policies relevant to the food system, and antimicrobial stewardship programmes

- International research on role of food manufacturers and retailers in tackling AMR

- International research on AMR transmission vectors throughout food system, 'hidden middle' & accompanying environmental reservoirs

- Research-informed influence on **Codex Alimentarius Guidelines for Integrated Monitoring and Surveillance of Foodborne Antimicrobial Resistance**

- International research on the histories and cultures of food production and consumption, which shape antimicrobial use and drivers of AMR