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HEALTH AND ENVIRONMENT THROUGH A LEGAL AND ECOLOGICAL PERSPECTIVE: EXAMPLES FROM NAN PROVINCE, THAILAND

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ABSTRACT

A common work on the link between health and environment is conducted in Southeast Asia, hotspot of emerging infectious diseases with potential pandemic risk and hotspot of biodiversity at threat. This study aims to analyze the local impacts of global changes on zoonotic diseases linked with biodiversity and local perceptions of environmental and biodiversity changes. This multidisciplinary work produces various data and intends to develop integrative approaches to favour the dialogue between disciplines and co-build the analysis tools of an issue in a specific context. Thus the common object of study of both the ecologist and the jurist is about and the impacts of global changes on human health at the regional level but also on distinct areas or landscapes at a country, province or village level. From our fieldwork, we analyze the way we combine various scientific knowledge, the choices we made and the limits of the study.

INTRODUCTION

A common work on the issues related to the links between health and environment is undertaken within the framework of the BiodivHealthSEA project (funded by the French National Research Agency), located in Southeast Asia, hotspot of emerging infectious diseases with potential pandemic risk as well as a hotspot of biodiversity at threat notably due to land use changes (Morand *et al*., 2014). This project aims to analyze the local impacts of global changes on zoonotic diseases linked with biodiversity and environment modifications and local perceptions of environmental and biodiversity changes taking into account the global governance architecture, national public policies and NGO interventions in health or conservation and land planning sectors. Multidisciplinary, this project produces various kinds of data, quantitative or qualitative and intends to develop integrative approaches in line with the method based on ecosystem services as presented in the Millennium Ecosystem Assessment (2005) or the One Health approach in order to favor the dialogue between disciplines and co-build the analysis tools of an issue in a specific context.

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Objectives

Within this context, the common goal both of the ecologist and the jurist concerns global changes and their impact on human health at the global scale of the Southeast Asian region as well as at smaller scales in specific parts or landscapes of a country, a province or even a village: environmental in both cases, the examined changes are not of the same nature.

MATERIALS AND METHODS

We intend to analyze, on the basis of the work we conduct in Nan Province, Northern Thailand, the way we combine various scientific knowledge, the choices we make and the limits of the study. The first step will be to examine the scale issues in our respective disciplines. We study how a common work on various data allows us to identify new research questions and provide a new perspective on our own research field as well as a new, iterative, way to describe our hypotheses. We underline how the interdisciplinary work helps us to confirm the scientific validity of results, particularly thanks to the fruitful perspective related to scale issues.

The multi-scale study induces a reflection on the scale choice

The issue is from the start presented as a research on scale variations from global to local and their effects. The point is to study how global changes induce modifications at other scales but as well to determine the local influences able to have repercussions on a national, regional or worldwide level. This aspect is particularly relevant regarding infectious disease transmission. Nevertheless scales of reference are not necessarily the same for an ecologist or for a jurist.

Global scale: the international level

The jurist will study the framework within which the work is conducted and consider all the terms of the problematic. The preliminary task consists in a review of public policies in the area of health and environment (One Health, Eco-Health, infectious diseases in Southeast Asia) in order to identify how those areas are seized by law. Actually we could highlight that the common investment of the FAO (Food and Agriculture Organization), the WHO (World Health Organization) and the OIE (Office international des Epizooties-World Organization for Animal Health-) in the Global Early Warning and Response System for Major Animal Diseases, including Zoonoses (GLEWS, 2006), explicitly referring to the One Health approach has underlined the environmental dimension of the issue and thus influenced the recommendations of one of the biodiversity-related international agreements, the Convention on Migratory Species especially resolution 10.22 of the Conference of Parties which refers explicitly to "One Health" (Lajaunie *et al*., 2015). It led us to examine how this notion later impregnated other resolutions as those coming from the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) or Ramsar Convention (on Wetlands), through the impulse given by the Liaison Group of biodiversity-related conventions, whose role is to enhance coherence and co-operation in the implementation of the conventions.

International environmental law, its principles and fundamental texts, completed by health law and more specifically by the International Health Regulation (IHR)—and the reflection that led to its amendment—guide the jurist's approach. Relying on those elements, the legal scientist may determine the judicial framework of action of the member states parties to multilateral environmental agreements and to the IHR and thus list the type of commitment regarding the States concerned by the study. At a global scale, the ecologist collects data related to climate change, climate variability as well as the trends of biodiversity erosion (endangered species), biological invasions and emergence of infectious diseases at pandemic potential. The analysis of such data shows the existence of a positive correlation between biodiversity (number of birds and mammals species) and the number of infectious diseases by countries in the region Asia-Pacific. Countries with high biodiversity level host a high diversity of infectious diseases which generates conflicts between conservation goals and health policies (Morand *et al*., 2014). Nonetheless, if we consider the evolution of the number of epidemics during the last decades, we observe a positive correlation between diversity loss (endangered species or forest cover) and the increase of epidemic of zoonotic diseases or of diseases caused by arthropod vectors. The biodiversity loss appears as a determinant, at the country's scale, of the augmentation of epidemics (and among them epidemics of emerging infectious diseases). However, such correlative studies do not explain the (local) ecological mechanisms responsible for the statistical increase of epidemics.

Regional Scale: Bio-Geographic and Political Scale

The regional scale is particularly relevant when it comes to studying the policy regarding infectious diseases: a real reflection is focusing on Southeast Asia, considered as a sensitive area for emerging infectious diseases. This reflection is led at two distinct levels: the level of regional office of international organizations (WHO, FAO, UNEP, OIE) and the ASEAN level (or the level of its member states). Numerous initiatives tackle the issue through various perspectives: we can refer to the Health and Environment Initiative (2004) associating all the ASEAN Member States and China, South Korea, Japan and Mongolia (gathering regularly the Ministers of Environment and Health of all those States) under the auspices of regional offices of UNEP and WHO and which targets a myriad of issues related to the links between health and environment (for instance climate change and ecosystems modification). The ecologist calls for biogeography, discipline which takes into account the geographical distribution of the living world. Regarding Southeast Asia, we distinguish the Indochinese Region (Burma, Laos, Vietnam, Cambodia and Thailand over Kra isthmus), the Sundaic Region (Malay Peninsula including the part of Thailand located in the southern part of Kra isthmus, Borneo and Indonesian islands in the northern part of Wallace's line), the Wallacean region (Timor Leste and Indonesian islands in the southern part of the Wallace's line) and the region of the Philippines (including the Philippine Archipelago only). The distributions of the living world, and particularly of reservoirs or vectors of pathogenic agents depend on the geological and climatic history. From species samplings on the field, it is possible to predict present, past or future distributions using environmental niches modeling. This work requires an important effort on the field and in laboratories (genetic analysis) and is essential to reintroduce the geographic distribution of species into the geopolitical space. The division of biogeographical entities does not fit with the politico-administrative divisions. The regional scale, beyond national boundaries, may sometimes be the good observation level to study environmental and sanitary issues and consider collective commitments of the states at a regional level, as it can underline the common trends while it can smooth the disparities linked with national specificities. Nevertheless, the national scale is essential to the jurist as is it the level of exercise of State's sovereignty.

National and Local Scale

We thus have to recall that, if the Convention on Biodiversity is an international agreement, its article 3 states: "States have (…) the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction."

The national scale is the scale of the implementation of international agreements in which States commits to respect certain principles that they must integrate into their national legal system. In the article 3 of the Convention on biodiversity cited above, we can observe that spatial scales can overlap and measures taken at the national level can have repercussions on the environment of neighbor states. An issue common to different states will require a treatment at a common scale: this is for instance the case of the Agreement on Tran boundary Haze Pollution of 2002 signed by all the ASEAN Member States.

Administrative Division or Landscape Unit

At the local scale, the study focuses on Nan Province: within the administrative unit constituting the Province, the legal scientist will examine the competences devolved to the Province with respect to the principle of subsidiarity and those that belong to the central power, mainly through areas of action related to ecology: agriculture, water and land management, land planning or conservation policy. It will also consider specific management modes of natural resources such as participatory management of community forests. It is necessary to observe and define the links between national and local scale, to understand for instance how a national political commitment (sometimes resulting from an international agreement) is implemented at the local level, within a regulatory framework (reduction of the use of pesticides, soil conservation). We examine the links between global and local scale through the example of an international convention like the United Nations Framework Convention on Climate Change (1992) and the REDD+ initiative aiming at the reduction of greenhouse gas emissions related to deforestation and forest degradation in developing countries as well as conservation, sustainable forest management and enhancement of forest carbon stocks. A project conducted in Nan Province, in Ban Huay Win shows that financial incentives related to REDD+ can help to maintain an efficient and sustainable participatory forest management (Suzuki, 2012).

At the local scale, a group of citizens (according to section 142 of Thai Constitution of 2007) a group of 10 000 people having the right to vote have the possibility to present a law proposal before the Parliament. This can help to bring local issues to the attention of the national level. The ecologist relies on the cartography of ecosystems and landscapes. The geology, the orography, the hydrology and the climate are crucial in the delimitation of environmental envelopes allowing the development of large plant communities (dipterocarp forests) and associated animal communities. At the local scale, the habitats characterized by their diversity in terms of elementary components (forests, rice fields, crops, buildings) and their organization (connectivity) are mapped using remote sensing technologies and geomatic tools as well as field observations. Human epidemiological data can be related with the distribution of reservoirs while taking into account the local context and the evolution of land use and land cover (Della Rossa *et al*., 2015). Apart from the usual administrative scales (international, national, local), it would be interesting to imagine a law more in line with the ecological or landscape scale, as it is the case for the water law and water management which applies at the scale of a river basin without consideration of boundaries and implies to define common rules of water resource use.

Temporal scale

Changes in land use, natural resources (water, forest) or linked to land planning resulting from public policies or regulations have impacts in the medium or long term and effects that have not been anticipated. It confirms the need for coordination of the different sectors involved into decision-making and implementation of the regulation. In Nan for instance, the financial incentive to switch from subsistence farming to commercial agriculture associated to an economic policy favoring maize crop led to an intensive use of pesticides and to reduction of the forest.

The ecologist is also using temporal scale for example to develop environmental niches models integrating climate change scenarios in order to propose future potential species distribution such as rodents and their zoonotic pathogens (Morand *et al*., 2015). A longitudinal study linking the main regulatory measures in the agricultural area or natural resource management and the potential ecological changes would be able to reveal the side-effects of some regulations and thus the pitfalls to avoid. Models proposed by the ecologists should be as well considered in order to forecast the necessary regulations in order to smooth the climate change effect and to improve natural resources management or to anticipate sanitary problems (agricultural pollution or infectious diseases).

RESULTS AND DISCUSSION

An iterative approach to refine hypotheses

The iterative approach is dynamic, allowing the progressive integration of new elements whether they are political, legal or ecological elements. The use of integrative approaches is recommended by the United Nations since the Rio Conference of 1992 (e.g., principle 9 of the Rio Declaration, 1992). A resolution of the First United Nations Environment Assembly (2014) echoes the IPBES (Intergovernmental Platform on Biodiversity and Ecosystem Services) concerns and insists on the necessity to provide appropriate tools to implement this kind of approach and to promote a strong science-policy interface. In its structure itself, the Biodiv Health SEA project responds to these recommendations aiming at strengthening a method associating the different dimensions of changes apprehended by diverse disciplines.

It supposes to integrate the various scales we examined above not only to have an overview of all the ecological, legal and political data but also to identify the missing elements. In the legal area, it is obvious that the crucial issue and the most delicate to highlight is the reality of legal norms and the efficiency of their implementation. Indeed, it seems that there is a missing link when we examine the involvement of Thailand into sustainable agriculture: it is the study of the real enforcement at the local scale as well as the need to bring to light the concrete measures taken to this end.

Confront Work Conducted in Both Disciplines to Strengthen the Results

Explanatory elements of some local changes can be given by the study of public policies (agricultural policy/financial incentive) or the study of law (extend and limit of the logging ban: which area, which management, which control). Local observations may suggest a necessary change into regulations and thus at different scales. Law is familiar with the technique of "body of evidences" which for lack of tangible or direct evidence, particularly in a complex situation, calls for various criteria in a converging and consistent way. That method is compatible with a systemic approach but this integrated approach also intends to highlight conflicts, contradictions or sticking points within a discipline or among disciplines. For instance, in law it is difficult to conciliate the principle of protection of the environment with the principle of freedom of trade as they respond to conflicting logic (Delmas-Marty, 2014). The bridging between ecology and law can allow demonstrating that the legislator is missing a point by omitting to take into account induced effects within ecosystems resulting from the implementation of a regulation. The ecologist also observes the existence of trade-offs, as the one between conservation of biodiversity which will protect reservoir species and potential human pathogens, as bats and their viruses, on the one hand, and public health which intends to control or even eradicate pests and pathogens carriers, on the other hand.

Conclusion

This work done at a project's scale constitutes a field experience with a multidisciplinary approach. It would be interesting to examine it further as legal scientists need scientific inputs in order to elaborate appropriate legal rules and converging policies in the areas of health and environment. If the temporal scale plays an essential role into the two disciplines presented, its role is difficult to underline as changes appear following a long time lag which is different if they result from the implementation of legal measures, or if they occur with climate change or ecological modifications. The legal time, time of the elaboration and the implementation of legal norms, should be taken into in to consideration. For instance, if environmental changes can arise abruptly, we should be able to integrate them into the legal norm without attempting legal order stability. The precaution principle is interesting in that sense as it obliges States to build a compelling legislative framework which integrates potential risks in the absence of scientific evidence (Prieur, 2006). In European Law, the recourse to that principle has been detailed by a communication of the European Commission. It states that three conditions should be gathered to use that principle: the identification of potentially negative effects; scientific evaluation of the potential adverse effects; and the extent of scientific uncertainty (European Commission, 2000).

This principle, despite the confusion related to its use, highlights the indispensable role of the work of the ecologist to inform the jurist on its own work on health and environment issues and as well to evaluate it. As we have seen, the issue related to the choice of scale is determining both for the ecologist and the jurist: hypotheses and methodology change according to the chosen scale. Ethical issues can arise in this research as they concern environment and infectious diseases. The mapping of infested zones or the identification of polluted areas or areas with depleted natural resources, particularly when they target ethnic minorities, could be used in various ways by decision-makers and it belongs to the scientist to act responsibly when it comes to publishing data. It is also necessary to consider the multitude of data and thus the choice of those constituting the background of legal measures or in contrast to unravel their adverse effects. The uncertainty related to the appropriate observation scale is to consider: a phenomenon happening locally is not necessarily transposable at another scale and this notion should be integrated into scientific results. Sensitive data sharing should lead to a common reflection associating researchers from different disciplines to determine a guide of good practices integrating the specificities of the region studied. The common approach of the ecologist and the jurist would probably lead to the elaboration of techniques to communicate scientific results that could be used, with the necessary precaution, into the definition of public policies and legal norms.

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