LinkTADs

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Final publishable summary report

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Executive summary

LinkTADs **(Linking Epidemiology and Laboratory Research on Transboundary Animal Diseases and Zoonoses in China and EU)** was a three-year initiative funded by the European Union's Seventh Framework Programme for Research and Technological Development (FP7) to coordinate European and Chinese research on animal disease prevention and control. The fight against animal diseases relies heavily on the research community developing new intervention/control tools and strategies. These could be in the form of new vaccines and diagnostics, or through a better knowledge and understanding of the diseases to prevent their emergence and spread, and improve approaches to surveillance, prevention and control. International collaboration between animal health researchers can speed up relevant advances by bringing together new ideas, technologies, funds, and expertise to solve livestock health challenges, thus optimizing the use of research resources. Therefore, international research coordination **plays a key role in the prevention, control, and eradication of animal diseases**.

LinkTADs aimed to coordinate research on two of the most important components of the disease prevention control cycle, epidemiology and laboratory diagnostics, between partners in the European Union (EU) and China. It is paramount that these two disciplines are linked and their work coordinated. LinkTADs allowed for the **improvement of scientific excellence in the field of animal health and the control of animal diseases** through the broad networking of scientific institutions. The coordination activities created a wide-ranging network within the relevant scientific communities and stakeholders, and the systematic establishment of linkages between on-going (and future) animal health research, training programmes, and innovation projects in the veterinary fields of the EU and China. Both sides were able to exchange knowledge and establish collaboration in order to more effectively control animal diseases, including those transmitted to humans (i.e. zoonoses).

The major results can be summarised as follows:

- Report **on agreed areas in animal health, food safety and security** requiring policy discussion and possible harmonisation between the EU and China.
- A **better understanding of the epidemiology and laboratory** research achieved through closer collaboration between research institutions. As a result, in the context of twinned European/Chinese research projects, **knowledge gaps** in the epidemiology/ecology of priority TADS and emerging infectious diseases (EIDs) were identified and filled. Recommendations for the design of **risk-based surveillance** programmes for endemic, emerging and exotic diseases in domestic and wild animal species were developed. **Joint Research Laboratories** were established to enhance the control, improve the diagnostic capabilities, and increase the knowledge of infectious animal diseases by heightening joint research activities between China and EU.
- Report on the **main findings and recommendations on the identification of research topics on animal infectious diseases (including zoonoses) of common interest** for China and the EU, while also suggesting specific practical areas for cooperation on animal infectious diseases between EU and China, and supporting **the official policy dialogues on animal diseases and food security** between the EU and China.
- Joint project applications and joint peer-reviewed scientific publications of LinkTADs partners.
- The **LinkTADs online** platform serves **as an information portal on EU-China cooperation in the field of animal health beyond the project completion**.
- Several **capacity building activities** have been implemented (short-term visits, exchange programmes and trainings) targeting both young and experienced researchers, **strengthening the collaboration between Chinese and European epidemiologists** in the long term, and enabling the sustainability of the LinkTADs project beyond its completion.
- Through an in-depth analysis of patenting activities, global trends in animal health research, relevant EU and Chinese programmes, and publishing activities, **possible synergies were detected and respective recommendations developed**.
- A **broad dissemination campaign** was carried out in Europe and China contributing to the wider project impact and closer EU-China cooperation in the field of animal health.

Summary description of project context and objectives

Launched in November 2013, LinkTADs (www.linktads.com) was a €1 million and three-year initiative funded by the European Union's (EU's) Seventh Framework Programme (FP7). It coordinated European and Chinese research on animal disease prevention and control. With five European and five Chinese partners, LinkTADs engaged major scientific players in the field of animal health. He projected was coordinated by FAO.

China's exponential economic growth over the last decade, coupled with its rising population and progressive urbanization, has led to a sharp increase in the demand and consumption of animal products. To meet such a growing demand of animal protein, livestock production has changed considerably (e.g. intensive farming), international trade of animals and animal products has grown dramatically, and agricultural areas have expanded at the expense of wild habitats. Today China is the world's largest livestock producer and consumer.

These economic, social and demographic shifts increase the potential for new pathogens to emerge, grow and spread on a global scale, sometimes affecting human health as well. The resulting diseases can spread over long distances and have an enormous impact on trade. Therefore, the effective prevention, control and eradication of these infectious transboundary animal diseases (TADs) is crucial for safeguarding and securing national and international food supplies, local livelihoods and human health.

LINKTADS AIMED TO:

- coordinate research across borders;
- aid in finding common research goals;
- guide partners along the process; and
- create sustainable and simple mechanisms to preserve collaborations in the future.

To contribute to today's livestock health challenges, LinkTADs aimed at coordinating the development and improvement of new epidemiology and laboratory tools by linking researchers in China and Europe. It facilitated research collaboration between the two regions and eased barriers related to regulations, policies, politics and language.

Focusing on epidemiology and laboratory diagnostics, the broad objectives of the initiative were:

(i) to identify priority areas for joint action;
(ii) to link European and Chinese animal health research, training programmes and innovation projects;
(iii) to ensure a wide-ranging network of scientific communities and stakeholders;
(iv) to provide a long-term vision and achieve coordinated planning regarding future common research;
(v) to contribute to the international policies related to EU animal health and trade;
(vi) to support young researchers through exchange programmes and training; and
(vii) to share the results and methodologies within and outside the consortium.

A 36-month work plan was designed based on eight closely interrelated work packages:

- **WP1 -** Management and coordination set up the basis for the project (e.g. gender strategy, advisory board, consortium agreement, etc) and ensured the smoothly day-to-day coordination of activities and the cooperation among partners over the project lifetime.

- **WP2 -** Analysis of animal health and food security research laid the technical foundations of the project, by identifying the research areas where joint actions were needed and where the future activities of the project were best focussed. WP3 and WP4 built on its conclusions.
- **WP3 -** Animal Health Science (Epidemiology) focussed on veterinary epidemiology, exchanging knowledge and fostering cooperation in priority areas/diseases.
- **WP4 -** Animal Health Science (Laboratories), similar to WP3, WP4 focussed on diagnostic technologies for early and rapid detection of animal pathogens.
- **WP5 -** Supporting policy dialogue provided the framework (which was fed by evidence from other WPs, especially WP3 and WP4) and supported international policy dialogue.
- **WP6** - Platform development provided all relevant information about the project, EU-China cooperation, as well as ongoing, past and future activities, while also generating the online community building exchange of experiences.
- **WP7 -** Exchanges and capacity building facilitated short-term exchanges and training programmes between European and Chinese research organisations to raise the awareness of cooperation opportunities and ultimately enhance existing collaborations and encourage new partnerships.
- **WP8 -** Dissemination and sustainability ran in parallel with the other WPs over the project's lifetime and focussed on maximising the project's visibility.

The fight against animal diseases relies heavily on the research community developing new tools and strategies. These could be in the shape of new vaccines and diagnostics, or through the use of epidemiology to better understand disease spread and improve approaches to surveillance, prevention and control.

International collaboration between animal health researchers can greatly speed up these advances by bringing together new ideas, technologies, funds and expertise to solve livestock health challenges, thus optimizing the use of research resources. However, there are also many barriers that challenge joint projects, including regulations, policies, politics and languages.

Within the development and exchange of scientific knowledge in **epidemiology**, for more effective prevention and control of diseases, the **specific areas to focus** were:

a. Recommendations for the design of risk-based surveillance programmes for endemic, emerging and exotic diseases in domestic and wild animal species (and the links to policy and control strategies such as compartmentalisation); This includes the updating, standardisation and use of epidemiological tools for disease surveillance based on novel, scientifically sound methodologies for risk analysis and disease modelling, and the application of advanced software solutions*. Relevant activities were conducted within WP3 in close collaboration with WP4 and WP7.*

b. Suggestions for the update of existing or development of new cost-effective, targeted control strategies that offer effective solutions for each priority disease in China. These should be harmonised towards existing internationally accepted standards, sufficiently flexible to enable smooth implementation at the local level. *Relevant recommendations on harmonization were developed within WP2.*

c. Identify and fill knowledge gaps in the epidemiology/ecology of priority TADS and emerging infectious diseases (EIDs), in the context of twinned European/Chinese research projects. *This was achieved within WP3.*

Regarding the development and implementation of **cutting-edge diagnostic technologies** for early and rapid detection of animal pathogens, including those with zoonotic impact, the **following activities were targeted**:

a. Review of existing activities in development and implementation of conventional diagnostic tools, as well as activities related to the development and implementation of novel diagnostic technologies. The aim of the activity would be the definition of common areas of research. *The common research areas were defined in WP7 reports, in close collaboration with WP2, WP3 and WP4.*

b. Determination of the necessary scope of research to enable effective response to diagnostic demands, based on current and future expected trends in the patterns of the major animal diseases, existing or threatening EU and China. *Activities within WP3, WP4 and WP5 contributed to the scope definition and further recommendations for effective responses.*
c. Define methods on how to develop adaptive mechanisms allowing for on-demand targeted research (top-to-bottom and bottom-to-top). This component is important as the epidemiology of the diseases, due to the global trends mentioned above, is rapidly changing and demands development of tailored (but scientifically sound) responses. This activity would be of great benefit for the animal health services in China and the EU, and it may result in long-term collaboration in the area of quick-responsive targeted research. *This was achieved through close cooperation within WP3 and WP7.*

As a result of LinkTADs, the wide co-ordination of research activities between the two regions **has increased EU-China collaboration** in line with the EU-China Science and Technology (S&T) co-operation agreement. The project **ensured a wide-range of networking** for the relevant scientific communities and stakeholders (through workshops in WP3 and WP4, policy meetings in WP5, webinars in WP8, exchanges and joint laboratories in WP7). LinkTADs allowed for **systematic establishment of linkages between on-going animal health research, training programmes and innovation projects** in the veterinary field from the EU and China, stressing the coordination between epidemiology and laboratory. Additionally, the project **improved training opportunities for EU and Chinese researchers.** Wide dissemination of project activities through social media channels, project platform, and dissemination events (WP8) ensured visibility of project outcomes. Established partnerships, joint project applications (WP4), as well as existing project tools and cooperation mechanisms (funding database (WP6) and Focal Point Network (WP8)) laid the groundwork for LinkTADs' sustainability.

Main Science and Technology results

LinkTADs activities yielded significant results in terms of EU-China cooperation in the field of animal health, namely in the areas of epidemiology and laboratory research. Additionally, important LinkTADs outcomes relate to policy implications. Wide dissemination of project results contributed to reaching project objectives and enhancing project impact.

Overall project results can be summarized as follows:

- LinkTADs has achieved all the goals originally set in terms of the organisation of meetings, webinars, exchanges, and other networking opportunities. This has resulted in the building the relationships between LinkTADs partners, most of whom did not know each other at the beginning of the project. The wide variety of topics of the workshops was chosen in alignment with the priorities and gaps identified at the beginning of the project. Spanning epidemiology, laboratory and policy aspects, internationally renowned experts were invited to present and participate along with LinkTADs partners. This provided excellent opportunities to learn more about the research being conducted at different institutions, to identify common interests, and to start exploring face-to-face potential pathways and topics of collaborations. In total **11 technical workshops were organized**.
- LinkTADs envisaged funds for its partners to visit each other's laboratories and facilities, learn in depth about the activities and research lines, meet all researchers at the recipient institution (not just those directly involved in LinkTADs) and discuss the best way to collaborate in future. As a result, **6 short academic visits and 3 exchange programs were organized**.
- A series of webinars were organized covering mostly specific diseases or policy aspects. This modern tool was seen as a useful way to deliver talks by experts allowing a wide participation of stakeholders in the EU/China. **7 webinars were broadcast** throughout the course of the project.
- The training component of LinkTADs was closely aligned with the China Field Epidemiology Training Program for Veterinarians (China FETPV), an interdisciplinary (One Health) approach that has been highly successful in building up field epidemiology capacity in a highly interactive and sustainable way. In addition, LinkTADs partners were sponsored to participate in specific sessions at the InterRisk Master, and a one-month on-line course on foot-and-mouth diseases was exclusively delivered by the European Commission for the control of Foot-and-Mouth Disease (EuFMD) to 40 Chinese veterinarians in different institutions. As a result, **5 trainings were delivered**.
- During its lifetime, **LinkTADs has actively interacted with seven other EU-funded consortia**: STAR-IDAZ, ASFORCE, RISKSUR, EFFORT, RAPIDIA, DRAGON-STAR and COMPARE. Such collaborations have been mostly through the joint organisation of events, as well as inviting experts from the other consortia to attend LinkTADs workshops.

Scientific and technical results of LinkTADs activities relate to the areas of research analysis, epidemiology, laboratory, policy and EU-China cooperation, exchange, capacity building and training, and innovative solutions.

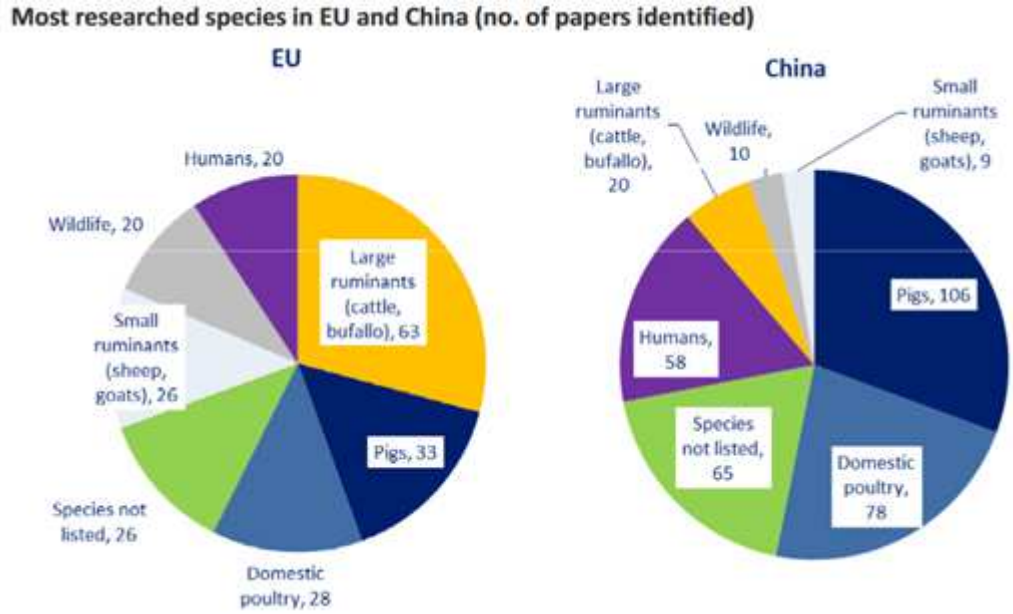
Research analysis

WP2: In order to plan LinkTADs activities accordingly as well as contribute to future cooperation between European and Chinese institutions in the field of animal health, at the start of the project the gaps where common policies would have been required were indentified, as were potential regulation harmonization areas.

Three reports – **D2.1 Review of the emerging animal health and food security**, **D2.2 A report on the mapping task to identify synergies and gaps and D2.3 Report on agreed areas in animal health, food safety and security** were developed and distributed to all relevant stakeholders. The reports are public on the LinkTADs platform.

Literature review

LinkTADs partners reviewed different aspects of animal health policy in the European Union and in China and compared European and Chinese animal health policies related to animal identification, movement of animals within each region (with a focus on pigs), surveillance for early detection of exotic threats (with a focus on African swine fever) and contingency planning in case of the introduction of an exotic threat (with a focus on African swine fever). A literature review was conducted to describe the main aspects of animal health policy in both the EU and China. Separate searches in the EU and China were made using equivalent terms. Three hundred and sixty papers from the previous 36 months were randomly selected for review. Papers were scored based on the abstracts according to a list of pre-defined questions. Abstracts were only scored if they described original research, and such research had been carried out in either the EU or China.

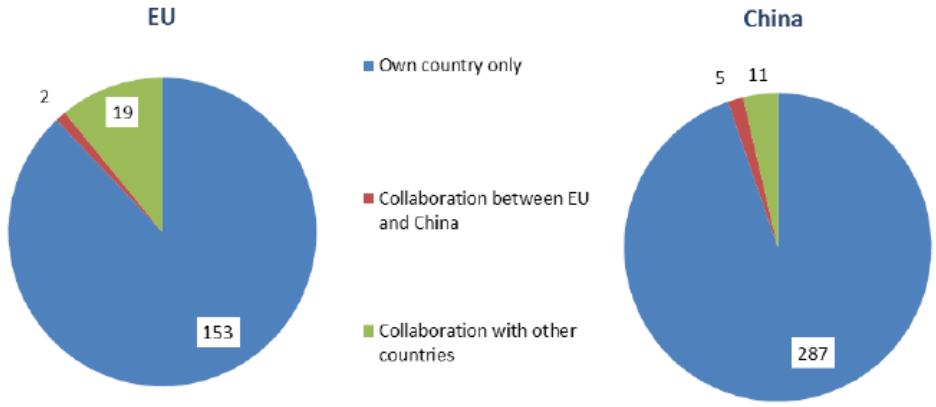


According to the literature review (D2.1), a small proportion of animal health research in both the EU and China is concerned with risk analysis and mathematical modelling. Therefore it will be useful to explore any constraints to this type of research and seek opportunities to increase research activity in this area given its importance in surveillance, contingency planning and response to epidemics of zoonoses and transboundary animal diseases.

Private companies seem to have considerable involvement in animal health research in the EU (12% of papers reviewed) compared to China (2% of papers), thus there is an opportunity for knowledge sharing between the EU and China concerning strategies for engaging with private industry and accessing resources.

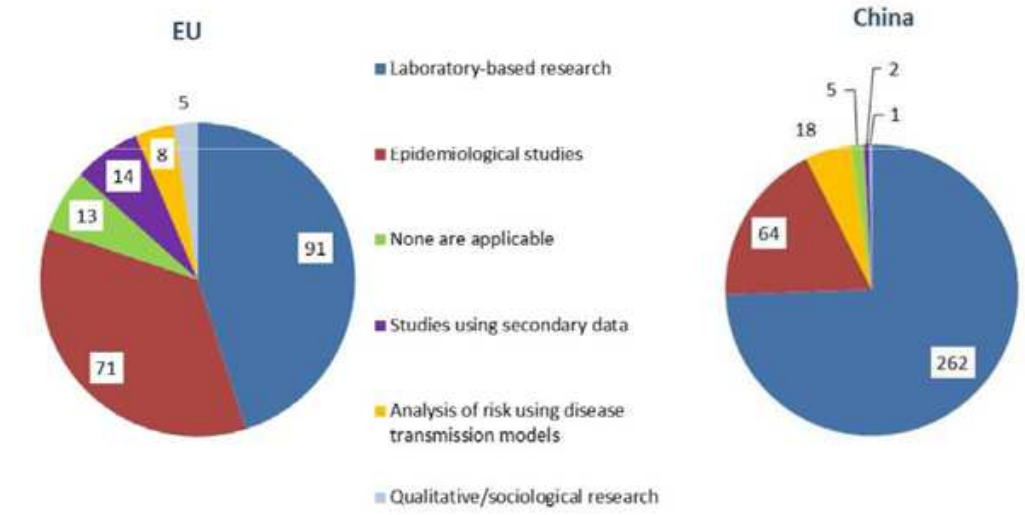
Current research collaborations between the EU and China are fairly limited, with only 1% of EU papers and 2% of Chinese papers reviewed involving collaboration with the other region. However, both regions are fairly actively involved in collaborations with other countries and this experience can be built upon to form effective research networks between the EU and China.

International collaborations



Animal health research in China is predominantly laboratory-based, while in the EU there is proportionally more research activity in epidemiology in comparison. Therefore, there are opportunities for knowledge exchange and expanding the scope of epidemiology research in China.

Types of research



Online survey

An online survey was also developed to identify the areas where harmonization would be necessary to improve farmers' livelihoods and public health. The survey was completed by 10 participants working either in the EU, China, or in international organisations (OIE/FAO/EFSA, etc).

Several apparent gaps in research resources were highlighted by survey participants in both the EU and China. One issue was a concern for both regions – the lack of awareness of and difficulties in access to postgraduate epidemiology courses. The other issues were highlighted in one region but not the other, signifying the potential for these gaps to be filled by cross-collaboration between the two regions. For the EU, these issues included lack of access to funding and to technologies/equipment/laboratory facilities; for China, it included lack of access to databases, of personnel trained in epidemiology and of reference laboratories.

According to D2.2, filling the gaps in resources is a major reason for collaboration shared between both regions, as is the need to address a lack of existing collaborations. This is encouraging and the identification of resource gaps can aid in targeting future collaborations more precisely. The need to prevent cross-border transmission of important diseases is of major concern for the EU. This may be influenced to some degree by stakeholders' definitions of the term 'borders', as many EU stakeholders may have in mind their own country's borders rather than the EU's; while Chinese stakeholders may not relate to their notion of borders in the same way as China is so much larger than any individual EU country.

This evidence was taken into account for WP3, WP4 and WP7 activities in order to facilitate further exchanges between the EU and China. The most effective use of LinkTADs resources can be made by identifying opportunities for collaboration based on the major priorities of stakeholders in both regions. By understanding the synergies and differences between the EU and China in terms of motivations, barriers and resource gaps, we can ensure that any future exchanges and collaboration projects are reciprocal in nature and targeted to address gaps and strengthen synergies.

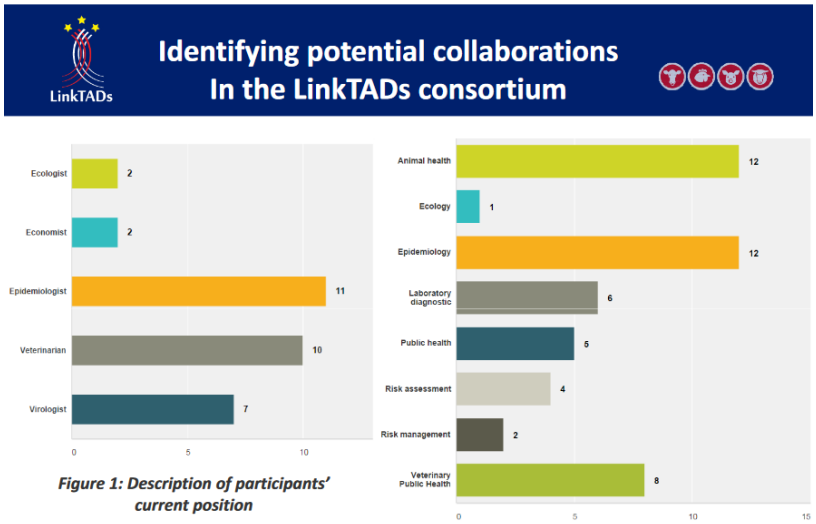


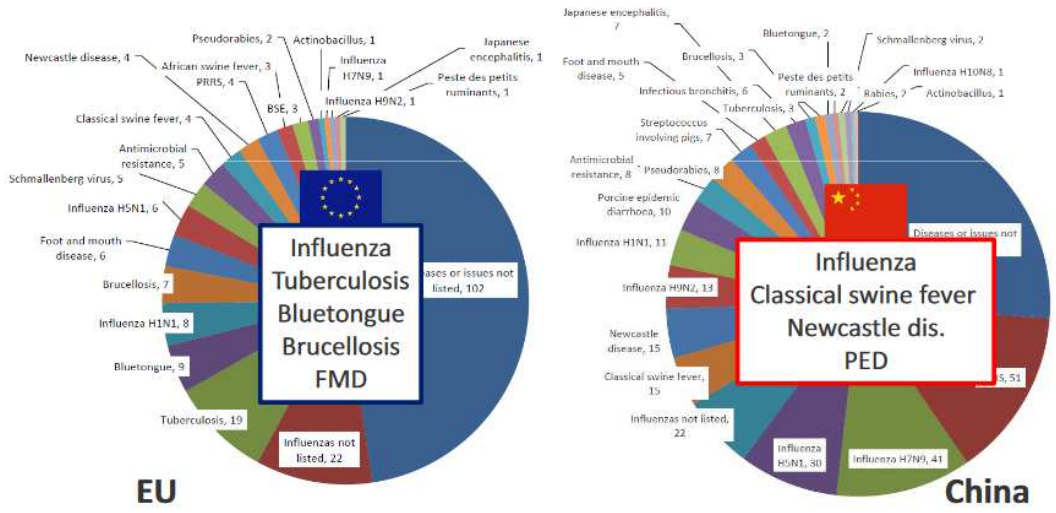
Figure 1: Description of participants' current position

Figure 2: Description of participants' discipline

D2.3 suggests that the current animal health policy in the EU is rather complex (50 directives/regulations, 400 texts of secondary legislation) and, being written between 1988 and 1995, it needs to adapt to new challenges and diseases. Animal health policy in China is different: although complex (from 3 main laws to more than 200 technical guidelines) as well, it allows more flexibility. Results of this study suggested that there could be a benefit in trying to harmonise legislation regarding animal identification and animal movement within the EU and China to improve trade opportunities, animal and human health.

The most important scientific outcome of WP2 activities is the identification of animal health priorities and gaps. The main objective of the online questionnaire was to identify the diseases for which LinkTADs partners could set up EU-China and epidemiology-laboratory sciences collaborations in the future (within WP3 and WP4). Based on the questionnaire results, partners selected diseases for which at least 1 Chinese and 1 European partner and at least 1 epidemiology and 1 laboratory sciences partner showed a high interest (score above 4)

- Literature review of published scientific papers



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According to these results 10 top-priority diseases were selected:

- African swine fever (ASF)
- Antimicrobial resistance (AMR)
- Avian influenza (AI)
- Bovine tuberculosis (bTB)
- Classical swine fever (CSF)
- Japanese encephalitis (JE)
- Peste des petits ruminants (PPR)
- Porcine reproductive and Respiratory syndrome (PRRS)
- Foot and mouth disease (FMD)
- Porcine Epidemic Diarrhoea (PED)
- Rabies

Epidemiology

WP3 aimed to improve epidemiological capacity that would eventually strengthen emergency response capacity for emerging infectious diseases (EIDs) and public health.

Workshops and meetings enhancing EU-China networking in epidemiology were organized and relevant recommendations were used for future LinkTADs activities as well as enhanced relevant EU-China collaboration. A **meeting on the ecology and epidemiology of avian influenza (AI)** was organized in April 2014 with the aim to identify of the main knowledge gaps in TADs and EIDs eco-epidemiology. An expert-opinion method was used to prioritize the most important gaps in existing knowledge of TADs and EIDs eco-epidemiology, leading to a set of recommendations (**D3.2 Meeting recommendations and conclusions, prioritization of the gaps in TADs & EIDs eco-epidemiology**).

As a result of the **Workshop on Field Epidemiology** held in April 2015, seven concept notes (one per disease) and one project sheet were finalized (**D3.4 Workshop proceedings and conclusions, propositions to set up new research projects**). Concept notes have been drafted for 7 diseases:

- Improving bovine tuberculosis control and surveillance in China;
- Targeted research efforts on peste des petits ruminants in China to support the global eradication plan;
- Improving African swine fever preparedness in China;
- Improved surveillance and control strategies towards the eradication of classical swine fever in China;

- Antimicrobial resistance and its transmission in bacteria of animal, environment and human origin;
- Improving avian influenza Virus control and surveillance in China;
- Improving porcine respiratory and reproductive syndrome control and surveillance in China.

The concept notes analyze the general disease situation in both regions, define the knowledge gaps, challenges and research questions, as well as propose further study routes and potential funding opportunities. The concept notes will hopefully lead to development of more detailed project proposals and to the implementation of new projects where both LinkTADs and external partners can collaborate beyond the life-span of LinkTADs, addressing the major research gaps identified during the workshop and beyond.

The project sheet was finalized for a project, which was already funded by the Chinese Ministry of Science and Technology (MoST): *Eco-epidemiology and risk analysis of genotype shift of Japanese encephalitis virus (JEV) in pigs and mosquitoes*. The project sheet summarises the main aspects of a newly funded project between SHVRI, CIRAD and SVA. This project, funded by the Chinese Ministry of Science and Technology (MoST), is a major outcome of LinkTADs, since it associates a Chinese laboratory (SHVRI), an EU laboratory (SVA) and a European epidemiology group (CIRAD) that met thanks to LinkTADs.

The **Workshop on Risk-based surveillance** held in July 2015 served as an important example of LinkTADs twinning activities with RISKSUR and ASFORCE projects and aimed to provide recommendations for the design of risk-based surveillance programmes for endemic, emerging, and exotic diseases in domestic and wild animal species. Participants worked on the design of efficient surveillance strategies for the early detection of ASF or the prevalence monitoring of highly pathogenic avian influenza and identified the main associated challenges. Therefore, workshop conclusions (**D3.3 Workshop proceedings and conclusions, list of the most relevant methods for the surveillance**) on the design of efficient surveillance strategies for the early detection of ASF and prevalence monitoring of highly pathogenic avian influenza are of high importance for future development of surveillance systems on animal health.

Training

Additionally, WP3 provided important training opportunities for EU and Chinese veterinarians, by linking to the China-FETPV (Field Epidemiology Training Program for Veterinarians), a sustainable training program on veterinary field epidemiology for the future. These trainings contributed to standardize the knowledge and methodology on applied veterinary epidemiology for China, nurture trainers and mentors within a national network for training veterinary epidemiologists in China and foster greater synergy and collaboration.

During a meeting in July 2014, recommendations for the FETPV program were developed (**D3.1 Meeting recommendations and conclusions, proposal for future field epidemiology training courses**). Based on these recommendations, two training were organized within WP3 in close cooperation with China-FETPV.

A **Field Epidemiology Training session** was organised in China for Chinese and European epidemiologists. Experts and experienced researchers were invited to the training sessions to present specific research projects on their respective topics. A special focus was also given to framework conditions for research and innovation (R&I) such as IPR protection, standards, regulation, among others. The training sessions focused on training participants in how to organise epidemiology training sessions (including educational techniques) and to identify constraints that may be encountered when trying to implement training at the national level. The purpose of the initiative is to develop the capacity of selected Chinese FETPV trainers, which is considered as an important step achieving sustainability and localization of the development of veterinary epidemiology in China. Trainers presented a summary of their plans for each of the 16 topics identified in the last workshop, such as surveillance, outbreak investigation and control strategy. The training provided a theoretical and practical application for evaluation of disease surveillance systems and introduced available tools to conduct qualitative and quantitative evaluation. The training materials (**D3.5 Training material Field Epidemiology and online presentations)** are available on the LinkTADs platform.

An **Analytical Epidemiology Training session** was organised in Europe for Chinese and European Epidemiologists. The training session combined training for different up to date analytical methods in epidemiology such as Social Network Analysis (SNA) or Capture-Recapture methods. The objective of this training was to allow the Chinese epidemiology trainees to understand the principles and the practical applications of the evaluation of animal disease surveillance systems, and to introduce available tools conduct

qualitative and quantitative evaluation, and in the 2nd part of training, to gain basic understanding of risk analysis and its application in animal disease prevention and control. The training materials (**D3.6 Training materials Analytic Epidemiology and online presentations**) are available on the LinkTADs platform.

In general, WP3 activities 1) Built a bridge for Chinese and European scientists to exchange and improve the knowledge and techniques on EIDs and TADs; 2) Established a base for further collaborations and project applications on EIDs and TADs between Chinese and European scientists; 3) Specialized research activities on particular animal diseases such as JEV, ASFV and PRDC; 4) Improved the management of EIDs and TADs; and 5) strengthened the collaborations between Chinese and European epidemiologists in the long term.

Laboratory research

Prioritization of animal diseases in China and Europe carried out within WP2 was embedded into WP4 events. As a result, a **collaborative network has been set up** among partners through workshops, teleconferences, exchange programmes, collaborative research, joint applications of proposals and close cooperation with WP2, WP3 and WP7 activities. As an outcome of the network, close collaborations on the targeted diseases between LinkTADs partners' laboratories were established and strengthened. The role and the scope of applications of the advanced diagnostic technologies in the research and disease control areas were clearly defined.

Joint Research Laboratories

Joint research laboratories refer to a mechanism to join existing multi institutional research efforts to investigate pathogens that are of animal (and/or zoonotic) importance for both partners. The laboratories established within LinkTADs explored the potential research areas on the major pathogens of interest. The laboratories were also encouraged to sign up an agreement in order to become a member of the joint research laboratories in China or EU

As an achievement of collaborative exchange, a **Joint Laboratory of Veterinary Microbiology** has been established between HVRI and SVA. The Joint Laboratory is aimed to enhance the control, improve the diagnostic capabilities and increase the knowledge of infectious animal diseases through the following joint activities

A second **Joint Laboratory of Animal Infectious Diseases** was established between SHVRI and SVA.

Joint project applications

There are several research programmes supporting international research collaboration in both the EU and China. Based on these programmes, and in compliance with the agreed research areas, the collaborating laboratories established a platform with key scientists or teams to jointly apply for future research projects from the EU, China or other funding sources.

In early 2014, **SHVRI, CIRAD and SVA** jointly applied for a proposal entitled "Eco-epidemiology and risk analysis of genotype shift of Japanese encephalitis virus (JEV) in pigs and mosquitoes". The objectives of the proposal were: 1) To explore the mechanisms of JEV genotype shift and identify the ecological and epidemiological factors associated with JEV genotype shift; and 2) To analyse the risk of JEV genotype shift on JEV control. Due to the joint efforts of all parties, the proposal was funded by the Ministry of Science and Technology (MoST) of China with a total budget of 1,270,000 RMB. The 3-year project, which began in January 2015, will allow the three LinkTADs partners (SHVRI, CIRAD and SVA) to continue joint collaborative research.

To implement the existing JE project, a protocol for descriptive epidemiological study of JEV genotypes I and III circulation in China was drafted by CIRAD and sent to SHVRI for discussion in December 2016. The protocol described the selection of pig farm types and epidemiological landscapes, sampling season and numbers, testing methods, etc. This drafted protocol was modified and finalized in Shanghai during a short visit by CIRAD to SHVRI (see WP7) in April 2016. A protocol for isolation of JEV from mosquitoes has been sent by SHVRI to CIRAD in December 2016. This protocol describes step by step how to isolate JEV from 100-mosquito pools, including the process for homogenizing mosquitoes, inoculating cells and examining CPE, etc.

Moreover, an **Agreement on collaborative research on Japanese Encephalitis Virus (JEV)** was signed between SHVRI and CIRAD. These strengthened collaborations between Chinese and EU LinkTADs partners have already resulted in joint project applications, some of which have already been funded. SHVRI and CIRAD officially signed up **a Letter of Agreement for collaboration on the project "Eco-epidemiology and risk analysis of genotype shift of Japanese encephalitis virus in pigs and mosquitos**". The purpose of this agreement is to establish clear guidelines and define the mutual rights and obligations of the parties during the preparation, organisation and supervision of the project.

Most importantly, to achieve the sustainability of certain LinkTADs activities and results, the project consortium, together with invited external partners decided to **jointly develop a project to a H2020 call targeting the issue of antimicrobial resistance (AMR)** in farm animals in China and the EU. The project will involve major research groups from both EU and China. The LinkTADs sustainability workshop was held 19-20 October, 2016 in Kunming, China. The workshop was aimed to discuss the future project proposal (concept note, Work Packages, proposal timeline) as well as funding schemes. Partners discussed relevant existing policies in the EU and China in order to formulate the objectives for proposed Work Packages focusing on harmonized policy strategies and industry standards. The proposal is currently under development.

Diagnostic technologies

One of the objectives of WP4 was to upgrade and implement the diagnostic technologies for early and rapid diagnosis of animal infectious diseases including zoonosis via collaboration between the EU and China. HVRI has established an accompanying **E^{rns}-based ELISA for marker vaccines against CSFV**, the assay has been co-validated in SVA and the University of Veterinary Medicine in Hannover (TiHo). SVA has also co-evaluated together with HVRI and other partners the potential of the real-time PCR assay performed on a portable thermocycler T-COR4 for ASF and CSF surveillance. The method was designed to be used as a DIVA test accompanying E2-based marker vaccines against classical swine fever (CSF). A manuscript on the method has been accepted by Journal of Virological Methods with acknowledgement of the LinkTADs project. A PCR for ASFV has been developed at HVRI and evaluated at SVA. The method has been used for surveillance of ASFV in clinical porcine samples from Heilongjiang province of China, which borders on Russia.

The assay has been co-validated in SVA and TiHO. SVA has also co-evaluated with HVRI and other partners on the potential of the real-time PCR assay performed on a portable thermocycler T-COR4 for disease surveillance. Co-evaluation of an E^{rns}-ELISA developed by TiHo and QIAGEN Leipzig GmbH as an accompanying serological DIVA test for CSF marker vaccines was carried out. Two ELISAs (Erns-ELISA and E2-ELISA) for detection of anti-CSF antibodies developed in HVRI were subjected to inter-laboratory evaluation in SVA and TiHo.

Development of efficient protocols for sampling, analyses and determination of the microbial etiology for the Porcine Respiratory Disease Complex (PRDC) is crucial, as it is one of the most important pig diseases, causing economical losses, reduced animal health and welfare, and increased antibiotic use. In accordance with the conclusions reached during the additional short visit to SHVRI in June 2016, protocols for the sampling of pigs were exchanged and a multiplex PCR was set-up. This PCR detects specifically certain important bacteria and viruses from pig nasal swabs. The assay can successfully detect a range of bacteria (*Actinobacillus pleuropneumoniae*, *Mycoplasma hyopneumoniae* and *hyorhinis* and *Pasteurella multocida*), as well as the swine influenza virus, but it is possible to expand the range of microbes detected if needed. This successful work demonstrated the great advantages of scientific collaboration between EU and China in the area of animal health.

SVA and SHVRI plan to continue the collaboration regarding porcine respiratory disease complex (PRDC) in Sweden and China. The collaboration will cover the exchange of protocols, techniques results and evaluation of results. The partners also plan to joint apply to Formas Research Foundation in Sweden and the National Natural Science Foundation of China (NSFC) for financial support for this work.

Policy and EU-China cooperation in the animal health field

As part of Task 5.1 (**Provide support data to EU-China policy dialogue in infectious diseases of animal and zoonoses**), a report (D5.1) was written, which summarizes the main findings and recommendations related to the identification of research topics on animal infectious diseases (including zoonoses) of common interest for China and the EU. The report also suggests specific practical areas for cooperation on animal infectious diseases between EU and China, including existing bilateral programs, the governance structure and funding model, as well as the priority activity areas. It aims at supporting the official policy dialogues on animal diseases and food security between the EU and China, and providing guidance to future collaborations on areas of common interest by analysing the priority activity areas, the governance structure, the funding model, intellectual property rights (IPR) procedures, and criteria to elect members and evaluate the programme.

Task completion allowed for a solid base for networking, discussion of common interests and preparation of joint activities, providing logistic support and the maintenance of networks around targeted stakeholders. Further work involved the mapping of ongoing bilateral dialogues to ensure policy coherence and provision of support data to EU-China policy dialogues in animal diseases through a summary report. Another area examined was the linking of existing funding schemes and the indication of possible synergies between initiatives focusing on China, including activities carried out on one side by the European research programmes (EU Framework Programmes and EU Member States' national programmes, including those involving international partners) and, on the other side, by related research programmes coordinated by Chinese national institutions, e.g. the Chinese Academy of Agricultural Sciences (CAAS). The possibility of twinning large sets of research projects/consortia from the counterparts' (i.e. Chinese) programmes was also analysed.

The organisation of policy dialogue consultation meetings among the EU-China policy makers on animal health and food security included two face-to-face and three online bi-regional consultation events, targeting policy-makers, other high level officials, representatives of S&T and development (with a focus on animal health and food security) programme owners, as well as of innovation agencies and other relevant S&T and innovation actors from China and Europe (e.g. researchers and industry representatives). The events provided a structured platform for high-level policy dialogues and allowed for the discussion of mechanisms supporting the commercialization of research on animal health and food security in the two regions.

During the first policy event on African swine fever (ASF), participants endorsed 11 cross-cutting **recommendations** for immediate action to build preparedness and improve ASF policy making. These recommendations included increasing communication and awareness, conducting risk assessments, ensuring training, assessing policies, addressing the issues of backyard low biosecurity production systems and wild boar, linking with other swine disease efforts, collaborating with forestry authorities and hunters, and mobilizing additional resources. Recommendations, as well as all presentations have been made available through the LinkTADs website.

Additionally, **D5.3 Roadmap for Strengthening EU-China Animal Health Research Cooperation** presents WP5 outcomes. WP5 provided a framework for political dialogue and served an important purpose in the networking of policy makers. The goal was to enhance the framework for collaboration between the EU and China through the organisation of bi-regional consultations events, which in turn would help increase policy discussion related to animal health diseases. The aim of the roadmap is to provide a sustainable strategy for EU-China research cooperation outside of European funded research programmes, and acts as the primary tool for the diffusion of key recommendations and outcomes at the policy/macro level. Based on the comments and results from the policy dialogue meetings and surveys to stakeholders, the consortium has formulated **suggestions on EU-China cooperation in TADs and zoonoses** for the forthcoming years.

The Roadmap suggests that sustainable policy dialogue can be better achieved through long-term training provided to technicians/experts/officials in government-owned institutes, who provide technical support to decision-making. More transparent communication channels are also welcome, and it was specifically indicated that Chinese counterparts would like clear and easy access to information about updates on policy changes and new project opportunities. More specific actions could include the establishment of new projects, funding initiatives that can benefit both sides and that are more feasible in terms of project management (finance/ operation/reporting), involved industries (R&D, farms, manufacturers), and dedicate sufficient time

towards better matching research institutes before projects begin. Personal exchanges, transparency and further harmonization in funding mechanisms should be encouraged. Enhanced funding opportunities and defined research priorities and relevant intellectual property right (IPR) management mechanisms should be promoted between the two regions. Most importantly, communication routes should be set with policy makers, and industry should be more actively engaged.

Another WP5 outcome includes **web-based meetings** (i.e. webinars) on various topics on animal health policy which cover: 1) disease outbreak investigation; 2) prevention and control of rabies; 3) surveillance of influenza H7N9 ; and 4) antimicrobial resistance. Additional webinars were organized within WP8. The selection of topics was done in consultation with LinkTADs partners and other Chinese stakeholders. The audience of these webinars was mainly from national and local laboratories, animal disease control centres, universities and research institutes in the EU and China, but often also including individuals based in other regions. Advantages of such web-based lectures and real-time discussions are obvious and widely appreciated; it is significantly easier to organize a webinar compared to a face-to-face meeting, it is time and cost effective, and it makes it easier to reach a larger audience all over the world. Webinars are made available on the project's website and will serve as one of LinkTADs' exploitation routes.

Within WP8 **Task 8.4 Detect Synergies and Propose Joint Actions** aimed at monitoring and analysing bilateral and multilateral cooperation programmes and platforms between EU and China, LinkTADs produced two important reports. Linking up with other projects, this task focused on the production of a comparison over worldwide trends in animal health research cooperation between the EU and China. Possible synergies were detected and respective recommendations developed. Secondly, joint patenting and other similar joint actions of research and development (R&D) actors in China and Europe were analysed as indicating innovation potential and private-sector cooperation. Results of analyses of research output were contrasted with (geographic and thematic) patterns visible in patenting activity. It served to identify the best research and innovation actors in order to approach them with targeted information, thus further increasing cooperation levels.

The work on the task showed that while there is a good number of joint cooperation activities between the EU and China, indicated as well in the form of joint academic research publications, scientific and innovation focused cooperation should still be supported and enhanced in both regions. The strategic priorities have been already identified, procedures for joint funding opportunities have been set up, and there is a strong network of scientists and officials who can support the interested parties in successful collaboration.

In close cooperation with other work packages in LinkTADs and cooperating with other projects (RISKSUR, ASFORCE, etc.), LinkTADs partners monitored bilateral and multilateral cooperation and EU policies and programmes with China and analyzed them against the background of global tendencies for the **D8.4 Joint Innovation report**. D8.4 lists important findings and recommendations. It also provides analysis of global trends in animal health research as well as relevant EU policies and programmes with China. The report pays specific attention to research funding opportunities, including Horizon 2020 and trade cooperation in the field between the EU and China. The common research topics for the EU and China as identified by D2.1 served as focus points for the identification of innovators and innovative actions of the D8.4. After the focus was identified, desk research was conducted concerning trends in patenting and publications related to the focus topics. A great number of publications and patents were selected for further analysis. For collecting publications, The National Centre for Biotechnology Information's PubMed database and ScienceDirect were used. Multiple searches were conducted using the focus topics as keywords; 2015 and 2016 (until May, when the search was conducted) were chosen as the years for publication to seek out the most up-to-date references. The search was conducted in English and the results were collected in a Microsoft Excel 2007 database.

The study identified **the most researched disease** (animal influenzas), **trends in patenting activities in the EU and China** (patenting organizations, patenting topics and key words), **top (20) research institutions in the EU and China** (with additional breakdown per country).

An added value of the report is the comparative insight into **joint publishing and patenting efforts** by the EU and China. Within the task, the synergies with other project and initiatives have been identified - STAR IDAZ, Dragon Star Plus and One Health Initiative.

Partners developed recommendations for future EU-China initiatives, which stress the importance of maintaining synergies with existing and building up new synergies, increased cooperation between epidemiology and laboratory research aspects between the EU and China; more involvement in short projects (joint visits, exchanges), increased cooperation with private sector (IT industry in particular); increased harmonization in animal health policies; promoting stronger international research networks.

Most importantly, LinkTADs methodology could be used to identify more key actors and carry out more coordinated research as the project has already established a Joint Laboratory for Veterinary Microbiology.

D8.10 Best Practices Report lists best practices of EU-China cooperation in the relevant fields. LinkTADs partners have analysed the information from secondary sources, such as policy documents, press releases and other news and reports available on the Internet, as well as gathered additional information from policy events (e.g. the ASF policy event organised with LinkTADs) and other face-to-face discussions (e.g. FAO China visited the Veterinary Bureau in China several times).

The main reports and documents analysed include results/deliverables from WP2, WP3, WP4 and WP5, policy documents and reports developed within the ChinaAccess4EU (http://www.access4.eu/China/) and DRAGON STAR (http://www.dragon-star.eu/) EU-China projects.

The report analyzed Chinese and European programmes and relevant gaps in harmonized research, identified within WP2. Additionally, best practices were collected within LinkTADs, as well as outside the project activities.

Best practice	Activity
EU-China Trade Project I-II	Supporting CFETPV training courses – animal health
Bilateral Netherlands-China cooperation	Supporting the development of veterinary epidemiology in China – animal health
LinkTADs initiated collaboration between SHVRI, CIRAD and SVA	Common project application to MoST funding for « Eco-epidemiology and risk analysis of genotype shift of Japanese encephalitis virus in pigs and mosquitos » - the project was funded and started in 2015 – animal health
LinkTADs initiated collaboration between HVRI and SVA	Collaboration for establishment of a joint laboratory of Veterinary microbiology – animal health
ESA-MOST Dragon 2 Programme	A programme supporting long term scientific collaboration between the EU and China – training, products useful for animal health research
China Field Epidemiology Training programme for Veterinarians	European epidemiologists supporting a training programme for Chinese veterinarians – training, collaboration in animal health
ICONZ project	Integrated control of neglected zoonoses – Africa focus - animal health
STAR-IDAZ project	Global Strategic Alliances for the coordination of research on the major infectious diseases of animals and zoonoses – global collaboration - animal health
ChinaAccess4EU project	EU-China research collaboration support – any scientific field
Dragon STAR project	EU-China research collaboration support – any scientific field
CHOICE project	EU-China research collaboration support – ICT field

Developed recommendations focus on **increased chances for funding of future joint projects** (based on identified priorities for joint research as well as funding opportunities within Horizon 2020 and other sources). Moreover, partners developed **recommendations for international collaborative projects** which include focusing on specific topics during face-to-face events, taking into account the multiplier effect of training courses, included training for trainers, increased researchers' mobility, reciprocal actions with other projects, as well as the usage of big data, IT systems and new technologies.

New solutions and dissemination

Important mechanisms to facilitate future joint research were established by LinkTADs – Focal Point Network (Task 8.6) and Funding database (WP6).

The LinkTADs platform supporting the collaboration between researchers in the EU and China was continuously updated based on the users' feedback. Launched in October 2014, the platform has proven to attract a number of international researchers specializing in animal health and food security. It was been visited more than 10,000 times over the last two years.

The LinkTADs platform provides all relevant information about EU-China cooperation as well as ongoing and past activities in the EU and China regarding animal health research. It also provides an opportunity for the researchers to generate, join and contribute to discussions and new collaboration opportunities. The platform includes several sections developed specifically within LinkTADs: collection of EU-China policy and strategy documents in animal health research collaboration; partner database, downloadable library of workshop reports, recorded webinars, training materials, and newsletters. Additionally, a "Find funding" database was developed.

The **funding database** is an innovative tool, designed to help researchers look for available funding covering travel grants, scholarships, exchange programmes, fellowships available for European and Chinese experts working in the veterinary field including animal health and food safety. The tool currently lists 180 entries collected by EM. The platform gives the access to this unique database for anyone interested in funds targeting EU-China animal health cooperation, researchers' mobility and joint collaboration. Users can search by eligible country, grant type and activities funded as well as by inserting relevant key words.

The LinkTADs platform will be sustained beyond the project completion as an information platform on cooperation in the animal health field between the EU and China.

As part of WP8, the **LinkTADs Focal Point Network** was established in February 2015. It consists of international researchers and experts from the EU and China with experience in animal health related research and relevant expertise in EU-China cooperation, e.g. funding, logistics, networking opportunities, etc. The LinkTADs Focal Point Network will provide support to anyone interested in animal health research and relevant cooperation between the EU and China as it will be sustained beyond the project completion using LinkedIn for communication with international researchers working in the field of animal health who have had a collaboration experience with Chinese colleagues and would like to share their know-how with like-minded individuals who are looking to engage in similar activities.

The potential impact, main dissemination activities, and exploitation of results

The project, building upon and leveraging past Europe-China research cooperation in food security and animal health, as well as taking into account previous and existing collaborative initiatives, projects, exchange programmes, and policy agreements, **aimed to deepen engagement and build momentum in enhancing research capacity in the two regions. At the same time, it attempted to broaden the scope of EU-China cooperation through stimulating sustainable innovation collaborations.**

Relying on selected best approaches in the EU and China in the field of animal disease and food security, the project aimed to coordinate research on two important components of the disease control cycle with partners in the EU and China in order to **improve scientific excellence in the field of animal health.** Such research coordination should contribute to a more effective prevention, control and eradication of animal diseases.

In addition, the project focused on dissemination of project information, interaction and networking with relevant researchers and business communities throughout Europe and China. As a result of the implemented activities, the project will serve as a platform for all stakeholders across governments, funders, practitioners, researchers and the private sectors in the field of animal diseases and food security.

The project's impact on different aspects of EU-China cooperation in the field of animal health

Wide coordination of research activities from the EU and China has increased EU-China collaboration in line with the EU-China Science and Technology (S&T) cooperation agreement.

The EU-China S&T Cooperation Agreement was first signed in 1998 and currently the cooperation shows growing dynamism as is demonstrated by the growing numbers of Chinese participants in cooperative research projects funded by EU programmes (FP5, FP6 and FP7 and lately, Horizon2020). The EU-China S&T Agreement covers all the activities of research, technological development, and demonstration, and the Overview of Europe-China S&T Cooperation (published in 2011 and updated in 2012) highlights successful cooperation regarding research cooperation in animal health and identifies animal health as a key future area in research cooperation. LinkTADs took a further step in extending such research cooperation and further identifying best practices for increased success of EU-China projects in the field of animal health and food security.

The project was dedicated towards the **development and exchange of scientific knowledge** in epidemiology to **enable more effective prevention and control of diseases**. At the same time, it focussed on the **development and implementation of advanced diagnostic technologies** for the early detection of animal pathogens, including those that may infect humans. Efforts on both components were coordinated to focus on the same objectives.

The project also allowed for the **ongoing coordination of an eco-epidemiological research group** (EU-China-International partners) on emerging infectious diseases (EIDs) in China that has been meeting and conducting research together for the past several years.

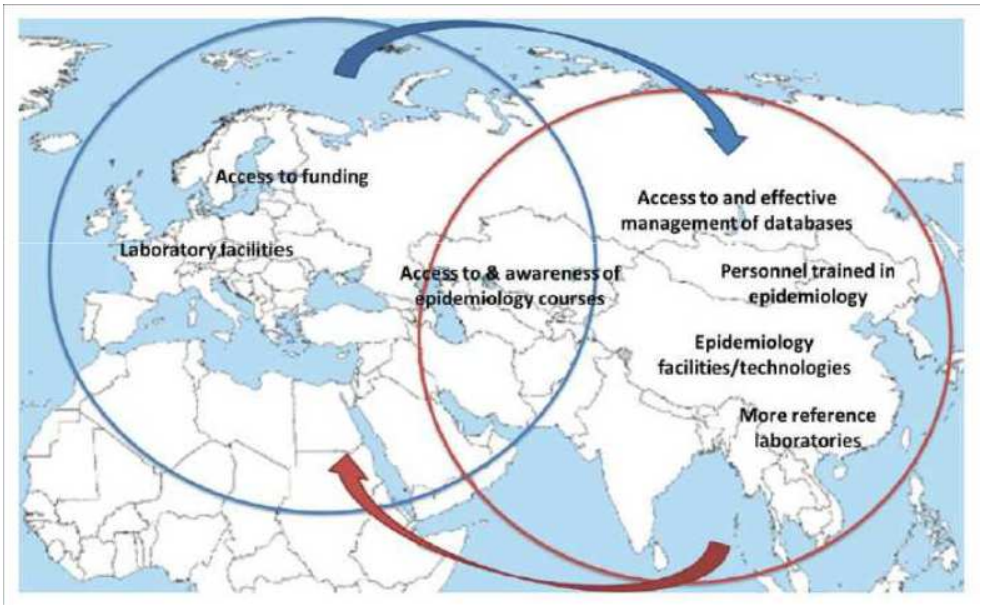
To achieve an effective collaboration that will be sustainable in the future, the selection of partners became the most critical step. LinkTADs combined a balanced selection of EU and Chinese partners that are world leaders in their areas of expertise: epidemiology, laboratory diagnostics, cross-border cooperation, and policy. Therefore, the LinkTADs project team was composed of key scientific players in the fields of animal health and food security from the EU, China, and FAO.

Through a consultation process, LinkTADs first identified and prioritized the areas of research and animal diseases to focus on, both according to desk-based review and on the specific expertise and interests of LinkTADs partners.

All projects and initiatives related with animal health and international cooperation, networking, and exchange programmes were identified (EU initiatives and Chinese national initiatives). LinkTADs helped link these

initiatives by twinning, finding synergies, providing information exchange, and identifying common events, while building on the results and experiences of finalized projects.

In order to ease the job of scientists willing to work on EU-China collaboration in the animal health field, LinkTADs has made strong efforts to identify common trends and gaps in this area.



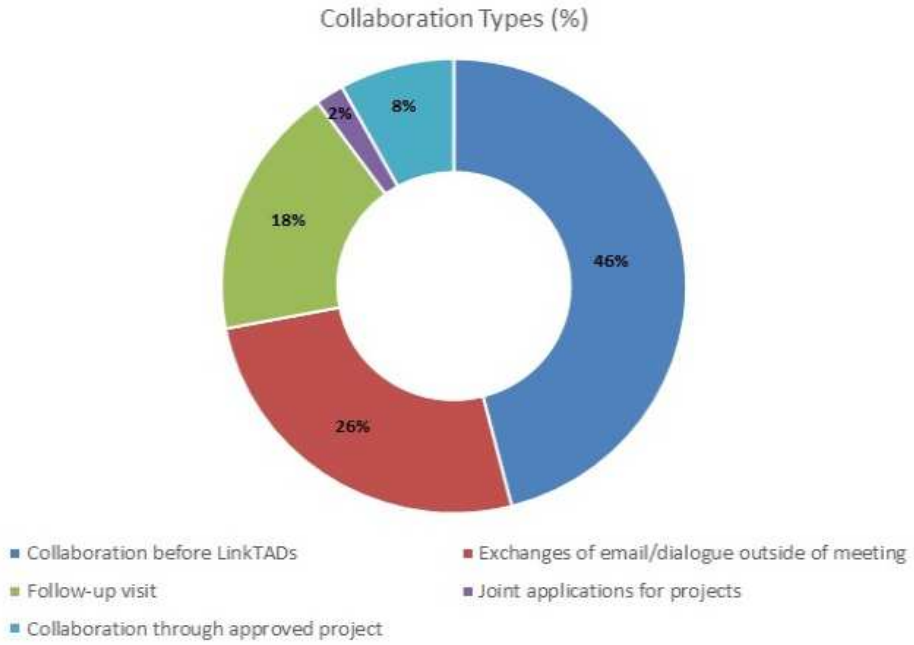
Identified synergies and gaps within WP2

Initial work was carried out within WP2 and the results of a survey implemented as part of LinkTADs (D2.2 Report on the mapping task to identify synergies and gaps and D2.3 Report on agreed areas in animal health, food safety and security) suggested that there could be a benefit in trying to **harmonise the legislation in animal identification and animal movement within the EU and China, in order to improve both animal and human health**, as well as opportunities for trade. However, results also suggested that other policy topics such as the surveillance for early detection of exotic threats and contingency planning in case of introduction of exotic threats need to be context-specific, and therefore, will not benefit from harmonisation. Considering the need for the EU and China to be compliant with OIE standards in international trade, these could be used as a potential basis for harmonisation. If taken into account, LinkTADs recommendations will have a large impact on the approach towards shaping the preconditions for EU-China cooperation.

Analysis was further extended in the Roadmap for strengthening EU-China animal health research cooperation (D5.3) which **provided suggestions on EU-China cooperation in TADs and zoonoses in the forthcoming years**. The roadmap provided recommendations for strengthening EU-China animal health research cooperation and has been developed at the end of the project. The aim of the roadmap was to provide a sustainable strategy for EU-China research cooperation outside of European funded research programmes, and acts as the primary tool for the diffusion of key recommendations and outcomes at the policy / macro level. Combined with other recommendations formulated from the STAR-IDAZ and DRAGON STAR programmes, it is hoped that they will go a long way in creating a sustainable relationship for EU-China research cooperation.

The Joint Innovation Report (D8.4) detected important trends in the relevant EU-China cooperation in the field of animal health on the basis of in-depth monitoring of innovative projects and research opportunities. Report recommendations include enhancing cooperation in the field of animal health with a focus on diagnostics, genetics, big data, predictive analytics and mobile technologies as well as taking into account globalisation of operating structures in the industry field.

LinkTADs proposed a whole range of coordination activities to achieve effective and sustainable coordination between China and the EU.



Furthermore, the Best Practices Report (D8.10) identified a number of successful examples, including those involving projects and synergies with other programmes and initiatives, when these had a positive impact on R&I collaboration. This analysis produced a number of recommendations that can be considered to further improve EU-China cooperation in R&I, especially in the field of animal health.

The project ensured a wide-range of networking opportunities for the relevant scientific communities and stakeholders

During project implementation, **cooperation between Chinese and EU LinkTADs partners was strengthened and mechanisms were created to establish sustainable collaborations**, such as joint laboratories, workshops dedicated to the write-up project concept notes, joint project submissions resulting in ongoing projects and signed Memoranda of Understanding.

In addition to strong scientific partners, the project team also involved partners who are experienced in networking and dissemination, ensuring the maximum engagement of relevant stakeholders in the scientific, business and policy-making communities.

LinkTADs efforts were aimed at **expanding the LinkTADs network of researchers and institutions to external partners,** not only in the EU and China, but also in the rest of the world. The process started by inviting external experts to deliver talks at project meetings and workshops (organized within WP3, WP4 and WP5). This resulted in collaborations at different levels, i.e. exchanges of information, follow-up visits, joint applications for projects, etc. Some of these have already materialised into ongoing projects, or project applications. Importantly, LinkTADs recommendations (D8.10) suggest that networking of projects and initiatives is so effective that it could be considered as an obligatory activity for all future projects.

LinkTADs and external partners can collaborate beyond the life-span of LinkTADs while addressing major research gaps detected within the project.

The work package on supporting policy dialogue (WP5) in LinkTADs provided a framework for political dialogue and served an important purpose in the **networking of policy makers**. The goal was to enhance the framework for collaboration between the EU and China through the organisation of bi-regional consultations events, which in turn would help increase policy discussion related to animal health diseases.

Thus, diversified project activities aim to involve stakeholders at different levels to enhance not only the research capacity in the field of animal health and food security, but also a more cooperative and effective policy dialogue.

LinkTADs' spirit will be maintained by the new projects that have and will arise from the new partnerships created throughout its three year run.

The project allowed for the systematic establishment of linkages between ongoing animal health research, training programmes and innovation projects in the veterinary field from the EU and China.

The project constantly monitored opportunities in research, training and innovative projects in the field of animal health and food security. An entire work package (WP2), "Analysis of animal health and food security research in the EU and in China", was designed and dedicated to a detailed, in-depth analysis on fostering linkage between projects from both the EU and China.

The joint work in epidemiology (WP3), laboratory (WP4), as well as exchanges and capacity building (WP7) resulted in **expanding mutual understanding, sharing information and materials, disseminating diagnostic technologies, building partnerships, and establishing collaborative research between institutes**. Concurrently, they also guided policy-making, benefited industry, generated a closer EU-China partnership, and allowed for the training of young scientists with enhanced capabilities and international views. Partners' knowledge in epidemiology (WP3) was complementary to competencies in laboratory sciences (WP4). One of the main goals of LinkTADs was to bring together Chinese and European scientists while bridging the gap between epidemiology and laboratory sciences.

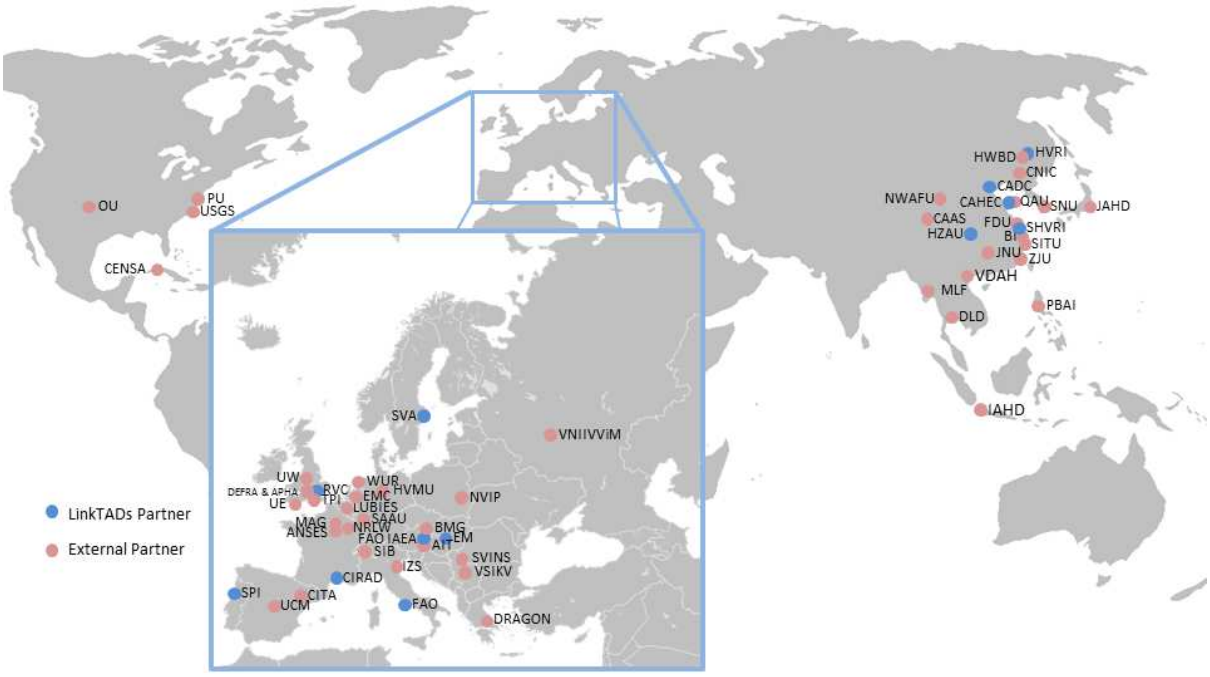
As a stand-alone project achievement, enhancing LinkTADs impact far beyond its implementation, a Memorandum of Understanding signed in the form of Exchange of Letters between FAO and CAAS (within WP1) aimed at **improving synergies between ongoing animal health research, training programmes and innovation project in the veterinary field** from the EU and China through CAAS facilitation of linkages between existing mirroring projects and related EU projects.

The **LinkTADs Funding Database** (developed within WP6) will serve as a unique source of information on funding opportunities for researchers from both regions raising awareness on available funding and increasing researchers' mobility as a result.

The project improved training opportunities for EU and Chinese researchers.

Realizing and thus emphasizing the importance of involving EU researchers, the project incorporated tailored capacity building, training events, and exchange programmes. These activities are not only embedded in the scientific aspects of the project (WP3 Scientific on epidemiology issues and WP4 Scientific on laboratory issues), but also stand as a specific endeavour (WP7 exchange and capacity building), aiming at providing maximum opportunities for involving EU and Chinese researchers and provide them with training opportunities. The trainings resulted in improved epidemiological and laboratory skills of animal health researchers in China and the EU, which will in turn improve the fight against EIDs and TADs synergy between LinkTADs WP3 trainings and the Chinese FETPV program. Organising the LinkTADs field epidemiology training as part of the training of trainers in the CFETPV program was rather logical and significantly increased the impact of the project. The joint work in WP3 and WP4 and the exchanges and capacity building will result in expanding the mutual understanding, sharing information and materials, disseminating diagnostic technologies, building partnerships and collaborative research between laboratories, improving the policy-making, benefiting the industries generating the impact of closer EU-China partnership, and increasing the number of young scientists with enhanced capabilities and international views.

LinkTADs' networking map visually demonstrates the project's impact in terms of newly established research cooperation/networking efforts involving project partners and external experts/institutions.

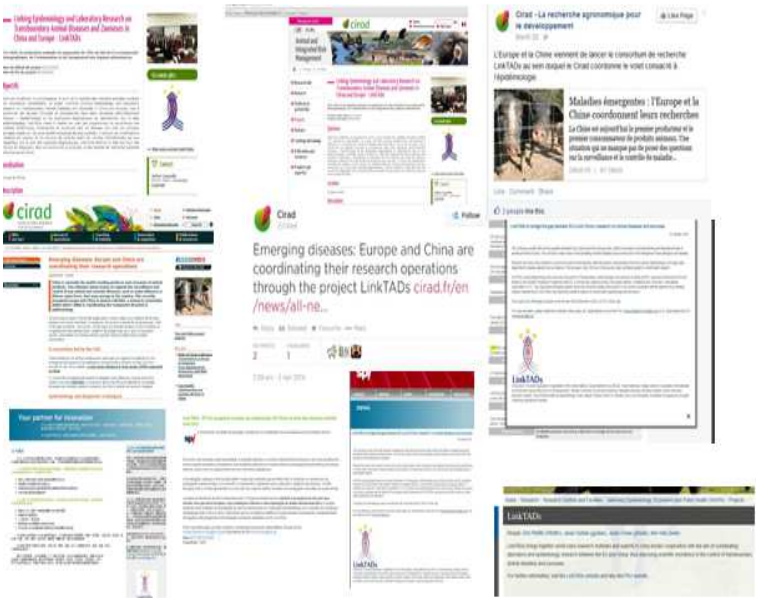


In summary, LinkTADs has: formulated research and policy recommendations and feedback to policy makers; increased mutual understanding, scientific excellence and cooperation in the field of animal health between EU and China; enhanced information exchange on diagnostic technologies, epidemiology and laboratory working standards in both regions; enhanced knowledge on funding and cooperation opportunities; enhanced training capacity of researchers in both regions; and provided recommendations to be used in future innovative projects in the field of animal health and food security developed by partners in the EU and China.

Main dissemination activities and exploitation of results

In addition to capacity building events (organized within WP3, WP4 and WP7) and enhancing relevant policy understanding through conducted analysis (within WP2 and WP5), different activities focused on achieving project impact within a wide-range of stakeholders. Moreover, the dissemination events, as well as the development of the Focal Point Network provided further support exploitation of the project results to a wider interested public.

LinkTADs dissemination and communication activities have consistently raised the project's visibility and profile throughout the project's implementation. Partners carried out their activities actively both in Europe and China, contributing to the wider project impact and closer EU-China cooperation in the field of animal health.



Partners' online dissemination actions

Active online activities and coverage of the project were intensified during the second half of the project's lifetime, with a particular focus on the tools that proved to be most effective, such as LinkTADs LinkedIn page and group, LinkTADs blog posts (11 blogs in total), and linking with other networks. Partners regularly presented LinkTADs at relevant events they attended and shared updates on their institutional websites and social networks (detailed information is provided in the table below).

Anonymous 12 November 2014

This training will be very helpful for the Epidemological capacity building in China, and the Chinese government is paying high attention to this project.

Fusheng Guo 12 November 2014

The FETPV training principle is training by doing. Each cohort last for two years with five months classroom training and one and half years field practice. Every trainee need to finish at least one animal disease surveillance and one outbreak investigation with close guiding by the national and international mentors. An epidemiological network has been establishing through the program. The excellent trainees attend the peste des petits ruminants (PPR) and H7N9 influenza outbreak investigation in the country and their recommendations were taken by the national veterinary authority. These might different from the Massey University program. One student graduated from the Massey University program just attends the FETPV new cohort.

Anonymous 12 November 2014

The FETPV welcomes foreign trainee. Two Mongolian veterinarians attended one training module in 2012.

Anonymous 6 November 2014

will the training include foreign students, researcher and scientists?

Anonymous 6 November 2014

Hi Timothy, I think your group are to be commended for the work you have achieved. Are you aware that there is a similar system being administrator from Massey University, coordinated by Peter jolly and involving several veterinary epidemiologists. In a similar manner to you they involve training of local veterinarians in "hubs" and also provided some form of web-based communication and management tools. In this case the training has involved both veterinary and public health (medical) personnel. Given the benefits of both of your groups appear to have achieved, a conversation between the two groups might synergise further efforts in Asia . Regards Mark

Comments under LinkTADs blog entry

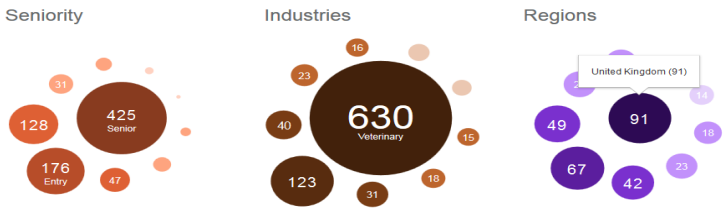
Four dissemination events were organized in the EU and China targeting around 200 participants/event and reaching a wider audience of 4,000 individuals through poster sessions and web streaming. Synergies and joint actions were identified (D8.4 and D8.10); seven webinars were organized and proved to be a cost efficient and popular way to connect with researchers worldwide. A sustainable support network of researchers with experience in EU-China cooperation in the field of animal health was established (Focal Point Network).

Two representatives of the European Commission (EC) agreed to be appointed as members of the FPN and contribute to the dissemination of information circulated within the network.

LinkTADs FPN online space

In order to **ensure the sustainability of the Focal Point Network (FPN)** after the end of the EU funding, the LinkTADs consortium proposes to transform the Network by bringing together more scientists and researchers working in the field of animal health; researchers trained within the exchanges, workshops, webinars and other activities within the duration of LinkTADs. A support system for Focal Point Network Members will continue to exist through the online LinkTADs platform and LinkedIn group; the FPN will use LinkedIn as the preferred online platform, as it is accessible both in the EU and China. The **LinkedIn** network proved to be the most active and successful dissemination tool for LinkTADs, as it is updated daily and engages external researchers into discussions.

LinkTADs had more than 1,200 connections on LinkedIn and it is within the top three referral channels to the LinkTADs website (after direct website hits and Google search) and main referral channel among LinkTADs social networks. The popularity of LinkTADs LinkedIn account has been steadily increasing over the last two years (starting from 44 connections in October 2014).



LinkTADs LinkedIn activity

Members of the Network will be encouraged to proactively contribute to discussions. They will be sharing relevant calls for proposals and abstracts, funding opportunities, relevant news from the animal health field, details about ongoing initiatives and projects, and related information that can be useful for European and Chinese researchers in the field looking to expand their network and learn more about EU-China research and teaching cooperation opportunities. Maintenance of the Focal Point Network will be key, as are the tools and documents accessible through LinkTADs platform, which will continue to be active for the next three years.

In addition to LinkedIn, active dissemination was carried out on Twitter, Facebook and Weibo. As of October 2016, LinkTADs' Twitter account has 479 followers (a four fold increase from October 2015), more than 1600 tweets posted and more than 400 re-tweets/mentions/favourites; 113 Facebook likes and 100 Weibos. The average share of LinkTADs web pages via the share tool is 30 times by external users; 3rd, 4th and 5th issues of LinkTADs' newsletter (October 2015, April 2016 and November 2016) each reached 500 addressees and 25 relevant projects.

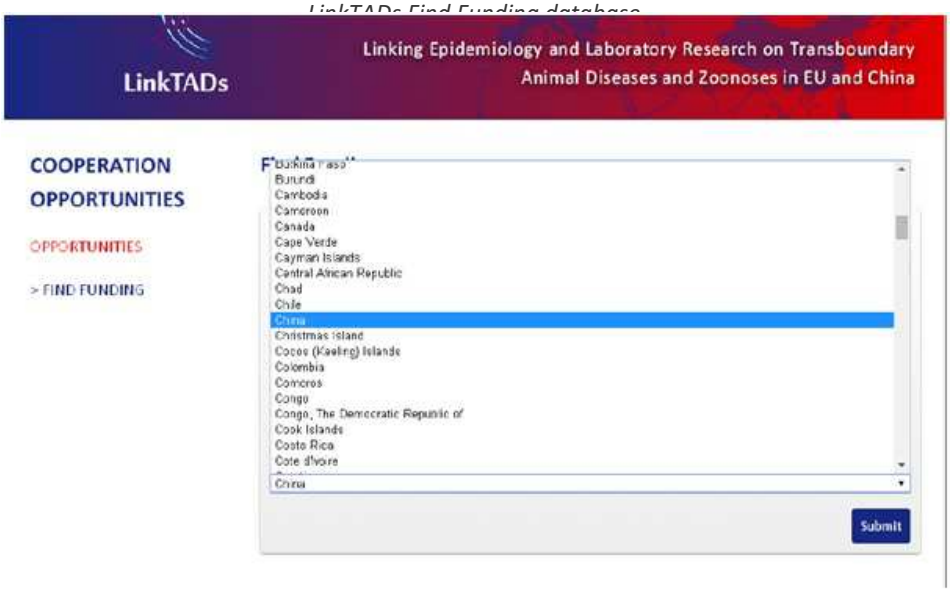
The LinkTADs platform provides all relevant information about EU-China cooperation as well as ongoing and past activities in the EU and China regarding animal health research. Google analytics on the LinkTADs website (October 2014-October 2016) showed that there were 10,432 sessions on the website with 27,187 page views from 6,772 users (35.3% of them were returning visitors). The platform has 133 registered users and 126 newsletter subscriptions. It has been restructured based on users' feedback and partners' recommendations in order to display the information in the most efficient way.

LinkTADs home page

It also provides an opportunity for the researchers to generate, join and contribute to discussions and new collaboration opportunities. The current structure fully takes into account the needs of the users and corresponds to the LinkTADs objective of enhancing EU-China cooperation in the field of animal health and agriculture. In order to comply with the needs of different users, the platform was tailored based on the feedback and suggestions received.

The platform will be maintained as the Information Platform for at least two years after the project ends. The "News and Events" section should be continuously updated in cooperation with relevant projects. Additionally, such important sections, developed uniquely within LinkTADs (such as e-Resources, Find Funding and Partner search) will serve as the documents library, funding opportunities database, and selection of partner organizations active in the field of animal health.

LinkTADs Find Funding database



Contact details and project partners

The consortium's composition and responsibilities are balanced between 11 European and Chinese partners, incorporating some of the major scientific players in the animal health field in both the EU and China. The consortium is well rounded with the presence of partners with a long history of establishing cross-border cooperation and linking research to policy makers and industry. In addition, the combination of networks and dissemination channels of all the consortium partners represents a powerful tool to disseminate the knowledge and mechanisms generated during the project. Moreover, LinkTADs consortium partners have signed a cooperation agreement with the Chinese Academy of Agricultural Sciences (CAAS) regarding mirroring activities.

The consortium partners are:

- Food and Agriculture Organization of the United Nations (FAO) (with Joint FAO/IAEA Programme for Nuclear Techniques in Food and Agriculture and FAO Emergency Centre for Transboundary Animal Diseases (ECTAD) China)
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- Europa Media Non-profit Ltd. (EM)
  Contact person: Gabriella Lovasz, gabriella.lovasz@europamedia.org
- Royal Veterinary College (RVC)
  Contact person: Dirk Pfeiffer, pfeiffer@rvc.ac.uk
- Centre de Coopération Internationale en Recherché Agronomique pour le Développement (CIRAD)
  Contact person: Julien Cappelle, julien.cappelle@cirad.fr
- National Veterinary Institute of Sweden (SVA)
  Contact person: Frederik Widén, frederik.widen@sva.se
- Shanghai Veterinary Research Institute (SHVRI)
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- China Animal Health and Epidemiology Center (CAHEC)
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- Sociedade Portuguesa de Inovação (SPI)
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