

## REQUIREMENTS OF THE MANAGEMENT PLANS OF PROTECTED AREAS TO INCLUDE SUPPORTIVE MEASURES OF SANITARY-VETERINARY IMPORTANCE

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**Abstract.** Lately, a series of studies has emphasized a direct connection between the dynamics of protected wildlife and the outbreak of diseases of sanitary-veterinary quarantine even within protected areas. These outbreaks are crucial in installing sanitary-veterinary quarantine management plans at regional or national levels with significant costs associated with sampling, molecular diagnostics and application of sanitary-veterinary control and eradication measures. On one hand, it is recognized that the increase of biodiversity is always associated with an increased incidence of sanitary-veterinary issues of quarantine importance. Romania is under sanitary-veterinary quarantine for more than 15 years on various diseases thereby harming livestock and export of meat and meat products. The aim of this study is to reveal the costs associated with sanitary-veterinary quarantine diseases and links between the regulatory frameworks on nature protection and sanitary-veterinary quarantine. The study analysed the consistency of the management measures adopted through the current management plans for Romania and the present plans for sanitary-veterinary control and eradication of quarantine diseases. This study revealed the need to assess the economic costs associated with implementing the current sanitary-veterinary action plan for 2015-2020. The most affected area is the food economy that requires a re-evaluation of the need for studies on predicting the dynamics of protected wild species of interest depending on environmental factors. Such studies should evaluate the feasibility of current management measures applied both in protected areas and by the plan of sanitary-veterinary quarantine to generate new alternatives in ensuring the favourable status of conservation of endangered wildlife.

**Keywords:** protected areas, plan of sanitary-veterinary quarantine, management plan, synergetic measures.

**Rezumat. Necesitățile planurilor de management ale ariilor protejate pentru a dezvolta măsuri suport de importanță sanitar-veterinară.** În ultima perioadă sunt publicate o serie de studii care subliniază conexiunea directă dintre dinamica speciilor sălbatice protejate și apariția bolilor de carantină sanitar-veterinară inclusiv în arii protejate. Apariția acestor focare este determinată în instalarea regimului de carantină sanitar-veterinară la nivel regional sau național cu costuri semnificative asociate colectării probelor, diagnosticării moleculare și aplicării măsurilor veterinare de control și eradicare. Pe de o parte se recunoaște faptul că întotdeauna creșterea biodiversității se asociază cu creșterea incidenței cazurilor de carantină sanitar-veterinară. România este în carantină sanitar-veterinară de 15 ani pentru diferite boli prejudiciind în acest fel creșterea animalelor și exportul de carne și produse din carne. Scopul acestui studiu este de a releva costurile asociate bolilor de carantină sanitar-veterinară precum și legăturile dintre legislația de mediu și cea pentru carantină sanitar-veterinară. Pe de altă parte au fost analizate coerența dintre măsurile de management din planurile de management adoptate pentru România până în prezent și planurile sanitar-veterinare pentru controlul și eradicarea bolilor de carantină sanitar-veterinară. Din acest studiu a reieșit necesitatea evaluării costurilor economice asociate implementării planului de carantină sanitar-veterinară pentru perioada 2015-2020. Cel mai afectat domeniu economic fiind cel alimentar se impune o reevaluare a necesarului de studii privind predicția dinamicii speciilor sălbatice protejate de interes funcție de factorii de mediu. Rezultatele acestor studii pot evalua fezabilitatea măsurilor actuale de management aplicate atât în ariile protejate cât și în cadrul planului de carantină sanitar-veterinară, generând noi alternative pentru asigurarea stării favorabile de conservare a speciilor sălbatice periclitare.

**Cuvinte cheie:** arii protejate, planul de carantină sanitar-veterinară, plan de management, măsuri sinergice.

### INTRODUCTION

Protected areas promotes the conservation and sustainable use of biodiversity as well as the maintenance of the healthy status of species and their habitats (COSTANZA et al., 2016). On the other hand, protected areas are relevant for protecting, at the landscape level, biodiversity as species, habitats and traditions related to local communities and indigenous local communities (LEE, 2016; MOORCROFT, 2016). However, the higher biodiversity is, the higher risks for maintaining healthy species and habitats is (OSTFELD & KEESING, 2017). Since 1993, it has been stated that, at landscape level, we need to give more attention to smaller organisms to maintain biodiversity and conserve ecosystems (FRANKLIN, 1993).

Romania entered the European Union with the highest biodiversity among all Member States (SANTINI et al., 2016) and, in 2017, it officially declared 1075 protected areas covering 24.84% of the mainland surface (ANTONESCU et al., 2015; \*\*\*, 2017a). Based on the provisions of Art. 6. of the Habitats Directive, it is stated that Member States shall establish the necessary conservation measures and will provide guidelines to further integrate management plans in other development action plans that may be coupled with the provisions of Art. 6.4. last paragraph, where it is stated the need to rise attention on issues related to human health and public safety and other imperative reasons of overriding public interest (TROUWBORST et al., 2016). The same healthy issue is addressed by the current Birds Directive 2009/147/EC based on the provisions of Art 1.a) and the first line. Of interest is the term “favourable status of conservation” provided by the Art. 1 let. f) of the Habitats Directive, where it is stated that *its natural range and areas it covers within that range are stable or increasing*. In 2016, Trouwborst and collaborators draw attention on the weakness of the concept “favourable status of conservation” (FSC) that remains a subject to “considerable confusion when considering Directive interpretation and operationalization, impairing the effectiveness of its implementation”. If the understanding of FSC must be defined by increasing the number of individuals will not be beneficial in case of outbreaks of pests and diseases of sanitary-veterinary

importance inside or outside protected areas. This relates to the Franklin's statement regarding the relevance of microorganism in maintaining the health of ecosystems (FRANKLIN, 1993).

The current management plans need to include management measures to ensure that the microorganisms that may prejudice the equilibrium of ecosystems are controlled and / or eradicated. Most of the sanitary-veterinary species of quarantine importance are microorganisms and invertebrates. Recent analyses of the management plans adopted in Romania do not comprise such measures, and do not address such risks (ANTOFIE, 2016a; 2016b; 2016c). Such a gap is also noticed in the proposed guidelines for developing management plans for the European ecological network of protected areas Natura 2000. Moreover, the newest article published about issues related to large carnivores does not connect for example issues between FSC and sanitary veterinary aspects (TROUWBORST et al., 2016). One major gap in developing the management plans is the lack of phytosanitary and sanitary-veterinary measures as Romania already run a national action plan covering the entire country territory for different outbreaks regarding pests and diseases of utmost importance that are highly costly (ANTOFIE, 2016c). Moreover, the last report regarding the state of environment in Romania does not define phytosanitary and sanitary-veterinary needs to be developed at the borders or inside protected areas for pests or diseases of quarantine relevance (TERRAZ & CHAPUT, 2007; \*\*\*, 2015c).

The scope of this article is to find connections between the current regulatory frameworks for nature protection and for sanitary-veterinary domain to propose guidelines in developing new measures to be included in the future management plans and applied in case of protected areas. These measures should act synergetic with sanitary-veterinary action plans for controlling and eradicating pests and diseases at national level.

## MATERIAL AND METHODS

This paper is developed based on screening the current regulatory frameworks for nature protection and sanitary-veterinary domain based on an integrative approach regarding the SWOT analysis (strengths, weaknesses, opportunities, and threats) related to existing synergistic management measures between both legal frameworks. The case study is focused on the outbreaks of rabies in Romania, as well as in neighbouring countries, and it takes into consideration the existing gaps in the current regulatory framework of both domains: nature protection and sanitary-veterinary.

## RESULTS AND DISCUSSIONS

*Diseases and pests of sanitary and veterinary importance in carnivores and herbivores.* It was already stated that the concept of FSC is creates confusion for the proper development of management measures for large carnivores (TROUWBORST et al., 2016). The major large carnivores residing in Romania are the following: wolf (*Canis lupus*), brown bear (*Ursus arctos*) and Eurasian lynx (*Lynx lynx*). The survival of these species is due to large herbivores such as ungulates species and, in Romania, the species belonging to Cervoidea and boars are the species preferred by large carnivores (ROZYLOWICZ et al., 2011). However, these herbivore species are among the most important reservoirs of outbreaking diseases of sanitary-veterinary importance (PREDOIU & UNGUREAN, 2010) with negative impact on the economy of the country (i.e. classic swine fever, avian influence virus, rabies, tapeworm, Trichinella and so on).

Thus, in Slovakia, the increased population of red fox (*Vulpes vulpes*) was coupled with the increased spreading of the risks for rabies (i.e. provoked by a RNA virus belonging to *Lyssavirus* genus and Rhabdoviridae family) into urban and rural areas, including recreational localities. Most of these places were within protected areas or in their immediate proximity. The scientists reported that, during 2004, the high temperatures recorded for that year influenced the spreading of foraging and migration behaviour of wildlife (HURNÍKOVÁ et al., 2009). Rabies is considered as one of the most feared of all infectious diseases with a long history in human population (ANDERSON et al., 1981). These changes in the behaviour of wildlife were coupled with the increase of game population associated with the large carnivore predators as well as with the outbreak of rabies in specific areas. It was for the first time when another infection caused by fox tapeworm *Echinococcus multilocularis* was seriously taken in consideration for developing management measures that cover sanitary-veterinary measures (HURNÍKOVÁ et al., 2009). The authors pointed out the necessity to introduce preventive and control measures in management plans for protected areas that can minimize the risk of parasite spread and transmission to humans. Also, veterinary and sanitary educational programmes for tourists and hunters were proposed to maximize prevention and control of both, echinococcosis and trichinellosis.

An analogous situation was recorded for Lithuania where the study was focused on zoonosis spread by red foxes (*Vulpes vulpes*) and raccoon dogs (*Nyctereutes procyonoides*) especially due to the change in their behaviour (BRUŽINSKAITĖ-SCHMIDHALTER et al., 2012). In 2004, a complex study regarding the spread of *Echinococcus granulosus* which affected protected areas of Spain was published (CARMENA & CARDONA, 2014), confirming the direct interconnection between herbivores and carnivores in the outbreak of such infections of sanitary-veterinary impact in a similar way like in other countries from Sub-Saharan Africa (ROMIG et al., 2011) or Australia (JENKINS & MORRIS, 2003). Recently, information on the impact of this pest has been published in a doctoral thesis for Estonia (LAURIMAA, 2016).

In Poland, it was also reported the direct connection between the outbreak of quarantine pests and the increase in the population of small carnivores but for *Trichinella britovi* (MOSKWA et al., 2012). Similar cases have been reported for small carnivores in Europe, namely in Austria, Tyrol (VISSER et al., 2011). Recently, in a study regarding the reintroduction of griffon vulture in the Retezat National Park (i.e. ROSCI0217 Retezat and ROSPA0084 Munții

Retezat), Romania raised attention on the lack of coherency between nature protection and sanitary veterinary regulatory frameworks. The authors raise attention on the potential incidence of sanitary-veterinary diseases of quarantine interest (KELEMEN & MERTENS, 2014). A comprehensive study regarding the outbreak of bovine spongiform encephalopathy in Europe also rise the attention on the gaps between environmental and sanitary-veterinary policies especially for emergency situations (MARGALIDA et al., 2010).

*Control and eradication of zoonosis in the European Union.* At the European level, zoonosis is addressed by a complex regulatory framework among which the Directive 2003/99/EC of the European Parliament and of the Council of 17 November 2003 on the monitoring of zoonosis and zoonotic agents, amending Council Decision 90/424/EEC and repealing Council Directive 92/117/EEC; it sets relevant capacity building guidelines for all Member States. This Directive is fully transposed by the National Sanitary Veterinary and Food Safety Authority (NSVFSA) based on Order 34/2006 regarding the approval of monitoring norms against zoonosis and other agents. In the same year, based on Order 160/2006, it was transposed the European Commission Decision 564/2004/CE regarding the functioning of reference laboratory and on Order 23/2006, Regulation 2.160/2003/CE and Regulation 1.003/2005 referring to the control of *Salmonella* sp. and other zoonotic.

NSVFSA is currently implementing control measures for ensuring the healthy status of certain groups of animals important for trade purposes such as: birds, cattle, swine, horses, sheep, bees, fish and other groups of animals (e.g. the last group of animals is treated based on the provisions of the Directive 2010/63/EU). Currently, it is implemented an integrated plan for zoonosis controlling and combating at the European Union level based on the Regulation (EC) No 882/2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules (\*\*\*, 2004). This Regulation is adopted following the Directive 2003/99/EC of the European Parliament and of the Council of 17 November 2003 on the monitoring of zoonosis and zoonotic agents, amending Council Decision 90/424/EEC and repealing Council Directive 92/117/EEC. Based on the provisions of the Directive, Annex III, a coordinated monitoring programme must define: its purpose, duration, geographical area or region, the zoonosis and/or zoonotic agents concerned, the type of samples and other data units requested, minimum sampling schemes, the type of laboratory testing methods, the tasks of competent authorities, the resources to be allocated, the estimation of its costs and how they will be covered and the method and time of reporting the results. It is at the Member State level to further develop strategies regarding the improvement of prevention methods additionally to the provisions of the European Union regulation. Developing the entire capacity building for making effective the implementation of the sanitary-veterinary regulatory framework in Europe requires high level expertise of human resources as well as financial resources. However, when quarantine is imposed for sanitary-veterinary diseases and pests, measures must be applied all over the country territory, including inside protected areas considering the ecology of species and habitats.

*The case study regarding rabies.* To have a fast access to the most available data regarding rabies, the European Union is supporting the Rabies Information System of the WHO Collaboration Centre for Rabies Surveillance and Research. Based on the available data, Romania recorded an increased incidence of rabies between 2000 and 2015 with a net 350% increased. Such an increased incidence of rabies virus in both domestic and wild animal species may be influenced by higher values of temperature recorded during the last 5 years (i.e. 2012), when it was registered an increase of 1250%. High temperatures influence game multiplication (i.e. herbivores) as a food basis for carnivores. This percentage reduced after 2013 at half, but still the general trend has been upward starting with 2000 (\*\*\*, 2017b). Such an increased trend was recorded for Bulgaria and Hungary. In Hungary, the incidence of the virus in domestic and wild animals was almost double compared to Romania where herbivores are under wolf control. However, for the Republic of Moldavia, Serbia and Ukraine, all neighbouring countries, the trend is negative based on the Rabies Bulletin Europe. The analysis of these figures draws attention on the needs regarding the study on prediction trend of wild animal species of sanitary-veterinary importance at the country level with focus on connecting wildness, diseases and pests of sanitary-veterinary importance and of the impact on local communities and the economic environment.

Taking as a case study – rabies, major species as reservoir of the virus are foxes but also other species (i.e. bats). In Romania, in 2009, it was recorded a total of 75 cases (i.e. 47 in wild animals, 27 in domestic animals and 1 bat) that imposed the oral vaccination of all wild animals (LOJKIĆ et al., 2009). The entire programme was implemented by NSVFSA including protected areas in 2007 (NAJAR & STREINU-CERCEL, 2012). However, no prediction studies have been published regarding the tendency of wild species population and no correlation have been published in this regard to rather develop preventing measures than controlling and eradication measures that are more expensive. Only for the diagnostic of rabies the authorities need to perform RT-PCR analysis for the serotype of the virus and the type of oral vaccination based on baits (LOJKIĆ et al., 2009).

Based on Najar and Streinu-Cercel research, it results the major bite inflicting animals were cats and dogs, particularly stray dogs (more than two thirds of the cases (NAJAR & STREINU-CERCEL, 2012). In Romania, it is already known the situation with stray dogs that may behave as in the wildness in packs and the situation becomes more complicate when applying a coherent oral bait programme against rabies. However, cats are also relevant for transmitting the virus based on the Romanian authors and they state the need for a new strategy regarding the prevention of animal rabies and its transmission to humans. The current rabies eradication programme for 2015–2020 received couple of recommendations from the European Commission DG SANCO among which relevant is that of guiding Romania to ensure the review of the set of measures to be applied to contact animals in case of an outbreak of rabies (\*\*\*, 2015a). They further consider that such measures shall be based on the available relevant scientific knowledge and include all the necessary precautions to secure rapid control of the disease and to reduce the risk of spread of rabies to people or other animals based on points 5(d)(e) of the

Annex to Commission Decision 2008/341/EC. This statement entitles us to consider prediction studies related to the dynamics of wild species of sanitary-veterinary importance in already identified hot spots as habitats under the DG SANCO framework. These recommendations include the compulsory vaccination programme for dogs and cats against rabies supporting the scientific conclusions of Najar and Streinu-Cercel published in 2012. A comprehensive situation regarding all sanitary-veterinary issues of the European Union importance was already published in 2015 by DG(SANCO) (\*\*\*, 2015a). Based on this report, Romania shares no responsibility with the Ministry of Environment on issues related to animal health but only to genetically modified organisms and pesticides.

*Major and potential migration routes of wild and animals susceptible for spreading diseases.* There already appeared scientific publications supporting the role of authorities in the management of diseases due to bird migration (RAPPOLE et al., 2000). A high attention is given today to animal migration belonging to many groups, vertebrates or invertebrates, due to the seasonal changes in resources (ALTIZER et al., 2011). The authors mentioned their involvement in spreading raccoon rabies, influenza virus in humans or nuclear pluhedrosis viruses in insects. Also, the authors recognized the potential effect of global warming on outbreaking diseases and it seems to be explained especially for rabies in Romania and neighbouring countries. Later, in 2013, scientists stated the importance of predictive frameworks to overcome the spread of infectious diseases due to animal movement (ALTIZER et al., 2013). These authors discussed the effect of climate change on animal behaviour that can support on one hand the spreading of diseases or on the other hand can stop the spreading of other diseases.

These studies were further supported by other authors that developed a clear framework for assessing the impact on residing communities of wild and domestic animals with clear impact on local communities (BAUER & HOYE, 2014). Based on these results it is relevant that protected areas in charge with the monitoring of wild fauna to further develop maps related to major and minor routes of movement or migration and their potential incidence in hot spots of extremely importance from sanitary-veterinary point of view. Other studies documented the direct connection between biodiversity and richness of pests that varies consistently across parasites with different transmission modes, response variables, group sizes, and host taxonomy (RIFKIN et al., 2012). These authors also drew attention to the need for developing prediction framework to be used for maintaining the healthy status of fauna. Moreover, lately it was recorded the increased incidence of new emerging infectious disease (ENGERING et al., 2015). The importance in understanding animal behaviour and pests or diseases spreading in a new climate should alert authorities and act for developing new types of management measures based on these authors.

*New framework proposal for developing synergetic measures.* The new framework proposal starts from evaluating the financial feasibility of current management measures adopted based on the current management plans and the costs associated with implementing the sanitary veterinary action plan for controlling and eradicating pests and diseases of quarantine importance (Fig. 1).

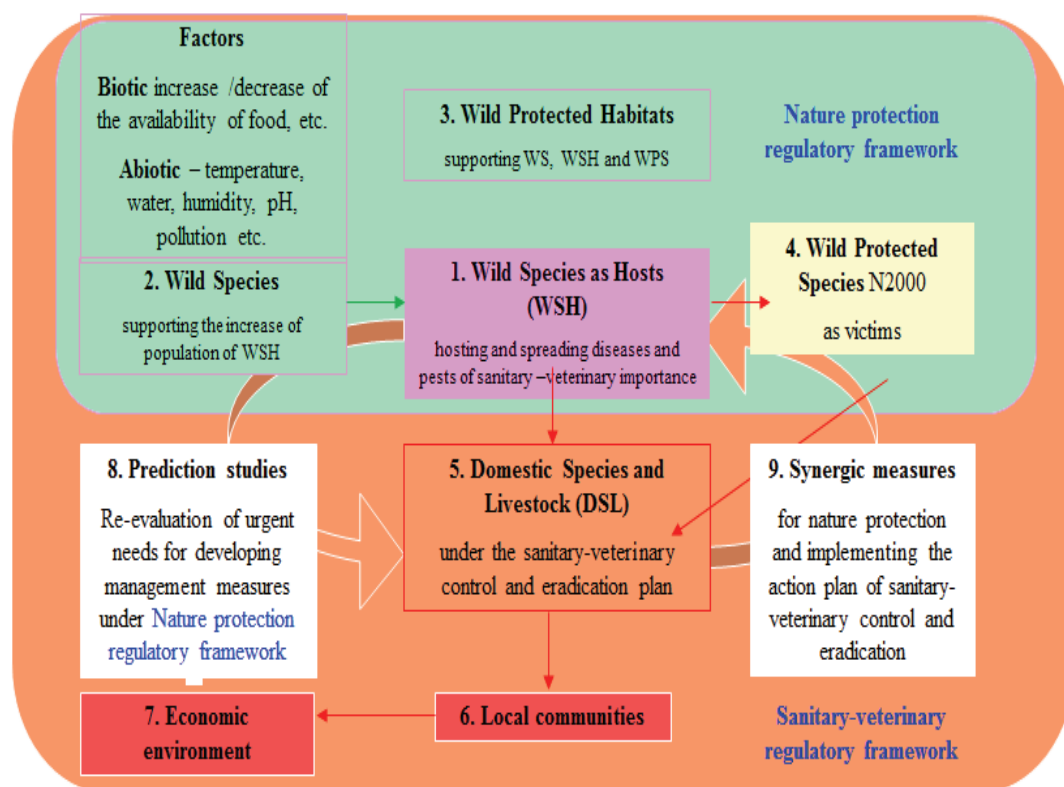


Figure 1. New proposed framework for analysing the gaps between the current regulatory frameworks for nature protection and sanitary-veterinary domain. The proposal starts with wild species as hosts and ends with the economic environment needs that may support prediction studies needed for elaborating synergetic measures.

This proposed framework rises attention on the need to interconnect the regulatory frameworks of sanitary veterinary importance with that of nature protection based on the requirements imposed by the economic environment. It was already known prohibitive costs Romania is paying for implementing sanitary-veterinary measures that are not considering in their efforts the need for developing synergetic measures with nature protection regulatory framework. The economy of the current sanitary-veterinary action plan is based on solving effects and not on finding solutions in solving the trigger of the problem.

Quarantine problems existed before 2007 through Romania's territory and not a single prediction study is in place to generate supportive management measures for ensuring that hotspots of sanitary-veterinary importance are maintained under a strict control. We also take into account new publications regarding the need for modelling vector-borne disease risk maps under climate change for migratory animals that can be used in the prophylaxis of sanitary-veterinary diseases (HALL et al., 2016). Based on the recommendations of these articles it is obvious that mapping the risks in hotspots for outbreaking diseases will place major changes in the management plans of wildlife, particularly in the control of wild species as hosts, protected species directly or indirectly affected, and the healthy status of protected habitat. In Romania, case transhumance or short movements of livestock will be more regulated within the borders of protected areas.

Relevant stakeholders should be under a special awareness programme regarding their activities inside protected areas. It is more than obviously that the maintenance of the favourable status of conservation of species needs to be readdressed not as a constant positive trend of a species but rather to a larger time scale to allow the species survival as well as the maintaining under strict control of outbreaking diseases of sanitary-veterinary importance. Moreover, the concept of free zones of sanitary-veterinary disease quarantine should be included in the scope of management plans for protected areas. Only based on exercising cause and effect issues related to outbreaks may enrich the management plans for protected areas with effective measures that further may support the economy of the country.

## CONCLUSIONS

Romania entered the European Union with the highest biodiversity as species and habitats and is paying a prohibitive price regarding the implementation of sanitary-veterinary plan for controlling and eradicating diseases and pests. Even if there is a proved direct connection between the high biodiversity and the increase of outbreaking of diseases of sanitary veterinary importance no economic study was published regarding the real impact of the sanitary-veterinary plan on the economy of the country. No synergetic measures are in place for connecting the current management plans adopted for protected areas and the current sanitary-veterinary action plan for 2015-2020 (\*\*\*, 2015b). There is a great need for declaring zones free of zoonosis inside protected areas. Only based on this it will be possible to develop effective synergetic measures for ensuring the conservation of species and their healthy status in the future. The current policy for environmental protection needs to be supported for developing innovative studies on wild species and hotspot areas regarding the dynamics of relevant species and outbreaking of sanitary-veterinary diseases correlated with the incidence of biotic and abiotic factors. The current action plan of the sanitary veterinary authorities on diseases of quarantine importance needs to act on the cause and not on the effect of outbreaking due to the prejudice of national economy.

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