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Risk assessment of African swine fever in the south-eastern countries of Europe

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Abstract

The European Commission requested EFSA to estimate the risk of spread of African swine fever (ASF) and to identify potential risk factors (indicators) for the spread of ASF, given introduction in the south-eastern countries of Europe (region of concern, ROC), namely Albania, Bosnia and Herzegovina, Croatia, Greece, Kosovo, Montenegro, North Macedonia, Serbia and Slovenia. Three EU Member States (MS) – Croatia, Greece and Slovenia – were included in the ROC due to their geographical location and ASF-free status. Based on collected information on potential risk factors (indicators) for each country and the relevant EU regulations in force, the estimated probability of spread of ASF within the ROC within one year after introduction into the ROC was assessed to be very high (from 66% to 100%). This estimate was determined after considering the high number of indicators present in most of the countries in the ROC and the known effect that these indicators can have on ASF spread, especially those related to the structure of the domestic pig sector, the presence of wild boar and social factors. The presence of indicators varies between countries in the ROC. Each country is at risk of ASF spread following introduction; however, some countries may have a higher probability of ASF spread following introduction. In addition, the probability of ASF spread from the ROC to EU MSs outside the ROC within one year after introduction of ASF in the ROC was estimated to be very low to low (from 0% to 15%). This estimate was based on the comparison of the indicators present in the ROC and the already affected countries in south-eastern Europe, such as Bulgaria and Romania, where there was no evidence of ASF spread to other EU MS within one year.

Keywords: African Swine Fever, risk, spread, south-eastern Europe

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Summary

TOR 1 requested EFSA to estimate the risk of spread of African swine fever (ASF) in the south-eastern countries of Europe and to identify the main risk factors of spread. For the purpose of this risk assessment, the south-eastern countries of Europe included all ASF-free countries in south-eastern Europe in December 2018 (the moment of receiving the mandate), namely Albania, Bosnia and Herzegovina, Croatia, Greece, Kosovo, Montenegro, North Macedonia, Serbia[1] and Slovenia. Collectively, these countries are subsequently referred to as the 'region of concern' (ROC). Three of the above-mentioned countries (Croatia, Greece and Slovenia) are EU Member States (MSs) that were included in the ROC due to their geographical location and ASF-free disease status.

The risk assessment focused on the assessment of the probability of ASF spread within the ROC, as well as the probability of spread from the ROC to as-yet-unaffected EU MSs outside the ROC following introduction of ASF into the ROC. Considering the short time frame of the mandate, EFSA was not asked to assess the likely direction of ASF spread, but rather to perform a qualitative assessment and to highlight the factors that may impact the spread of the disease from the ROC, once introduced, and to evaluate if some countries in the ROC are at higher risk of spread than others.

To assess the **probability of spread of ASF within the ROC after introduction**, five groups of potential risk factors (indicators) were identified that could potentially affect the spread of ASF in the ROC, once introduced, including: (1) indicators related to ASF spread in domestic pig populations (i.e. if swill feeding is allowed in the country, the presence of free-ranging pigs and home slaughtering as well as a substantial number of smallholders in the country); (2) indicators related to spread of ASF in wild boar populations (i.e. the average wild boar density and suitable wild boar habitat in the country); (3) indicators related to connectedness within the area (i.e. trade of pigs and pork/products); (4) indicators related to the societal context (i.e. consumption of pork or pork products and the 'at risk of poverty' rate) and (5) indicators related to preparedness and response activities (i.e. whether there was an operating pig identification and movement registration system, a passive surveillance system, contingency planning and laboratory capacity). These groups of indicators were selected based on the experience gained during the ASF epidemic in Europe over the last decade. Information on each of these indicators for the countries of the ROC was collected and evaluated.

Based on a collective evaluation of all indicators, experts of the standing working group on ASF estimated by consensus the likelihood of spread of ASF in the ROC as a whole and evaluated the uncertainty of their assessment. The existence of a legal framework for the three EU MSs of the ROC was taken into account. It was concluded that due to the high number of indicators present in most of the countries in the ROC and the known effect that these indicators can have on ASF spread (especially those related to the structure of the domestic pig sector, the presence of wild boar and social factors), the probability that ASF will spread within the ROC if the disease within one year following introduction is between 66% and 100% (i.e. very high).

The data collected for the identified indicators were either qualitative or quantitative. To determine whether the probability of ASF spread given an introduction of ASF was higher within any particular country within the ROC, the value of the quantitative indicators for that country (e.g. percentages of smallholders) was compared to the median value of the indicators of the whole ROC. For the qualitative indicators, it was indicated whether these were present or absent. A country was considered at risk of ASF spread if at least one qualitative indicator was present, or at least one quantitative indicator lay above the median. In addition, variation in risk between countries was assessed based on the number of indicators present for each country. It was concluded that the presence of indicators varies between countries in the ROC. Each country is at risk of ASF spread following introduction, as each country had several indicators present. However, there are several countries with higher numbers of pigs and a high number of indicators present, which would likely represent a higher probability of spread following introduction.

Finally, to assess the **potential spread of ASF from the ROC to non-affected EU countries outside the ROC**, given introduction into the ROC, the working group experts selected, as before, several groups of indicators that could favour spread of ASF from the ROC into non-affected areas of the EU. These indicators were mainly related to connectedness of the ROC to the non-affected area of the EU (e.g. people movements, the presence of shared borders and hunting tourism). It was hypothesised that indicators related to the societal context, such as the risk of poverty rate, may also contribute to ASF spread. Legal trade of live pigs and pig meat or products of pig origin from third

[1] ASF was detected in Serbia after the risk assessment was finalised, and before publication of this Scientific Opinion.

countries of the ROC to non-affected MS is very limited as EU rules provide strict risk-mitigating measures, and the rules in place include personal consignments. Additionally, free trade from the three EU MSs of the ROC to other EU MSs outside the ROC takes place owing to the existence of a EU legal framework. Further, the majority of pig farms in the ROC are smallholders, with pig and pork production mainly for personal consumption. The local movement of wild boar populations across borders was assessed to have a limited impact on the probability of ASF spread from the ROC to MS outside the ROC, as there is only one country (Slovenia, currently not affected) in the ROC with a land border to a non-affected MSs. However, there is a high level of movement of people through tourism or migration.

A comparison was made between indicators in ROC countries and in countries of south-eastern Europe that are already affected, such as Bulgaria and Romania, where there was no evidence of ASF spread to other EU MS within one year after initial ASF introduction. The probability of ASF spread from the ROC to non-affected MSs outside the ROC within one year after introduction of ASF into the ROC was estimated to be very low to low (from 0% to 15%).

Table of contents

1. Introduction

1.1. Background and Terms of Reference as provided by the requestor

1.1.1. Background

African Swine Fever (ASF) Genotype II was present in nine European Union (EU) Member States (MSs) at the time of the assessment: Belgium, Bulgaria, Czechia,[2] Estonia, Hungary, Latvia, Lithuania, Poland and Romania. As in 2014 the disease is mainly limited geographically to the Eastern part of the EU, with the disease being maintained in the wild boar population along the EU Eastern borders followed by an occasional spill-over in domestic pig holdings.

The developments in Romania during the summer of 2018 have highlighted a new pattern mainly focused on domestic pig holdings of any size, with few occurrences reported in wild boar. It is likely that this latter situation heavily relies on the spread through the human factor.

For the near future, the two main risks for the EU are represented by: (i) the specific situation in Romania; and (ii) a more generalised risk of witnessing the so-called jumps of the disease, due to the long distance spread by human factor.

Member States and the Commission are continuously updating the EU strategic approach to ASF and the related legislation. There is knowledge, legislation, scientific, technical and financial tools in the EU to properly face ASF.

The current situation in EU calls for the development of an EU strategy for the South Eastern Part of Europe based on scientific recommendations by EFSA. This strategy should be built and evolved on the basis of new science available and on new experiences gained. It is therefore necessary to better determine the extent of the problem to better target preventive and control measures in the light of the current development of the ASF epidemic updating and completing previous EFSA scientific opinions.

1.1.2. Terms of Reference

In accordance with Article 29 of Regulation (EC) No. 178/2002, EFSA is requested to provide a Scientific Opinion on the:

- Estimation of the risk of spread of ASF in the South Eastern Countries of Europe; identification and description of the main risk factors including the fact that some among of these are EU MSs.

1.2. Interpretation of the Terms of Reference

TOR 1 asks to estimate the risk of spread of ASF in the south-eastern countries of Europe, once ASF would be introduced in the area, including the fact that some among of these are EU MSs; and to identify the main risk factors (indicators) for the spread of the disease.

For the purposes of this risk assessment, the south-eastern countries of Europe included all ASF-free countries in south-eastern Europe in December 2018 (this being the moment when the mandate was first received), including Albania, Bosnia and Herzegovina, Croatia, Greece, Kosovo, Montenegro, the Republic of North Macedonia, Serbia[3] and Slovenia. Collectively, these countries were subsequently referred to as the **'region of concern' (ROC)**. Three of the above-mentioned countries (Croatia, Greece and Slovenia) are EU MSs that were included in the ROC due to their geographical localisation and the ASF-free disease status.

This request did not include an assessment of the risk of introduction into the south-eastern countries in Europe as such. Rather, the **probability of spread of ASF** within one year after introduction **in the ROC** was assessed provided that ASF would be introduced in the ROC. Considering the short time frame of the mandate, EFSA was not asked to assess the likely direction of the spread of ASF, neither the extend of spread, but rather to highlight the factors that may impact the further spread of ASF within and from the ROC, once introduced. In addition, considering the lack of data, and the short time available a qualitative risk assessment was carried out.

With other words, in this document '**spread**' is defined as a synonym for propagation of ASF within a year, implying transfer of the infection to other animals, farms or subregions.

[2] At the time of the mandate (December 2018), Czechia was not yet officially free of ASF, but in March 2019, Czechia was officially recognised to be free of ASF. In July 2019, also Slovakia was affected by ASF. This introduction took place after the risk assessment.

[3] The first outbreak of ASF in Serbia was reported only in July 2019, i.e. after the time when this mandate was received.

As a starting point, information about potential risk factors, or indicators that may lead to possible spread of ASF in the individual countries was collected. The overall probability of spread, however, was addressed by considering the ROC as a whole region, highlighting only those aspects that were of particular concern in individual countries. Hereby, the relevant EU regulations that are in force in the three EU MS in the ROC were considered. In addition, data on indicators from Romania and Bulgaria – two EU MS and affected countries in south-eastern Europe – were also provided as a comparison with the ROC. The collected data related to the following areas: (1) domestic pig (DP) and wild boar (WB) population and its interface; (2) connectivity between the countries in the ROC and EU MS, e.g. trade of pigs, pork and products and movement of people; (3) the social context in the countries; and (4) preparedness and responsive activities for epidemic diseases.

The same qualitative risk assessment approach was used to assess **the probability of introduction of ASF into the free EU MS outside the ROC**. Again, the relevant regulations and risk mitigation measures concerning movement of pigs and pork/products and personal consignments to the EU from the non-EU countries, as well as the regulations concerning the internal movements within the EU (considering that there are the three EU MS in the ROC) were taken into account. The collected data concerned (1) connectedness to the non-affected area of the EU and (2) the social context.

2. Methodology

2.1. Risk of spread of African swine fever in the south-eastern countries of Europe

2.1.1. Potential spread of ASF in the region of concern after possible introduction

Based on the experience gained during the ASF epidemic in Europe over the last decade, the working group experts selected a range of risk factors (indicators) that could potentially favour the spread of ASF following introduction into the ROC. The working group globally assessed the value of each of the indicators in the ROC countries and compared this with the situation in already affected countries in the EU. Hereby, the relevant EU regulations that are in force in the three EU MS in the ROC were considered. Subsequently, the experts of the working group estimated, by consensus, the likelihood of spread of ASF in the ROC within one year after possible introduction in the ROC, by evaluating all the indicators for all the countries of the ROC together. They also assessed the uncertainty of their assessment collectively according to EFSA's guidance on uncertainty in scientific assessments (EFSA, 2019). The following scale was used for the likelihood assessment: (Table 1).

Table 1: Probability scale used for the assessment

Probability term	Approximate probability range (%)
Very high probability	66–100
High probability	33–66
Moderate probability	15–33
Low probability	1–15
Very low probability	0–1

The indicators that were taken into consideration are listed below:

- **Indicators related to spread of ASF in domestic pig populations**
  - **Swill-feeding** is allowed in the country. Swill-feeding is well recognised as a risk factor for ASF (Mannelli et al., 1997; Bellini et al., 2016), facilitating spread particularly to unaffected farms. In the EU, it is important to note that swill feeding is prohibited (Commission Decision 2003/328/EC).
  - Presence of **free-ranging pigs** in some areas in the country. Free-ranging pig production is a recognised risk factor for ASF maintenance (Mannelli et al., 1997; Mur et al., 2016) as these animals at greater risk of contact with potentially infected wild boar. In the EU, it is important to note that all pigs, also free-ranging pigs, are considered to be domestic pigs and should be identified (Council Directive 2008/71/EC).

— Substantial number of **smallholders**. There is no common definition of non-commercial pig holdings in the ROC. In this opinion, the percentage of farms with up to, and including 10 pigs per holding, and the percentage of all domestic pigs that were kept in these farms, have been used as proxies of the size of the non-commercial pig sector. These farms are referred to as 'smallholders' throughout the rest of this document (**Table 2** and Figure 1). Smallholders generally have lower levels of farm biosecurity than commercial farms, and biosecurity is known to be a key constraint to ASF eradication (Mur et al., 2016). Low levels of biosecurity are a recognised risk factor for many infectious diseases of livestock, including ASF (Sánchez-Vizcaíno et al., 2013). The risk of ASF endemicity and spread will be influenced by the number, density and characteristics of pig farms with low biosecurity.
— **Home-slaughtering** of pigs is common in the country. Home-slaughtering is a feature of non-professional pig production, which is a known constraint to ASF control (Mur et al., 2016).

- **Indicators related to spread of ASF in wild boar populations**

— **Average wild boar density** (number of wild boar hunted per km^2) at country level: wild boar are an important contributor to ASF maintenance and spread in the current European epidemic (Costard et al., 2013b; Sánchez-Vizcaíno et al., 2013; EFSA AHAW Panel, 2018).
— **Suitable wild boar habitat** (% of area in the country with suitable wild boar habitat): wild boar are an important contributor to ASF maintenance and spread in the current European epidemic (Costard et al., 2013b; Sánchez-Vizcaíno et al., 2013; EFSA AHAW Panel, 2018; Sánchez-Cordón et al., 2018).

- **Indicators related to connectedness within the ROC**

— **Movement of pigs and pork/products** (numbers of pigs and kg of pork and pork products moved between the countries of the ROC): The ASF virus can survive for long periods of time in pork and pork products, which increases the risk of ASF spread to ASF-free areas (Sánchez-Vizcaíno et al., 2013). Movement of pigs and pork and wild boar products to the three EU MSs in the ROC is additionally regulated by Commission Implementing Decision 2014/709/EU which sets a series of animal health movement restrictions and control measures applicable to the dispatch of live pigs, pigs and wild boar meat. Some movements are allowed through derogations. The way the restrictions and the derogations are applied is linked with the areas listed in the implementing Decision. Free movement of live pigs and pig products from the three EU MSs of the ROC is regulated. On the other hand, no export from the non-EU MSs of the ROC to any EU MSs (including the three MSs of the ROC) is permitted, unless specific provisions apply and a specific authorisation exist (Commission Regulation (EU) 206/2010).

- **Indicators related to the societal context**

The importance of social factors (human factors) in the context of animal disease control is well recognised:

In broad terms, Moore et al. (2016) highlight the relationship between societal factors, such as poverty and corruption, and vulnerability to infectious disease. Further, compliance with the legal requirements laid down by veterinary authorities (VAs) is central to the success of control and eradication efforts, including ASF (Costard et al., 2013b; Gogin et al., 2013; Sánchez-Vizcaíno et al., 2013; Martínez-López et al., 2015; Mur et al., 2016).
With respect to ASF, a series of studies have highlighted the contribution of socioeconomic factors to the maintenance of ASF in Sardinia (Mur et al., 2016; Cappai et al., 2019; Loi et al., 2019). The risk of ASF maintenance was increased in municipalities with higher levels of human deprivation (defined as a lack of goods, services, amenities and physical environment), reduced educational levels and low employment (Cappai et al., 2019; Loi et al., 2019). These were generally depopulated areas, noting that illegal breeding in free-range territories (which is recognised as one of the primary reasons for endemic persistence of ASF in this area (Mur et al., 2016) is mainly practiced in mountainous areas that are economically deprived with limited outside access (Cappai et al., 2019). In these areas, biosecurity is often absent (Mur et al., 2016). Illegal trade of products and pigs has been an important feature of pig production on Sardinia and is likely a factor in the maintenance of ASF on the island (Mur et al., 2016).

For instance, several FVO audits from Romania (European Commission, 2017; 2018) have noted high levels of non-compliance among smallholders with key EU regulations relating to disease control, including pig identification, registration and movement, constraining efforts to control the disease. Similar findings were also reported by the National Sanitary Veterinary and Food Safety Authority of Romania in the Standing Committee on Plants, Animals, Food and Feed (National Sanitary Veterinary and Food Safety Authority Romania, 2019) in July 2019, e.g. non-compliance with identification and registration rules by smallholders (unidentified pigs over 60 days, the national database not updated, undeclared home-slaughter, keeping ear tags after home slaughter, etc.) and national biosecurity requirements (feeding with household waste, lack of disinfecting footwear, lack of work equipment, etc.)

— **Consumption of pork or pork products**. Societal norms with respect to pork consumption are likely to influence societal interest in pig production, particularly among smallholders. (Sánchez-Vizcaíno et al., 2013).
— **'At risk of poverty' rate**, this being the proportion of the total population at risk of poverty or social exclusion (Eurostat, 2019). Two potential links between poverty and ASF are hypothesised:

  - Firstly, non-commercial livestock production is generally of increased importance in poorer societies, reflected in the number and density of smallholder farmers. As reflected above, smallholders generally have lower levels of awareness about husbandry, disease and biosecurity. Several recent studies have highlighted the association between human deprivation and ASF maintenance in Sardinia (Mur et al., 2016; Cappai et al., 2019; Loi et al., 2019).
  - Secondly, it is recognised that national resource constraints will impact resources available to VAs for animal disease preparedness and response (Perry et al., 2001; Amanfu, 2006; Jurado et al., 2018), despite the co-funding provided by the European Commission to MSs to support their fight against ASF.

Collectively, these factors will have an impact on efforts to limit ASF spread following introduction.

- **Indicators related to preparedness and response activities**

  ASF control and eradication rely on classical disease control methods, including surveillance, epidemiological investigation, tracing of pigs and stamping out in infected holdings (Sánchez-Vizcaíno et al., 2012; Gallardo et al., 2015; Council Directive 2002/60/EC). Preparedness and response activities, including movement registration, passive surveillance and contingency planning, are central to this. Further, animal identification and farm records were identified as important preventive measures for ASF by a recent panel of experts (Jurado et al., 2018). Experiences from the ongoing epidemic in Europe and elsewhere suggest that any delay in detection of an incursion of ASF into a free area, and so a delay in implementation of control measures, will increase the probability for further spread of the disease. A functional passive surveillance system is crucial for early detection, and up-to-date contingency plans (CPs) in place, appropriate laboratory capacity and functional pig identification and movement registration systems form the basis for an efficient outbreak response. Here, a range of options were considered, including

  - No, or inadequate operating pig identification and movement registration system in the country.
  - No, or weak, implementation of passive surveillance.
  - No updated contingency plan or simulation exercises for ASF.
  - No or poor laboratory capacity.

2.1.2. Comparison of potential spread of ASF between countries in the region of concern, given introduction

To determine if a particular country within the ROC could be at higher probability of ASF spread given introduction, each of the potential indicators for that country was compared with the median of the whole ROC. For quantitative factors, those indicators that were above the regional median were considered '+', and those below the median were '−'. For qualitative factors, binary indicators were given a '+' if they were fulfilled, and a '−' if they were not (Table 21). A country was considered at

relative risk if at least one qualitative indicator was present, or at least one quantitative indicator lay above the median of the ROC. When no information was available, this was indicated with a question mark. After the assessment was conducted for all the countries of the ROC, the different countries were compared by the numbers of indicators present that could potentially lead to spread, i.e. by assessing if a given country was standing out by having possibly all, or almost all, or none of the indicators present. The existence of an EU legal framework was also considered.

2.1.3. Potential spread of ASF, given introduction, from the region of concern to non-affected EU countries

As before, the working group experts selected a group of **indicators that could potentially favour spread** of ASF from south-eastern countries of Europe into the non-affected area of the EU:

- **Indicators related to connectedness to the non-affected area of the EU:**
  - trade of pigs and pork/products
  - people movement
  - shared borders
  - commercial hunting, hunting tourism

Each of these factors will contribute to the potential for connectedness between regions, either via people (people movement, shared borders, commercial hunting, hunting tourism) or pigs and pork products (trade of pigs and pork/products, shared borders). These connections are recognised as risk factors for ASF spread from ASF-infected regions (Bellini et al., 2016; Jurado et al., 2018).

- **Indicators related to the societal context**
  - Risk of poverty: share of the total population at risk of poverty or social exclusion by country.

As indicated in Section 2.1.1, it is hypothesised that these indicators may contribute to ASF spread.

A similar methodology as described in Section 2.1.1 to assess the likelihood of ASF spread within the ROC was applied to estimate the probability that ASF would spread to a non-affected MSs outside the ROC in the year following introduction, along with the uncertainty present in the assessment.

3. Data

3.1. TOR 1. Risk of spread of African swine fever in the south-eastern countries of Europe

3.1.1. Domestic pigs

Populations of domestic pigs and husbandry systems in south-eastern Europe

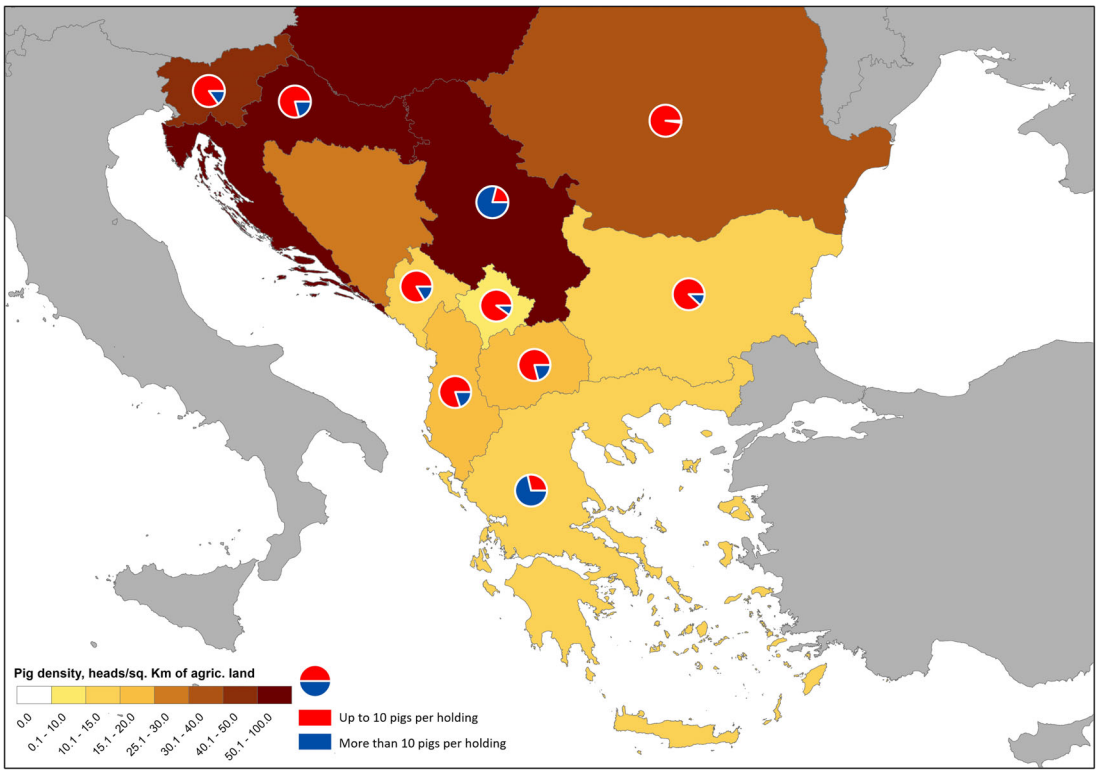
Data on the structure of the pig industry and domestic pig distribution were retrieved from the Eurostat database and obtained from national veterinary administrations from the Balkan countries.

Table 2: Domestic pig population in south-eastern Europe

Country	Number of pigs in country (heads)[a]	Pig density, (heads/km^2 of agricultural land)[b]	% of small holdings*** (n < 10)[c]	% of pig population kept in small holdings (n < 10)[c]	Numbers of pigs kept in smallholdings
ROC (Non-EU MSs)					
Albania	180,090	15.3	?	?	?
Bosnia and Herzegovina	548,000	25.1	?	?	?
Kosovo	60,500*	10.6	90	10	6,050
Montenegro	27,000	10.8	75	50	13,500
North Macedonia	196,000	15.5	78.9	4.5	8,820
Serbia	2,792,000	80.5	21.0	4.8	134,016

Country	Number of pigs in country (heads)[a]	Pig density, (heads/km^2 of agricultural land)[b]	% of small holdings*** (n < 10)[c]	% of pig population kept in small holdings (n < 10)[c]	Numbers of pigs kept in smallholdings
ROC (EU MSs)					
Croatia	1,049,000	68.1	79.0	19	199,310
Greece	758,000	11.3	28.5	0.17	1,288
Slovenia	259,130	42.0	85	16	41,460
Median		**15.5**	**78.9**	**10.0**	
Non-ROC ASF-affected countries in SE Europe					
Bulgaria	654,550	13.0	78.9	20	
Romania	4,023,800	29.2	98.0**	1**	

Sources: [a]: annual data on pig populations of Eurostat (apro_mt_lspig), December 2018.
[b]: Trading economics, (tradingeconomics.com).
[c]: National veterinary authorities of the ROC (Region of Concern) countries.
*: Provided by the Food and Veterinary Agency of the Republic of Kosovo, data available from 2017 only.
**: > 98% of the pig population in Romania are kept in herds registered as 'backyard herds'. However, the median herd size in these herds is 69 pigs. If only herds with ≤ 10 animals are considered backyard herds, the proportion of animals kept as backyards is extremely low (1%).
?: Data not available.
***: Percentage of farms with ≤ 10 pigs per holding and percentage of pigs kept in those farms of all pig holding and domestic pig population have been used as a proxy of the magnitude of the non-commercial pig sector and are referred to as smallholders.



*: > 98% of the pig population in Romania are kept in herds registered as 'backyard herds'. However, the median herd size in these herds is 69 pigs.

Figure 1: Pig density (heads/km^2 of agricultural land) in south-eastern Europe, and the proportion of small pig holdings with less or equal than 10 pigs per holding*, by country (red, in the pie charts)

Some of the key characteristics of pig farming as well as additional information on pig production in south-eastern Europe were provided by national authorities of the region, and retrieved from open sources provided by the international organisations and projects collecting related information: The World Organisation for Animal Health (OIE), The Food and Agriculture Organization (FAO), The Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs), The Standing Committee on Plants, Animals, Food and Feed (PAFF Committee) of the European Commission, Eurostat and national statistical offices of the ROCs countries can be found in Table 3.

Table 3: Key characteristics of pig husbandry systems in south-eastern Europe

Country	Swill-feeding is allowed in the country	Free-ranging pigs present in some areas in the country	Home-slaughtering is allowed in the country	Export/trade live pigs to/with EU Member States	Export/trade of pork/products to/with EU Member States
ROC (Non-EU MSs)					
Albania	?	?	?	?	?
Bosnia and Herzegovina	No	No	Yes	No****	No****
Kosovo	No	No	Yes	No****	No****
Montenegro	Yes	No	Yes	No****	No****
North Macedonia	No	Yes**	Yes	No****	No****
Serbia	No	Yes	Yes	No****	Yes (treated)****
ROC (EU MSs)					
Croatia	No***	Yes	Yes	Yes	Yes
Greece	No***	Yes	No	Yes	Yes
Slovenia	No***	Yes	Yes	Yes	Yes
Non-ROC ASF-affected countries in SE Europe					
Bulgaria	No***	Yes*	Yes	Yes	Yes
Romania	No***	Yes**	Yes	Yes	Yes

Source: information provided by the VAs of the countries of the ROC.
?: No data provided.
*: East-Balkan pigs.
**: Mangalita and Bazna pigs.
***: Commission Decision 2003/328/EC bans swill feeding to pigs.
****: Commission Regulation (EU) 206/2010.

The seasonality of pig production may have a potential influence on the spread of ASF, as it could be linked to the reproduction cycle of the pigs and also to husbandry systems in place (traditions), which requires, as one example, that higher numbers of animals are slaughtered and moved during festive periods. The total number of pigs in the countries of the ROC in June and December (when available) for three consecutive years (2016–2018) is presented in Table 4. Only for the Republic of North Macedonia, the available data showed seasonal differences in population size, with a doubling of the population in the winter seasons. For Kosovo and Serbia, the available data showed no tendency to seasonality, while for the other countries, data were not available for the summer season.

Table 4: Pig population size in summer and winter months (total number of pigs in December and June, thousand heads) in countries of south-eastern Europe

Country	2016		2017		2018	
	June	December	June	December	June	December
ROC (Non-EU MSs)						
Albania	?	180,360	?	180,090	?	?
Bosnia and Herzegovina	?	545,000	?	548,000	?	?
Kosovo**	67,500	62,400	69,900	64,300	69,300	60,500
Montenegro	?	55,000	?	25,000	?	27,000
North Macedonia	110,000	203,000	110,000	202,000	110,000	196,000

Country	2016		2017		2018	
	June	December	June	December	June	December
Serbia	3,016,000	3,021,000	2,883,000	2,911,000	2,680,000	2,792,000
ROC (EU MSs)						
Croatia*	?	1,163,000	?	1,121,000	?	1,049,000
Greece	?	743,000	?	744,000	?	758,000
Slovenia	?	265,700	?	257,200	?	259,130
Non-ROC ASF-affected countries in SE Europe						
Bulgaria	607,200	616,400	575,900	593,200	496,700	654,550
Romania	4,574,700	4,707,700	4,486,600	4,406,000	4,129,300	3,956,800

Source: Eurostat - Pig population - annual data [apro_mt_lspig], Last update - 17.5.19, Extracted on 19.6.19.
*: Source: Veterinary Directorate, Ministry of Agriculture, Fisheries and Rural Development, Croatia.
**: Source: The Food and Veterinary Agency of the Republic of Kosovo.
?: Information not available.

3.1.2. Wild boar

Wild boar distribution

No European-wide harmonised monitoring scheme currently exists to gather information on hunting statistics. At present, each country and organisation collect hunting data using its own procedures and acquires different types of data that are later implemented in different repositories with variable accessibility, which hampers the comparison and common use of data across Europe for comparison purposes (Enetwild, 2018). Detailed, harmonised information of wild boar density is desirable for risk factor analysis (EFSA AHAW Panel, 2018), but these data are currently available only on a local level, assessed with different methodologies. Hunting bag data are currently the only Europe-wide available relative abundance index of wild boar (EFSA AHAW Panel, 2018). Wild boar relative abundance in the Balkan countries has been provided in a report of the ENETwild Consortium (2018). This report provides recent data on national hunting harvest results (hunting bags) for European countries. These can be transformed into rough abundance figures by multiplying the harvest data by three (Table 5). Leránoz and Castién (1996) calculated that the hunting harvest represents between 25% and 37% of the actual population. Hence, multiplying the harvest by three is a conservative estimation of the (autumn–winter) population size.

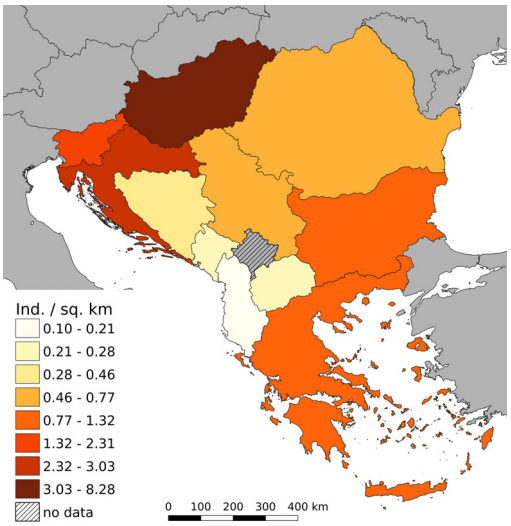
Table 5: Wild boar population density (no. of wild boar/km^2 of suitable habitat) in south-eastern European countries

Country	% of suitable wild boar habitat in country	Average number of wild boar/km^2
ROC (Non-EU MSs)		
Albania	77.8	?
Bosnia and Herzegovina	86	?
Kosovo	82.5	?
Montenegro	81.9	0.20–0.33
Macedonia	84.8	0.16–0.25
Serbia	75.3	0.47–0.75
ROC (EU MSs)		
Croatia	72.2	2.27–3.63
Greece	71.3	0.78–1.26
Slovenia	88.4	1.73–2.77
Median ROC	81.9	0.6–1.0
Non-ROC ASF-affected countries in SE Europe		
Bulgaria	76.8	0.99–1.59
Romania	68.2	0.57–0.92

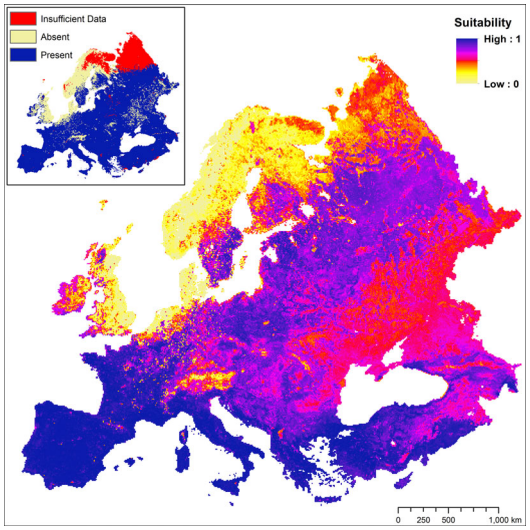
Provided by ENETWILD based on hunting harvest data from each country (% of suitable habitat according to Alexander et al. 2016).
?: Data not available.

The consortium used local hunting results and habitat modelling to predict the expected annual wild boar harvest (Figure 2A), and this can also be calculated at the country scale. Figure 2B presents the average wild boar habitat in the country and Figure 2C shows the comparison of countries with more or less hunted wild boar than predicted from the habitat, with the darkest grey shading representing those countries with more hunted wild boar than expected from the habitat quality.

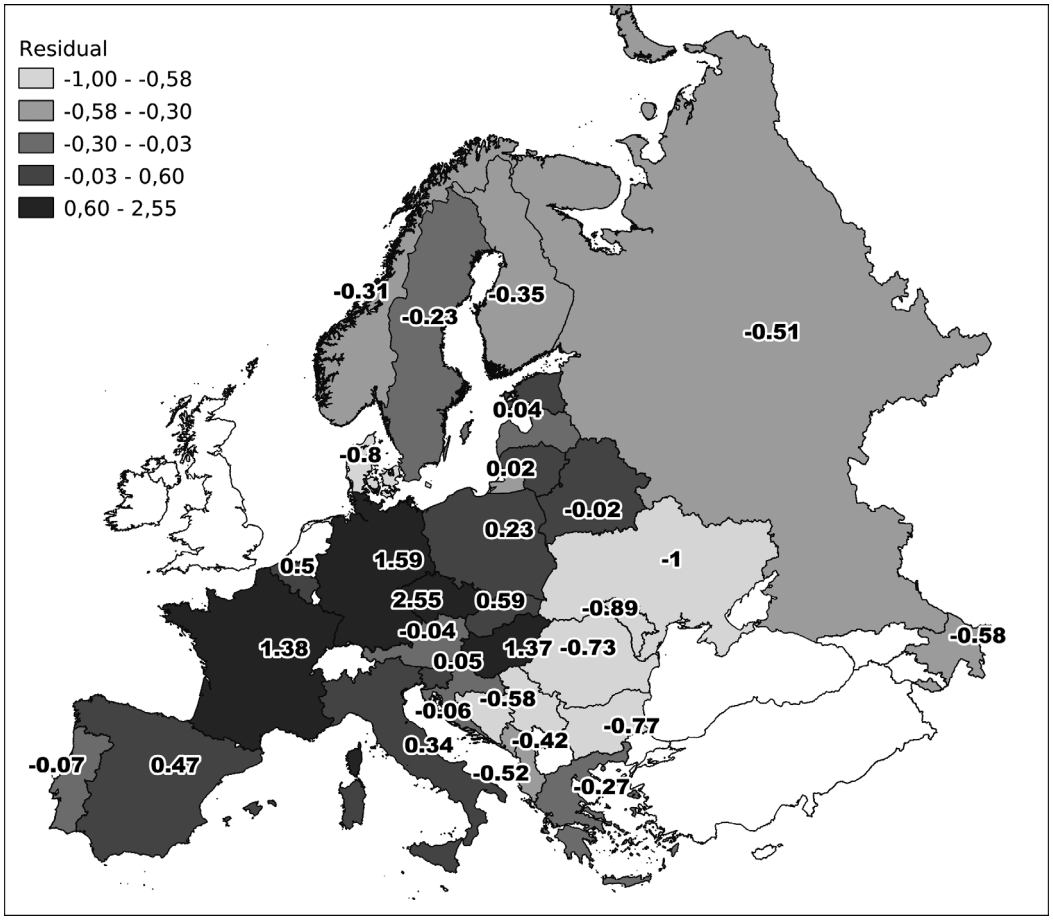
A. Estimated wild boar density in the region of concern



B. Predicted environmental suitability (relative likelihood of presence) for wild boar using random forest models



C. Hunted wild boar in relation to the expected wild boar numbers based on wild boar habitat



Hunted wild boar in relation to the expected wild boar numbers based on wild boar habitat. Values represent the residuals of the linear regression of wild boar hunted per surface by the predicted environmental suitability. Positive residuals indicate countries where the number of wild boar hunted is higher than expected given habitat characteristics, and vice versa.

Figure 2: Wild boar in the ROC: (A) estimated mean population density per country; (B) habitat suitability; (C) hunted wild boar in correlation to the habitat quality (Provided by EnetWild consortium; see description methodology in ENETWILD, 2019)

According to Figure 2C, which illustrates predicted vs. actual numbers of hunted wild boar in Europe, some countries in the EU are far above the mean (Czechia, France, Germany, Hungary), implicating that their wild boar densities are higher than expected based on the habitat. These are countries where the wild boar population is already reaching the upper end of the habitat carrying capacity, or the carrying capacity is higher than expected due to feeding or due to crops that favour wild boar proliferation. By contrast, countries like Bosnia and Herzegovina, Bulgaria, Denmark, Moldova, Serbia, Romania and Ukraine, some of which are in or close to the ROC, are hunting less wild boar than predicted by the suitable wild boar habitat, i.e. their wild boar populations are expected to grow in the next years if this is not counteracted by significant intervention.

Wild boar hunting and feeding policy

In addition to wild boar density or relative wild boar abundance, a number of other factors may play a role in ASF spread, including wild boar hunting and additional feeding policies.

Table 6 provides information on wild boar hunting and feeding policy in south-eastern Europe, as provided by the National competent authorities, including (1) the presence of fenced hunting estates (where wild boar are fed all year round); (2) whether wild boar feeding occurs outside fenced hunting estates; and (3) whether baiting for hunting is common practice.

To reduce the probability of spread through wild boar, preventive measures to reduce the wild boar carrying capacity of wild boar habitat (feeding bans + limiting wild boar access to attractive crops such as maize), along with actions to increase the annual wild boar hunting harvest (aiming at > 65% of the estimated population) are recommended.

Table 6: Wild boar hunting and feeding policy in south-eastern European countries

Country	Fenced hunting estates present (fed wild boar all year round)	WB feeding outside fenced hunting estates practice	Baiting for hunting is common practice	Preventive measures to decrease WB population	Hunting tourism* from other country allowed
ROC (Non-EU MSs)					
Albania	No	No	No	No	No
Bosnia and Herzegovina	Yes	Yes	No	No	Yes
Kosovo	No	Yes	Yes	No	Yes
Montenegro	No	Yes	No	No	No
North Macedonia	No	Yes	No	No**	Yes
Serbia	Yes	Yes	Yes	Yes	Yes
ROC (EU MSs)					
Croatia	Yes	No	Yes	Yes	Yes
Greece	No	No	No	Yes	No
Slovenia	Yes	Yes	Yes	Yes	Yes
Non-ROC ASF-affected countries in SE Europe					
Bulgaria	Yes	No	No	Yes	Yes
Romania	Yes	No	Yes	Yes	Yes

Source: provided and validated by the VAs of the countries of the ROC.
*: Hunting tourism: = 'Yes' means people outside the country are allowed to hunt.
**: New legislation in process of adoption.

As mentioned in Table 6, hunting tourism is one of the factors influencing the risk of spread of ASF. The number of hunting permits can be used as an indicator of this activity. Data on the number of permits issued to foreign hunters in 2018 and 2019 hunting seasons were provided only by the Croatian Ministry of Agriculture. Figure 3 shows the number of hunting permits issued in 2018. More details are presented in Appendix B.

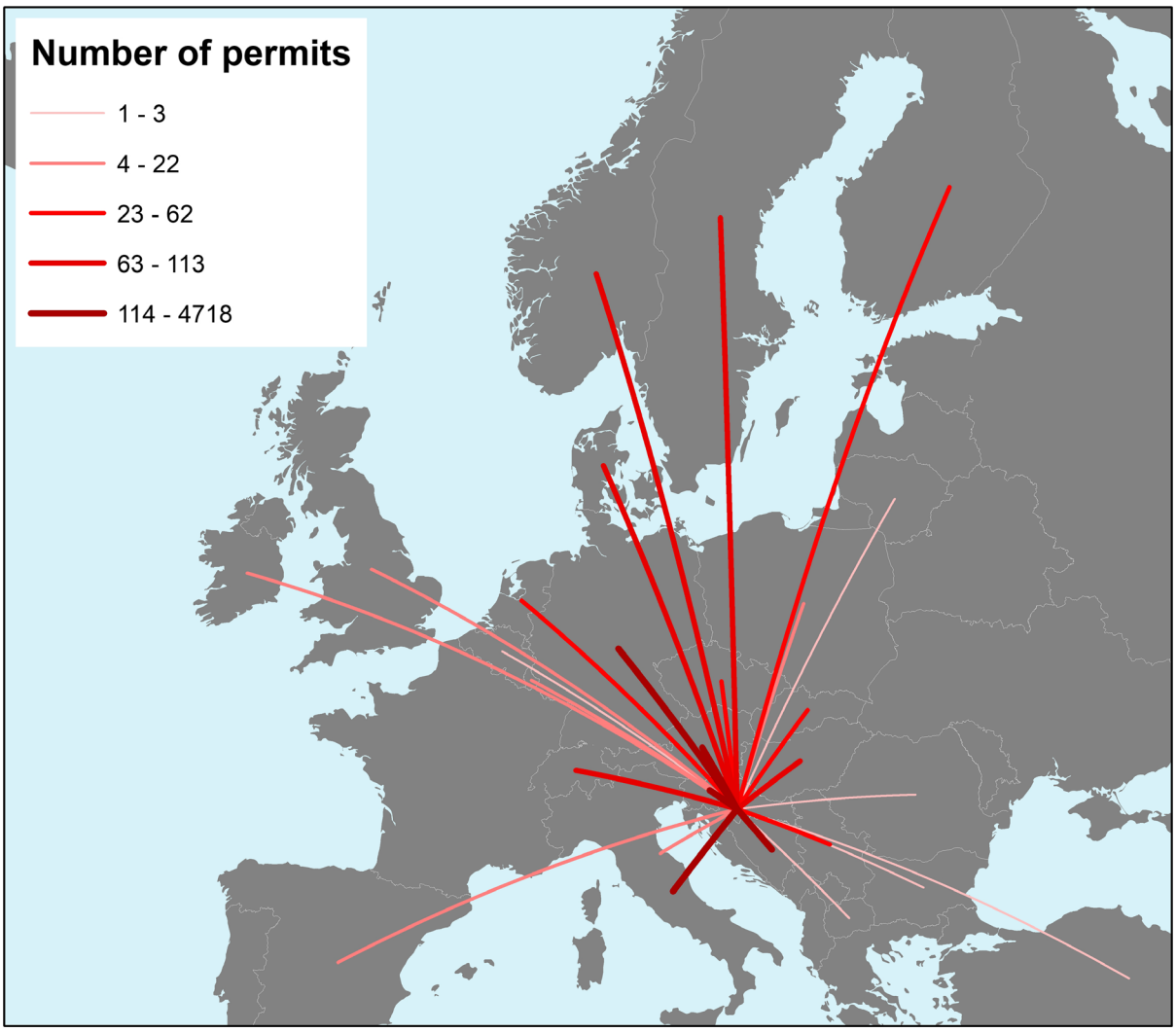


Figure 3: Number of permits issued by the Croatian Ministry of Agriculture to foreign hunters in 2018 and 2019

3.1.3. Connectedness

Trade of live pigs and pork

Under EU rules, there is limited trade of live pigs and fresh or frozen pig meat from third countries to EU Member States. No trade of live pigs or pork products is permitted from the non-EU Member States of the ROC to all EU MSs. A list of countries approved to export treated pork products to the EU is provided in Commission Regulation (EU) 206/2010. To protect the EU single market and international trade the movement of live pigs, pork or wild boar products from EU areas under disease ASF restrictions, is regulated by Commission Implementing Decision 2014/709/EU. This regulation prohibits the dispatch of live pigs, live wild boar, pork and wild boar products from the restricted areas and yet provides derogations under certain strict conditions, including testing or processing depending on the category of the areas (which are listed in the annex to the implementing act). Therefore, all data below refer to the legal trade taking place under these animal health movement restrictions and control measures (see Section 3.1.5 for the Legislative framework, and the trade restrictions).

Data from two databases, Eurostat (Eurostat's External Trade database) and TRACES, were retrieved to assess flows of live pigs, pork products and volumes of goods shipped. The number of pigs made over the last 3 years (2016–2018) reported to and the total volume of pork and pork products (100 kg) for 2016–2018 extracted from Eurostat were used as complementary indicators of pig and pork products trade activity in each country. The numbers of live pigs traded between the EU MSs in the ROC and the rest of the EU in 2016–2018 is presented in Table 7.

As can be seen in Table 7 from the large numbers of pigs traded between the EU MSs, only a small share originates from the three EU MS in the ROC, of which the most important share originates from Croatia (between 2016 and 2018, on average 0.52% of the total intra-EU pig movements originated from Croatia). More detailed information on the numbers of live pigs moved between the EU MSs can be found in the activity reports reported by TRACES (2016, 2017 and 2018). It should be noted that trade of life pigs from non-EU MSs is not in the scope of TRACES, and these data were therefore not provided in Table 7.

Also, intra-European trade of pork products is not in the scope of TRACES. However, the volumes of pork/pork products that are moved from restricted areas are reported to TRACES, and are given in Appendix B.

Table 8 shows the volumes of pork and pork products traded from the EU MSs in the ROC reported to Eurostat. As can be seen in Table 8, the trade of pork products from the EU MSs in the ROC to the other countries in the ROC is minimal, and the share of the trade from the three MS in the ROC in the intra-EU trade is minimal.

Table 7: Sum of live pigs traded for different purposes from 3 EU MS in the ROC to the 28 EU MSs in 2016–2018, reported to TRACES

ORIGIN	Slaughter	Production	Breeding	Other purposes	Total (all purposes)	Share intra-EU pig trade (%)
CROATIA (HR)	496,391	23,949	3,383	1	523,724	0.517839
GREECE (EL)	1,386	293	1,641	0	3,320	0.003283
SLOVENIA (SI)	6,053	325	269	0	6,647	0.006572
EU 28 TOTAL	27,651,948	70,677,932	2,806,559	110	101,136,549	

Table 8: Sum of trade of pork and pork products from EU MS in the ROC to the 28 EU MS and the other countries in the ROC in 2016–2018 (100 kg)

Origin	Destination									
	Albania	Bosnia and Herzegovina	Croatia	Greece	Montenegro	North Macedonia	Serbia	Kosovo	Slovenia	EU28
CROATIA (HR)	0	64,398	0	179	9,219	7,194	33,369	0	207,150	309,771
GREECE (EL)	3,996	0	91	0	0	817	18,334	0	8	291,860
SLOVENIA (SI)	446	12,032	82,356	0	127,724	4,652	41,481	28	0	156,445
Total of HR+ EL+SI	4,442	76,430	82,447	179	136,943	12,663	93,184	28	207,158	758,076
EU 28	149,254	456,573	2,780,141	6,394,244	648,601	293,701	1,105,204	2,128	1,748,244	230,998,856
Grand total	153,696	533,003	2,862,588	6,394,423	785,544	306,364	1,198,388	2,156	1,955,402	231,756,932

Source: Eurostat: data set 'INTERNATIONAL TRADE'/EU Trade Since 1988 by HS2, 4, 6 and CN8 (DS-045409). The product (HS/CN) codes used were: 0203, 020630, 020641, 020649, 020910, 021011, 021012, 021019, 160241, 160242, 160249, 16029051.

The movement of people

The movement of people is of potential relevance to ASF spread, given the potential of people to illegally move pork or pork products, including hunting trophies, wild boar meat and products thereof from affected areas. Three different aspects of people movement, within the ROC and from the ROC to non-affected MSs, are considered, including **labour migration**, **the movement of refugees and economic migrants,** and **tourism** within the Western Balkans. When referring to migration from non-EU countries of the ROC to the EU, the term 'western Balkan countries' is frequently used; according to the World Bank, the countries of the western Balkans include Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia (World Bank, 2018).

Labour migration patterns

There have been high levels of **outward migration** of people from the western Balkans for many years, continuing a tradition of temporary labour migration that has existed for centuries (Vermeulen et al., 2015). A substantial proportion of people from each of the Western Balkans countries live and work abroad (Figures 4 and 5).

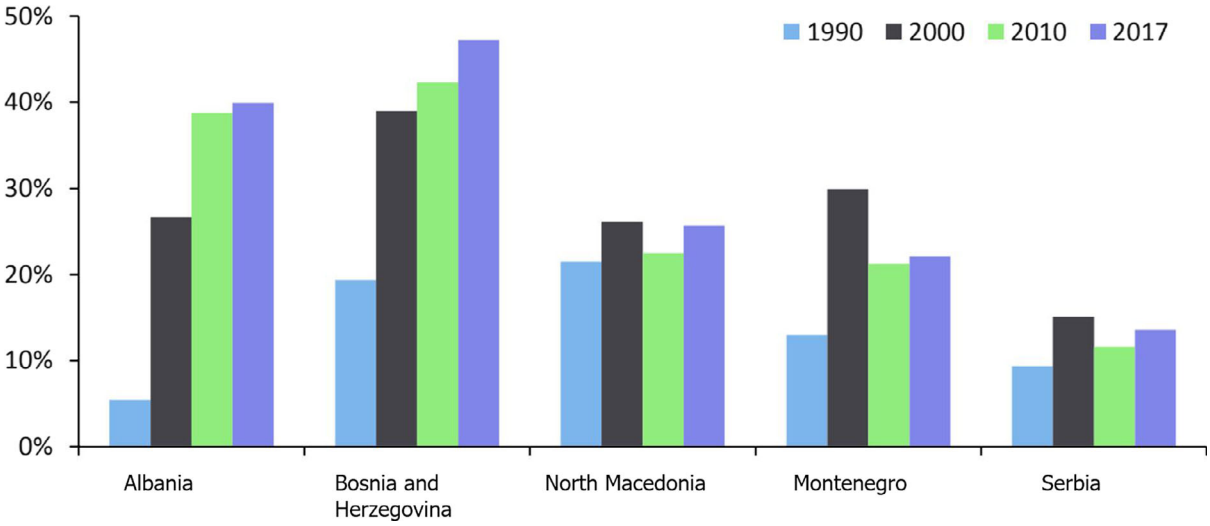


Figure 4: Emigration-share-to-resident population, 1990–2017 (Source: Western Balkans Labor Market Trends, 2018)

According to UN Statistics (Western Balkans Labour Market Trends, 2018), as for 2015, almost half of all emigrants from the Western Balkans countries moved to the EU-15 (Figure 5), including 84% of all Albanian emigrants (particularly to Greece and Italy), about 60% of emigrants from Kosovo (particularly to Germany) and 51 percent of Serbian emigrants (particularly to Austria and Germany). Croatian Bureau of Statistics reports that 63.9% of Croatian emigrants in 2017 moved to Germany.

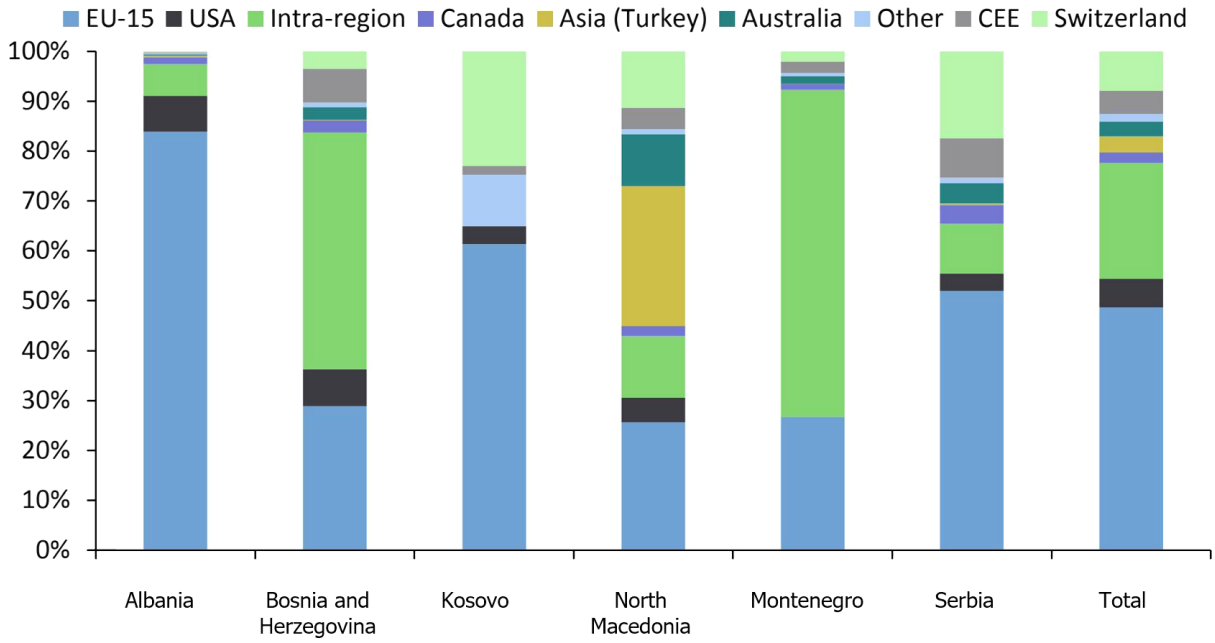


Figure 5: Main destination countries for Western Balkan emigrants, share in %, 2015 (Source: Western Balkans Labour Market Trends, 2018)

The strong linkages between the western Balkan countries and the European Union are clearly demonstrated in Figures 6 and 7 showing the acquisition **of EU citizenship by citizens of Western Balkan countries and the remittance flows from EU member states to Western Balkan countries.** Remittances refer to cross-border, person-to-person payments of relatively low value via money transfer operators. The transfers are typically recurrent payments by migrant workers to their relatives in their home countries.

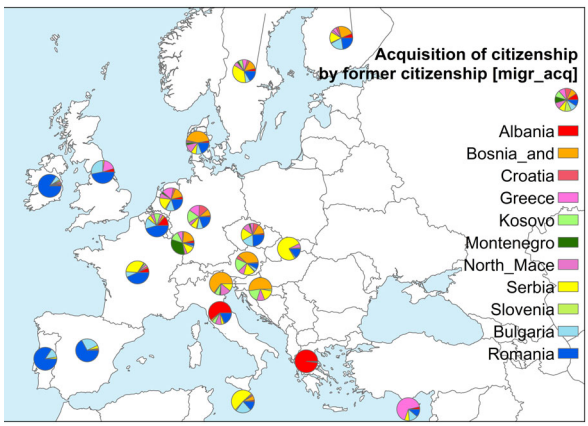


Figure 6: Acquisition of EU citizenship by citizens of Western Balkan countries in 2017 (Eurostat)

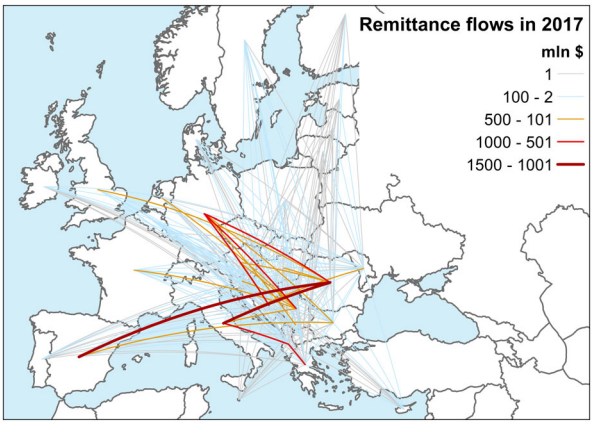


Figure 7: Remittance flows from EU Member States to countries of the Western Balkans during 2017 (World Bank)

There is also substantial, irregular and seasonal **migration of people within the western Balkans region**, both from other countries in the western Balkans and from elsewhere. Of all migrant labour in Montenegro and Croatia, the majority originates from within the region, mostly from neighbouring countries (Serbia and Bosnia, Herzegovina, North Macedonia and Kosovo). In Montenegro, 42.8% of foreign workers come from Serbia, followed by Bosnia and Herzegovina (22.5%), North Macedonia (7.2%) and Kosovo (3%). Similarly, Bosnia and Herzegovina report a high, but declining proportion of regional migrants, mainly from Serbia (70%) and Croatia (20%). In contrast,

in Albania, Kosovo, North Macedonia and Serbia, about 80% of labour migrants come from outside the South East Europe (SEE) region (Labour Mobility as a Factor of Development in South-East Europe).

The most significant illegal border-crossings of citizens of the Western Balkans countries occurred in the south of the region and related to seasonal movements of workers from Albania to Greece and back (Frontex. Western Balkans Annual Risk Analysis 2018).

Refugees and economic migrants

The western Balkans has been an important transit route (the 'Western Balkan route') for refugees and economic migrants to the EU, mainly from the Middle East and North Africa (Delauney, 2015). The route was officially closed in 2016 following support from the European Union to Turkey for registered refugees, principally from Syria (European Commission, 2016). Nonetheless, migrant flows have continued to some extent but with a changing pattern of movement, as demonstrated by the thousands of irregular entries into Bosnia–Herzegovina from Serbia and Montenegro since the beginning of 2018 (Italian Institute for International Political Studies, 2018).

Tourism within the ROC

The ROC countries are increasingly important tourist destinations (Table 9). Compared with the preceding year, there was a 15% increase in tourist numbers in 2016 to Bosnia and Herzegovina, of 13% to Serbia, of 8% to Albania, of 7% to Montenegro and 5% to North Macedonia (European Union Tourism Trends, 2017). The 'Western Balkans Cultural Heritage Route', a series of initiatives and events supported by the European Union and its Member States, was established in 2018 to connect sites and highlight the European Union's support to the preservation of culture in the region (European Union External Action, 2018).

Table 9: Arrivals of non-residents staying in hotels and similar establishments (thousand), 2017

Country	Thousand individuals	Source
ROC (Non-EU MSs)		
Albania	5,926.2	Institute of Statistics (Albania)
Bosnia and Herzegovina	870.0	Eurostat
Kosovo	86.0	Eurostat
Montenegro	794.8	Eurostat
North Macedonia	600.9	Eurostat
Serbia	1,335.6	Eurostat
ROC (EU MSs)		
Croatia	15,581.7	Eurostat
Greece	17,929.0	Eurostat
Slovenia	8,572.2	Statistical Office of the Republic of Slovenia
Median ROC	1,335.6	
Non-ROC ASF-affected countries in SE Europe		
Bulgaria	3,655.8	Eurostat
Romania	2,749.3	Eurostat

3.1.4. Societal context

Human population and poverty

Poverty can be measured in a number of different ways. The at risk of poverty is used here, reflecting the percentage of people on a low income in that country. It does not measure wealth or poverty, nor does it necessarily imply a low standard of living (Eurostat, 2019). In technical terms, at risk of poverty is defined as the share of people with an equivalised disposable income (total household income, after tax and other deductions, that is available for spending or saving, divided by the number of household members converted into equalised adults) below the at risk of poverty threshold, which is set at 60% of the national median equivalised disposable income after social transfers (Table 10).

Table 10: Human population density, rural population, unemployment rate and people at risk of poverty or social exclusion, 2017

Country	Human population density (persons per km^2)[a]	Rural population, % of total population[b]	Unemployment rate, %[c]	At risk of poverty, %[d]
ROC (Non-EU MSs)				
Albania	105.0	41.6	13.7	25.0*
Bosnia and Herzegovina	68.7	60.6	20.7	16.9
Kosovo	167	62.0	30.3	?
Montenegro	45.7	35.8	16.1	31.0
North Macedonia	83.0	41.8	22.4	41.6
Serbia	80.7	44.3	13.6	36.7
ROC (EU MSs)				
Croatia	73.9	40.7	10.2	26.4
Greece	82.2	21.7	18.0	34.8
Slovenia	102.6	50.4	8.6	17.1
Median ROC	**82.5**	**41.8**	**16.1**	**31.0**
Non-ROC ASF-affected countries in SE Europe				
Bulgaria	64.3	25.7	6.2	38.9
Romania	83.6	45.2	3.8	35.7

?: no data.
Sources: Eurostat: a – [TPS00003], b – https://tradingeconomics.com, c – Eurostat [cpc_pslm], d – Erostat [ilc_peps01].
*– 2016 in : A Survey on Poverty in Albania: Comparison between Rural and Urban.

Pork consumption

Annual pork consumption per capita is the indirect indicator of the role of pork products in food provision, pork production and trade in a country. The median pork consumption in the ROC in 2013 is of 26.8 kg per year shown in Table 11. This is much lower than median annual pork consumption (39 kg per year) in the EU28.

Table 11: Pork consumption per capita, 2013, in the region of concern

Country	Kg
ROC (Non-EU MSs)	
Albania	10.9
Bosnia and Herzegovina	9.4
Kosovo	?
North Macedonia	10.4
Montenegro	53
Serbia	32
ROC (EU MSs)	
Croatia	42.8
Greece	28.3
Slovenia	28.2
Median ROC	26.8
Non-ROC ASF-affected countries in SE Europe	
Bulgaria	9.5
Romania	25.3

Source: https://ourworldindata.org/
?: no data available.

3.1.5. Preparedness and response activities

This section presents a summary of information provided by the VAs adding information to: (1) a survey carried out by the Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs)[4] as part of 11th Meeting of Standing Group of Experts on ASF (SGE ASF)[5] held in Warsaw Poland on 24–25 September 2018; and (2) presentations of country representatives at an Inception workshop organised by the Food and Agriculture Organisation (FAO) held in Belgrade (18–19 February 2019). Specific to laboratory capacity, additional information was provided by the European Union Reference Laboratory for ASF (EURL).[6] Subsequently, EFSA analysed and presented these data in tables, and the VAs were asked to verify and update this information. Data collated in relation to the ASF situation in Albania were not validated by the Albanian VAs and consequently had to be omitted from this opinion.

Legislative framework

The European Commission issued in 1992 the Council Directive 92/119/EEC introducing general measures for the control of certain animal diseases, but this only included general measures for swine vesicular disease, not for ASF. In 2002, Council Directive 2002/60/EC included ASF into List A of 92/119/EEC and amended the measures concerning ASF, therefore constituting the main EU legislation laying down the measures and activities to control and prevent further spread of the disease.

The incursion and evolution of ASF into the EU brought about the need for specific additional animal health movement restrictions and **regionalised control measures** tailored to the characteristics of the epidemic and the characteristics of the areas where the disease emerges. The issuing of Implementing Decisions in response to the evolution of the diseases can be easily amended or replaced and are directly implemented and adopted by the MSs. A series of these Implementing Decisions repealing or amending the earlier one is issued as a common practice for many diseases. Regarding ASF, the Implementing Decision 2014/178/EU repealed by 2014/709/EU issued in 2014 has been amended several times following the evolution of the disease, and lately amended by Commission Implementing Decision 2019/1392.

The existing EU animal health legislative framework (Table A.1, in Appendix A) outlines compulsory measures and activities to: (1) prevent the introduction of a pathogen agent in a territory (EU, country, region, area) through border checks and veterinary checks for the single market; (2) eliminate the sources of the pathogen; (3) stop or control the further spread and (4) eradicate the disease. The guidelines and the supportive documents also provide detailed information to the authorities and to the stakeholders to better understand and implement the measures (Tables A.2, A.3 and A.4 in Appendix A).

EU MSs within the ROC (Croatia, Greece and Slovenia) have integrated relevant EU legislation into their national legislation and are obliged to follow any mandate or recommendation of the EU. The non-EU countries of the ROC (Albania, Bosnia and Herzegovina, Kosovo, Republic of North Macedonia, Montenegro and Serbia) that are included to the Instrument for Pre-Accession Assistance (IPA) have started to harmonise their national legislation related to animal diseases with the EU legislation. Most of these have already completed this process while Kosovo is currently only partially in compliance with EU legislation.

In terms of the regionalisation for ASF (under Implementing Decisions 2014/178; 2014/709 and 2019/1247), there is a working document (7112/2015) to support the regionalisation process, which details the criteria used to determine the size of the regions.

Laboratory capacity

The European Commission has issued the diagnostic manual of ASF through Commission Decision 2003/422/EC, describing the diagnostic techniques for the detection of ASFV that must be implemented by the MSs (see Table 13) on the Legislative framework. Moreover, *The Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* of the OIE provides a harmonised approach to ASF disease diagnosis by

[4] The Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs) launched in 2004, is a joint initiative of OIE and FAO to achieve the prevention and control of transboundary animal diseases.

[5] An initiative called Standing Group of Experts on African swine fever in Europe (SGE ASF) was established under the GF-TADs umbrella to build closer cooperation and transparency among countries affected by ASF and countries at risk, including a harmonised strategy of risk mitigation measures.

[6] EU Reference Laboratories: https://ec.europa.eu/food/safety/official_controls/legislation/ref-labs_en

describing internationally agreed laboratory diagnostic techniques (**Table A.3**). The EU Reference Laboratory (EURL) for ASF provides technical and scientific support to National Reference Laboratories (NRL)[7] and organises training activities and ring trials for diagnostic methods among the laboratories.

An overview of laboratory capacity in the countries within the ROC, based on the information received from different sources,[8,9,10] is presented in **Table 12**.

[7] Regulation 882/2004 Article 33 on National Reference Laboratories: https://efsa815.sharepoint.com/:w:/r/sites/AHAWAfricanswinefever/_layouts/15/Doc.aspx?sourcedoc={bad2f0f8-4587-4d2d-9acd-e0c49570ca15}&action=edit&wdPid=2791f641

[8] Results of Survey: 11th Meeting of Standing Group of Experts (GF-TADS) on ASF: http://web.oie.int/RR-Europe/eng/eng/Regprog/docs/docs/SGE%20ASF11/SGE%20ASF11%20(Warsaw,%20Sept%202018)%20%%20Plavsic_ASF%20Preparedness%20in%20Balkans.pdf

[9] The presentations of the countries (Albania, Bosnia and Herzegovina, North Macedonia, Montenegro, Serbia) participated to the Food and Agriculture Organisation (FAO) Inception workshop held in Belgrade (18–19 February 2019) available here.

[10] Information received from the EURL for ASF.

Table 12: Laboratory capacity of the countries of the ROC

Country	Type of ASFV detection method available	Maximum No. of blood samples per day in the Country	Ring test (Year/results)	Training the last 2 years	Self -assessment of the Countries as it came up through the OIE-GFTADS survey[a] to the relevant questions	
					Perception of the Countries for the capacity of their NRL	Perception of the Countries for their compliance with the GF-TADS recommendations[b] on laboratory diagnostics
ROC (Non-EU MSs)						
Albania	?	?	**?**	?	?	?
Bosnia and Herzegovina	Serology	350–400	–	Yes	The NRL is able to produce rapid and reliable diagnostic, in accordance with OIE standards	Only partially
	C- PCR	10	–			
	RT-PCR	110	–			
Kosovo	ELISA	800	–	Yes		Only partially
	PCR	50	–			
Montenegro	Serology	400	–	Yes	The NRL is able to produce rapid and reliable diagnostic, in accordance with OIE standards	Yes, fully
	RT-PCR	30	–			
North Macedonia	Serology	400–600	2018/Satisfactory	NO	The NRL is able to produce rapid and reliable diagnostic, in accordance with OIE standards	Yes, fully
	C-PCR	60–80	2018/Satisfactory			
	RT-PCR	70–100	2018/Satisfactory			
Serbia	ELISA + IPT	5200	2019/Satisfactory	Yes	The NRL is able to produce rapid and reliable diagnostic, in accordance with OIE standards	Yes, fully
	C-PCR	500	2019/Satisfactory			
	RT-PCR	600	2019/Satisfactory			

Country	Type of ASFV detection method available	Maximum No. of blood samples per day in the Country	Ring test (Year/results)	Training the last 2 years	Self -assessment of the Countries as it came up through the OIE-GFTADS survey[a] to the relevant questions	
					Perception of the Countries for the capacity of their NRL	Perception of the Countries for their compliance with the GF-TADS recommendations[b] on laboratory diagnostics
ROC (EU MSs)						
Croatia	ELISA (Ag+ Ab)	2800	2019/Satisfactory	Yes	The NRL is able to produce rapid and reliable diagnostic, in accordance with OIE standards	Yes, fully
	C-PCR	25	2019/Satisfactory			
	RT -PCR	300	2019/Satisfactory			
Greece	ELISA + IPT	100	2019/Satisfactory	Yes	The NRL is able to produce rapid and reliable diagnostic, in accordance with OIE standards	Yes, fully
	C-PCR	6	2019/Satisfactory			
	RT-PCR	12	2019/Satisfactory			
Slovenia	ELISA + IPT+ IB	1000–1700 (IB = 22-36)	2019/Satisfactory	Yes	The NRL is able to produce rapid and reliable diagnostic, in accordance with OIE standards	Only partially
	RT-PCR & C-PCR	15–30	2019/Satisfactory			

*: C-PCR: conventional polymerase chain reaction; IB: immunoblotting; IPT: indirect immunoperoxidase test; RT-PCR: real-time polymerase chain reaction; OIE: use of OIE standard method.
?: Information not available.
(a): Results of the Survey: 11th Meeting of Standing Group of Experts (GF-TADS) on ASF: http://web.oie.int/RREurope/eng/eng/Regprog/docs/docs/SGE%20ASF11/SGE%20ASF11%20(Warsaw,%20Sept%202018)%20-%20Plavsic_ASF%20Preparedness%20in%20Balkans.pdf
(b): All the recommendation are available on the web site of Standing Group of Experts on ASF under the GF-TADS umbrella.

Awareness campaigns and training activities

Risk communication of animal diseases such as ASF is crucial for prevention, control and eradication. The benefits of a well-designed and complete communication strategy are related not only to an effective passive surveillance system for the early detection of the disease, but also to an effective response from VAs.

Within EU, the responsibility of the MS to raise such awareness with respect to ASF is described in the strategic approach to the management of ASF for the EU (SANTE/7113/2015 - Rev 10). VAs play a significant role in organising such awareness campaigns and training activities within their countries. For transboundary diseases, like ASF, there are additional international initiatives to enhance this effort under the umbrella of EC, EFSA, OIE, GF-TADS and FAO.

Several awareness campaigns for ASF are already in place in the ROC (**Table 13**), according to the replies of the countries. Some countries have focused only on key stakeholders, while some others have extended the campaigns further to all relevant stakeholders who might come into contact with live animals susceptible to ASF (DP, WB) or their products (e.g. farmers, hunters, wildlife managers, custom services, animal transporters, livestock market staff and travellers).

A range of different tools is being used to disseminate information related to ASF, such as posters, leaflets, instructions, manuals, the media (TV, radio) and the websites of the authorities. Workshops and meetings are also being held with stakeholders and veterinarians. In addition, the EU MSs in the ROC are obliged to show posters at entry points as foreseen by Regulation 206/2009 as well as per Article 15a of Commission Implementing Decision 2014/709.

The capacity of the VAs to deal with ASF either at the level of prevention or occurrence is based on three main pillars: the legislative framework in place, training and resources. The legislative framework in relation to ASF has been described above (Section 3.1.5) and in Appendix A (Table A.2).

Although resources remain a standing and sustained demand in every domain, in the case of epidemics, the availability of resources is a critical prerequisite for the VA at all levels of prevention, control, eradication. Limited resources will contribute to further spread of the diseases, as it constrains both the preparedness and response of the VA.

In relation to training, the VA staff need suitable knowledge and qualifications to enable an effective intervention (Table 14). This can be ensured by participation in training activities covering relevant domains and objectives, either organised at a national level or by international organisations such as EC (BTSF, Better Training for Safer Food[11]), FAO, IAEA (International Atomic Energy Agency) or the EURL for ASF.

Awareness campaigns for travellers, hunter, farmers etc. should be further encouraged in the ROC, in order to limit the risk of spread via movements of people, as well as to increase the probability of early detection. Furthermore, regular repetitions and changes of awareness campaigns are recommended in order to maintain awareness.

Training activities for VA staff, other competent authorities and hunters should be organised frequently and cover all relevant ASF topics in order to increase the probability of early detection and effective control. This is especially important, as seven out of nine countries within the ROC felt that they have insufficient training of the VA staff.

Table 13: Awareness campaigns in countries within the ROC

Country	Awareness campaign in place for	Year started	Means/tools used	Perception of the Countries for their Compliance with the GF-TADS recommendations[(a)] on risk communication strategy[(b)]
ROC (Non-EU MSs)				
Albania	?	?	?	?
Bosnia and Herzegovina	Some key stakeholders	2016	In preparation stage	Partially
Kosovo[(c)]	Some key stakeholders	2017	Meetings	Partially

[11] Better Training for Safer Food (BTSF) is a Commission training initiative covering food and feed law, animal health and welfare and plant health rules.

Country	Awareness campaign in place for	Year started	Means/tools used	Perception of the Countries for their Compliance with the GF-TADS recommendations[a] on risk communication strategy[b]
Montenegro	Some key stakeholders	2018	Manuals, leaflets, media (television), ASFVPA website, workshops, TAIEX	Partially
North Macedonia	All stakeholders	2018	Leaflets, brochure/guidelines on biosecurity measures in pigs, trainings	Partially
Serbia	Some key stakeholders	2017	Manuals leaflets, posters, website, media (news, radio, television)	Partially
ROC (EU MSs)**				
Croatia	All stakeholders*	2018	Official documents, posters, leaflets, website of the Ministry, workshops, meetings with stakeholders and hunters, media	Fully
Greece	All stakeholders	2016	Official documents, posters, leaflets, workshops, meetings with stakeholders and hunters, website of the Ministry (http://www.minagric.gr/index.php/el/for-farmer-2/animal-production/pigs/1126-asthenxoiron)	Fully
Slovenia	All stakeholders	2016	Leaflets, posters, media (web pages, news, radio, television), website designated to ASF (www.afriskaprasicjakuga.si), workshops for hunters and vets	Fully

?: Information not available.
*: 'All stakeholders', according to the relevant question in GF-TADS survey, it refers to farmers, hunters, wild animal managers, custom services, transporters, livestock markets and travellers.
**: Article 15a of Commission Implementing Decision 2014/709 Information obligations for MSs.
(a): All the recommendations are available on the web site of Standing Group of Experts on ASF under the GF-TADS umbrella.
(b): Results of the Survey: 11th Meeting of Standing Group of Experts (GF-TADS) on ASF: http://web.oie.int/RREurope/eng/eng/Regprog/docs/docs/SGE%20ASF11/SGE%20ASF11%20(Warsaw,%20Sept%202018)%20-%20Plavsic_ASF%20Preparedness%20in%20Balkans.pdf
(c): Territory (this designation is without prejudice to position on status, and is in line with UN Security Council Resolution 1244/99 and the International Court of Justice Opinion on the Kosovo declaration of independence).

Table 14: Training activities on ASF that have taken place the last 2 years in different countries in ROC for the staff of Veterinary Authorities and stakeholders

Country	Training on procedures at infected premises within protection and surveillance zones	Training on procedures at local disease control centres	Training on procedures at the national disease control centres	Training on tracing and keeping records	Training on procedures for the notification of the disease (national level, international level, communication with the public)	Training on sampling procedures; specifically, on wild boars	Training on the procedures to be followed in the field	National training activities in place for the stakeholders
ROC (Non-EU MSs)								
Albania	?	?	?	?	?	?	?	?
Bosnia and Herzegovina	Yes	Yes	Yes	Yes	Yes	No	No	Partially
Kosovo	Yes	No	No	No	No	No	No	Partially
Montenegro	Yes	No	No	Yes	Yes	Yes	Yes	Partially
North Macedonia	No	No	No	No	Yes	No	No	Partially
Serbia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Partially
ROC (EU MSs)								
Croatia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Fully
Greece	Yes	Yes	Yes	Yes	Yes	Yes	No	Partially
Slovenia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Partially

?: Information not available.

Compensation policy for farmers

For animal diseases, such as ASF, control strategies are based on drastic measures with an impact on trade and the rural economy, such as culling of all animals in affected premises and trade restrictions for live animals and their products. To ensure compliance with the regulations and to reduce socioeconomic impact, timely and efficient compensation mechanisms for economic losses incurred by animal owners are crucial.

An overview of compensation policies in place in the countries within the ROC is shown in Table 15. Moreover, the European Commission provides financial support to MSs to eradicate, control and prevent various animal diseases, including for emergency measures according to the Regulation (EU) No 652/2014. Specific measures are co-funded through: (i) National Veterinary Programmes for the eradication, control and surveillance of animal diseases and zoonoses (veterinary programmes) and (ii) Emergency measures.

Table 15: Compensation policy for ASF in the countries within the ROC

Country	Level of compensation (percentage of the value of the animals killed)	Time interval between culling and compensation	Compensation for indirect loss of the production due to the shutdown of the establishments (empty stable period)
ROC (Non-EU MSs)			
Albania	?	?	?
Bosnia and Herzegovina	100% or more	30–60 days	No
Kosovo[(a)]	from 75 to 100%	30 days	No
Montenegro	100% or more	30 days	No
North Macedonia	100% or more	30 days*	No
Serbia	100% or more	30 days	No
ROC (EU MSs)			
Croatia	Up to 100%	60 days	No
Greece	100% or more	60 days	No
Slovenia	100% or more	Not specified, reasonable time	No

?: Information not available.
*: From the submission of the official request for compensation.
(a): This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

A compensation mechanism is in place, which covers the value of culled animals, but not indirect losses, in all countries within the ROC.

Communication and cooperation between authorities

Cooperation among countries, including the exchange of information, plays a key role in better understanding ASF epidemiology, and in implementing timely and appropriate measures for prevention and control. To this end, many initiatives have been developed to enhance communication and cooperation between national authorities. The Animal Disease Notification System (ADNS) developed by the European Commission and the World Animal Health Information Database (WAHIS) developed by OIE are digital applications that enable immediate notification and information about contagious animal disease outbreaks, including ASF. The notification of the outbreaks of listed diseases in ADNS is compulsory for EU countries according to Council Directive 82/894/EEC (as last amended by Commission Implementing Decision 2012/737/EU). The standing Group of Experts on African swine fe ver in Europe (SGE ASF) was set up to build up a closer cooperation among countries affected by ASF and thereby address the disease in a more collaborative and harmonised manner across Europe.

The SGE ASF Europe is a unique opportunity to engage affected countries into a fruitful regional dialogue and increased transparency. The GF-TADs offers the ideal framework to discuss common/ harmonized mitigation measures based on scientific and technical grounds only.

To ensure efficient prevention and control of ASF, active collaboration between the VAs and other competent authorities and stakeholders is needed. Given the role of WB in the current epidemic of ASF in Europe, authorities responsible for the environment, wildlife and hunting are particularly important (SANTE/7113/2015 - Rev 10). The transboundary nature of the disease, and the role that human activities play for long distance and cross border spread implies a need for engagement also of custom and border control services. The involvement of organisations and associations of farmers and hunters are also crucial. An overview of communication and cooperation between authorities and stakeholders within and between the countries within the ROC is summarised in **Table 16**.

Table 16: Communication and cooperation among the different national authorities and cross border cooperation between the countries within the ROC. The table has been filled in with the information received from OIE/GFTADS survey

Country	Active cooperation with farmers and other food business operators	Active cooperation with hunters and authorities for wildlife	Active cooperation with Customs and other Services	Perception of the Countries for their Compliance with the GF-TADS recommendations[(a)] on cooperation with		Cross Border Cooperation		
				hunting and wild management organisations	customs officials on coordinated border management	Cooperation with the neighbouring countries	Follow activities of EC, OIE and FAO	Notification to WAHIS and to ADNS
ROC (Non-EU MSs)								
Albania	?	?	?	?	?	?	?	?
Bosnia and Herzegovina	Yes	Yes	Yes	Partially	Partially	Yes	Yes	No
Kosovo	Yes	Yes	Yes	Partially	Fully	Yes	Yes	Partially
Montenegro	Yes	Yes	Yes	Fully	Fully	Yes	Yes	Fully
North Macedonia	Yes	Yes	Yes	Fully	Fully	Yes	Yes	Fully
Serbia	Yes	Yes	Yes	Fully	Fully	Yes	Yes	Fully
ROC (EU MSs)								
Croatia	Yes	Yes	Yes	Fully	Fully	Yes	Yes	Fully
Greece	Yes	Yes	Yes	Fully	Fully	Yes	Yes	Fully
Slovenia	Yes	Yes	Yes	Fully	Fully	Yes	Yes	Fully

?: Information not available.
(a): All the recommendation are available on the website of Standing Group of Experts on ASF under the GF-TADS umbrella.

Contingency plans

For rapid and efficient control and eradication of ASF, national CPs are needed in order to ensure the high level of preparedness and rapid response to an occurrence (Council Directive 2002/60/EC, Regulation 2016/429). The CP should clearly describe the procedures and the flow of commands to be followed and should include guidelines or manuals with the Standard Operating Procedures (SOPs) to support any person or competent authority involved.

Regular updates are needed to ensure that the plans adapt to the epidemiological situation of the disease and remain in compliance with recommended control measures. In addition, it is important that regular simulation exercises are carried **out**.

An overview of CP in place in the countries within the ROC is shown in **Table 17**.

Table 17: Contingency plans for ASF of the countries of ROC

Country	CP in place and integrated in national legislation	Specific manuals and SOPs were developed for the CP	CP updated the last 2 years	Simulation exercise for ASF CP	Disease control centres appointed by CP and functional
ROC (Non-EU MSs)					
Albania	?	?	?	?	?
Bosnia and Herzegovina	Yes	No	Yes	No	At national and regional level
Kosovo	Yes	Yes	Yes	No	At national level
Montenegro	No	Yes	No	No	No
North Macedonia	Yes	Yes	Yes	No	At national and regional level
Serbia	Yes	Yes	Yes	Yes	At national and regional level
ROC (EU MSs)					
Croatia	Yes	Yes	Yes	No	At national and regional level
Greece	Yes	Yes	No	No	At national and regional level
Slovenia	Yes	Yes	Yes	No	At national level

?: Information not available.

Registration and identification system for domestic pig population and animal movements

Registration and identification systems are very important tools for risk assessment and disease management. They provide information that is essential for epidemiological investigations and allow forward- and backward-tracing of animal movements and animal products. The more detailed and digitalised they are, the more effective is their contribution to the management of the diseases and the epidemiological investigation. According to Council Directive 2008/71/EC and to the Commission Decisions 2000/678/EC, the development of these systems is a legal requirement for the MS of EU. In addition, it is a requirement for EU pre-accession countries.

An overview of registration and identification systems in place in the countries within the ROC can be seen in Table 18 below. Few countries within the ROC had either no movement registrations (one country), no contingency plan (two countries), incomplete NRL capacity (one country), or insufficient surveillance (two countries). These deficiencies should be improved, as the first three reduce the effectiveness of controlling disease, while the last one decreases the probability of early detection as well as the effectiveness of control.

Table 18: The registration and identification systems of the domestic pig population of each country within the ROC

Country	Digital national database for the registration of domestic pig population	Registration of pig farms with unique identification code	Registration of the number of pigs in farms by census	Frequency of census	Registration of pigs with individual identification code	Registration of domestic pig movements in the national database	Official health certificate accompanies the dispatches (issued by official authorities)	Movement notification document accompanies the dispatches (issued by the owner of the animals)
ROC (Non-EU MSs)								
Albania	?	?	?	?	?	?	?	?
Bosnia and Herzegovina	Not at national but only at local level	Yes	Yes*	Once a year*	Yes	No	Yes	No
Kosovo	Yes	Yes	–	–	Yes	Yes	Yes	Yes
Montenegro	Yes	Yes	Yes	Twice a year	Yes	Yes	Yes	Yes
North Macedonia	Yes	Yes	Yes	Twice a year **	Yes	Yes	Yes***	No
Serbia	Yes	Yes	Yes	During registration	Yes	Partially	Yes	No
ROC (EU MSs)								
Croatia	Yes	Yes	Yes	Once a year	Yes	Yes	Yes	Yes
Greece	Yes	Yes	Yes	Once a year	Yes (reproductive population)	Yes	Yes	Yes
Slovenia	Yes	Yes	Yes	Once a year	Yes	Yes	No/Yes****	Yes

?: Information not available.
*: During vaccination for CSF.
**: Normally once a year but due to the ASF threat twice a year.
***: Issued by the PVPs under contract with CA.
****: No for internal movements but yes for dispatches outside the Country.

Surveillance activities

As ASF is a notifiable disease, passive surveillance in DP and in WB is a legal obligation and is in place in the south-eastern European countries. Passive surveillance mainly concerns the laboratory analysis conducted on WB found dead, and may or may not include road kills, and on DP with clinical signs similar to ASF. In some countries, active surveillance is also in place, including systematic (random or risk-based) sampling and laboratory analysis of DP or hunted WB.

An overview of surveillance activities carried out during 2018 in the countries with the ROC can be seen in Table 19. All the results were negative for ASF.

Table 19: Surveillance activities in place during 2018 in ROC

Country	Passive Surveillance in 2018					Active Surveillance in 2018				
	Wild Boar (found dead)		Domestic Pig (clinical suspected)			Wild Boar (hunted)		Domestic Pig		
	In place	No. of animals tested	In place	No. of animals tested	No. of the suspicious farms	In place	No. of animals tested	In place	No. of animals tested	No. of farms sampled
ROC (Non-EU MSs)										
Albania	Yes	0	Yes	0						
Bosnia and Herzegovina	Partially	1	Partially	0	0	Partially	73	–	–	–
Kosovo	Yes	0	Yes	0	0	No	–	No	–	–
Montenegro	Partially	0	Yes	9	–	Yes	303	No	–	–
North Macedonia	Yes	0	Yes	2	1	Yes	0	No	–	–
Serbia	Yes	25	Yes	–	–	Yes	703	Yes	–	–
ROC (EU MSs)										
Croatia	Yes	19	Yes	66	3	Yes	1,500	No	–	–
Greece	Yes	4	Yes	0	0	No	–	No	–	–
Slovenia	Yes	66	Yes	1	1	Yes	365	Yes	340	253

Surveillance activities, especially passive surveillance of wild boar and domestic pigs, should be reinforced in the ROC as it remains the most effective means for early detection of ASF, benchmarking should be considered, to determine a threshold of the minimum number of wild boar found dead to be tested. Timely intervention to prevent ASF spread to non-affected areas within the ROC, as well as from the ROC to non-affected EU MS outside the ROC, is highly dependent on early detection and effective control of the disease.

4. Assessment

4.1. Risk of spread of African swine fever in the south-eastern countries of Europe

4.1.1. Potential spread of ASF in the region of concern after possible introduction

4.1.1.1. Indicators related to spread of ASF in domestic pig populations

Since 2007, most of the ASF outbreaks in Europe have occurred in smallholdings. This could be a consequence of poor biosecurity conditions and other inherent features, including the use of swill-feeding (illegal in the EU), illegal animal movements, collections of backyard pigs in markets, home-slaughtering, outdoor keeping and possible contacts to other pigs or feral pigs (Jori and Bastos, 2009; Costard et al., 2013a; Guinat et al., 2016). Moreover, the surveillance of smallholder farms by veterinary authorities is more difficult than surveillance of commercial farms, which generally have high biosecurity levels and good recording of animal and people movements in the farm or purchases of feed or services. This is illustrated by the conclusions in the audit report of the European Commission

(DG (SANTE) 2018-6700), which stated that the lack of effective traceability, which generally prevails in the smallholder farms in Romania, contributed to the spread of ASF in that country.

The high **percentage of smallholders** (78.9%, see Table 2) in the domestic pig sector is a very important indicator contributing to the potential spread of ASF within the ROC. From the countries with data available on the numbers of animals in pig herds, it is clear that smallholder pig production is a key feature of pig production throughout south-eastern Europe, representing most pig holdings in all countries except in Greece and Serbia. The percentage of smallholders in the ROC (Table 2) is high, with a median of the 78.9% of pig farms with less or equal than 10 animals per herd in the ROC. In Serbia, the pig density is high with approximately 80.5 pigs per km^2 of agricultural land on average. The agricultural sector in this country is characterised by small family farms raising livestock mainly for home consumption. Although only 21% of the pig herds have less or equal than 10 animals, the absolute number of pigs kept in smallholder farms in Serbia is substantial (about 134,016 pigs, see Table 2), second only to Croatia. In Greece, the percentage of smallholdings is relatively low (28.5% has $\leq$ 10 animals), compared with the other countries in the ROC for which data were available (Table 2). In Croatia, Kosovo, North Macedonia and Slovenia, the percentage of smallholders is higher than the median value among the ROC countries.

The **presence of free-ranging pigs** in some areas in the region may contribute to the possible spread of ASF in the ROC. This has been demonstrated in the past for other diseases, such as Aujeszky's disease or brucellosis in the ROC (Duvnjak et al., 2015; Milicevic et al., 2016; Zutic et al., 2017). Free-ranging pig farming is a traditional husbandry practice in most countries in the ROC. Autochthonous pig breeds (Black Slavonian, Turopolje, Mangalitsa, Moravka, East Balkan pig) are usually reared in extensive or semi-extensive production systems that might facilitate contact with WB (Ribani et al., 2019). Outdoor reared pigs in the region of Srem, north western Serbia, are part of an extensive breeding system in the field and woods that can facilitate contacts with wild boar (Zutic et al., 2017). A population genetics survey of wild boar in Europe was recently completed, mapping the hybridisation of wild boar with domestic pigs. Individuals with more than 10% domestic ancestry in their genome were mostly concentrated in Austria, Bosnia and Herzegovina, Bulgaria and Serbia. The study suggests that hybridisation has occurred over a long period and is still ongoing, as recent hybrids were detected. The authors suggest that the pattern of wild boar hybridisation is due to differences in farming practices (backyard or free-range) which facilitates domestic pig/wild boar contacts and indicates risks for animal health (Iacolina et al., 2018). Similar findings were reported by Nikolov et al. (2017) and Ribani et al. (2019). In addition, it has been shown that infectious diseases are 'shared' between domestic pigs and wild boar. Studies on *Brucella suis* strains have provided evidence that wild boar might be a source of infections for domestic pigs (Duvnjak et al., 2015; Zutic et al., 2017). Other *B. suis* surveys suggested introduction of wild boar from central-Eastern Europe to Italy for hunting purposes (Di Sabatino et al. 2017). In Serbia, WB and DP also share similar Suid Herpesvirus 1 strains (Aujeszky's disease; Milicevic et al., 2016). Further, farmed wild boar are present in Bosnia and Herzegovina for the purpose of training hunting dogs (Zahirovic et al., 2013) and Marinou et al. (2015) mention 'extensively farmed' (fenced) WB in Greece.

The **absence of the ban of swill feeding** in the country is another indicator related to the pig husbandry systems. In all countries of the ROC, except Montenegro, swill-feeding is forbidden by law.

Finally, **home-slaughtering of animals** could be a driver for the spread of the disease. Home-slaughtering of pigs is allowed in all countries of the ROC, except Greece, which could be an important indicator for spread of ASF, as feature of non-professional pig production, which is a known constraint to ASF control (Mur et al., 2016). It should be noted though that illegal swill-feeding or home-slaughtering can still occur, albeit in contradiction of the law, and thus this assessment is paired with considerable uncertainty.

4.1.1.2. Indicators related to spread of ASF in wild boar populations

Currently, a WB density threshold under which the spread of ASF in WB populations would fade out has not been determined, and ASF has occurred in regions where WB densities are very low (EFSA AHAW Panel, 2018). Nonetheless, high WB density is recognised as a risk factor contributing to the spread of ASF in WB. As illustrated in Table 5, the estimated median of relative WB abundance in the ROC based on hunting bag per suitable habitat is between 0.6 and 1 WB per km^2. In some areas in the Baltic States, ASF has been present for 4 years and has spread to areas where WB densities are estimated to be very low (e.g. below 0.4 animals/km^2) (EFSA AHAW Panel, 2018). Some countries within the ROC have a relatively high WB abundance, such as Greece, Croatia and Slovenia. Therefore, it is expected that the average WB density in the ROC will not impede the spread of the disease. The

same could be said about the median suitable WB habitat in the countries of the ROC of 81.9% (see Table 5), which is on average not less than those areas in Europe where ASFV has been detected for several years.

Relative WB abundance in Slovenia, Serbia, Croatia and Greece has increased in recent decades (Tsachalidis and Hadjisterkotis, 2008; Massei et al., 2015). Increasingly mild winters are strongly associated with population increases across Europe, although there are region-specific threshold temperatures for the onset of exponential growth (Vetter et al., 2015). Furthermore, abundant availability of critical (energy-rich) food resources can outweigh the negative effects of cold winters on population growth of WB (Vetter et al., 2015). The reproductive performance of WB in the ROC has been studied by Šprem et al. (2016a). The mean number of fetuses per sow was 6.02 (4.62 per juvenile, 6.39 per yearling and 6.77 per adult) suggesting a higher reproductive capacity compared with other populations in southern and northern Europe, but comparable with some populations in central Europe (Šprem et al., 2016a). Natural boundaries such as the Dinaric mountain chain in Croatia do not represent a significant barrier for wild boar movements (Šprem et al., 2016b; EFSA AHAW Panel, 2018).

In Montenegro, North Macedonia and Serbia, the WB density is lower than the median of the ROC (median ROC = 0.6–1.0 wild boar/km) (see Table 5).

The **suitable WB habitat** is less than the median of the ROC (median ROC = 80%) in Albania, Croatia, Greece and Serbia (see Table 5).

Supplementary **feeding of WB** is a widespread practice throughout Europe. A study in Bulgaria investigated the species visiting feeding stations using camera traps. The WB were the most frequently visiting mammal and spent the longest periods of time at the feeding stations (Popova et al., 2017). WB feeding has been banned since December 2018 in Croatia (Žaklin Acinger-Rogić, personal communication). Aggressive interactions among WB around feeding stations are likely to be a means of ASFV transmission (EFSA AHAW Panel, 2018). As there was no quantitative information on WB feeding available for most of the ROC countries, this information was not used further in the assessment.

4.1.1.3. Indicators related to connectedness

The intensity of **trade of live pigs and pork/products** within the ROC is low compared with the intense trade movements observed between EU MSs. Serbia is the largest pig producer in the ROC (Table 2).

Based on the number of movements of live pigs reported to TRACES by the EU MS in the ROC, it appears that most pig movements from the ROC originate from Croatia. However, not all trade data are reported to TRACES, as this is not obligatory in the non-EU countries and the non-EU ROC countries trade with each other, as demonstrated by data reported to UN COMTRADE. Therefore, there is a considerable uncertainty around this trade indicator. In addition, trade between affected countries in the EU is strictly regulated: products must be treated and no live animals can be exported from affected countries to the 28 MS in the EU. Furthermore, trade between countries in the EU is regulated. From ASF affected areas, there is a prohibition of trade of live pigs and pork, however strict derogations apply (e.g. products must be treated).

In the ROC, **domestic pig production** is the most important livestock enterprise in Serbia and Croatia, followed by Slovenia (**Table 2**). However, in terms of connectedness, these three countries only export very small number of live pigs to other countries in the ROC.

There is substantial and ongoing **movement of people** between the countries within the ROC (Section 3.1.3).

4.1.1.4. Indicators related to the societal context

In 2017, the percentage of the total population **at risk of poverty** or social exclusion in the ROC had a median of 31.0% (Eurostat, 2019). One of the consequences of poverty, in the context of assessing the potential risk of spread of ASF in the ROC, is the scarce availability of resources to control the disease. The availability of sufficient and appropriate resources is critical to an effective system for animal disease control. Furthermore, poverty has been associated with poorer compliance with control measures. For example, poor households that keep a few pigs in backyard farms for subsistence may not immediately notify the VA when suspecting ASF infection in their holding. In addition, it can also be assumed that swill-feeding is more likely to occur in poor smallholder households, in spite of any legislation in place that forbids the practice. Therefore, poverty is likely an important factor that could potentially contribute to spread of ASF in the concerned area, given its introduction.

In terms of traditions that could influence the spread of ASF, the median **pork consumption** for the ROC is relatively low (e.g. median of 26.8 kg of pork consumed per capita in the ROC) as shown in Table 11; however, in some countries such as Croatia, Montenegro, Serbia and Slovenia, the consumption of pork is higher than the median and this may favour spread of ASF.

The median **risk of poverty** is 31.0% in the ROC (Table 10). The at risk of poverty rate in Greece, Montenegro, North Macedonia and Serbia is above this median in the ROC. Bosnia and Herzegovina and Kosovo have the highest levels of rural populations in Europe, with very high unemployment rates. The labour markets in the western Balkan countries in general (Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia) are characterised by high unemployment (Table 10).

4.1.1.5. Indicators related to preparedness and response activities

According to the data and information we received from the national authorities, most countries of the ROC are relatively well prepared to deal with a potential incursion of ASF in their countries. Contingency plans have been set up and are up to date in all but two countries of the ROC. Laboratory capacities are sufficiently well developed to deal with ASF detection, with one exception and absence of data in one country, and passive surveillance activities are being carried out (although the numbers of animals tested are low). However, most countries in the ROC declared the need for further improvement in the capacities of the VA to deal with a potential ASF outbreak. Also, the registration of animal movement is absent, or not reported in two countries. Lack of traceability of animal movements could be an important driver for the potential spread of the disease in the ROC, following an incursion.

Most of the countries in the ROC have a legislative framework in place that would allow them to implement effective control measures in case of an incursion ASF.

According to the replies that the countries within the ROC provided to the survey carried out by the GF-TADs, there are available resources such as consumables for outbreak investigations in the field, whereas resources for carcass management and disposal are limited (suitable only for a small number of outbreaks). Moreover, the countries within the ROC have only partially implemented activities to reinforce the VAs with appropriate technical competences and human and financial resources for the prevention and control of ASF.

All countries in the ROC, except Kosovo, have designated a NRL for ASF. Staff in these laboratories have received training on diagnostic methods during at least the last 2 years. The NRLs of Croatia, Greece, Slovenia and Serbia have in 2019 participated in proficiency tests organised by the EURL for all diagnostic methods, except virus isolation, with satisfactory results.

Based on self-assessments, all countries within the ROC have adequate **laboratory capacity** to produce rapid and reliable diagnosis of ASF in compliance with OIE standards. Most of the countries also comply with the GF-TADS recommendations on laboratory diagnostics (Table 13).

The VAs of all countries within the ROC have participated in several relevant **training activities** related to disease outbreak management and control (Table 15). No information was available from Albania. Kosovo and Montenegro did not organise training on procedures for disease control. Seven out of eight countries, from which information was available, declared to have only partially fulfilled training programmes for all target groups, however. All the countries within the ROC have carried out some level of awareness raising activities related to ASF, targeting relevant stakeholders, but most of the countries only partially comply with the GF-TADS recommendations on risk communication.

According to the self-assessments, all countries in the ROC, for which information is available, fully comply with the need to collaborate between the Competent authority and neighbouring countries, other relevant authorities and stakeholders.

All the countries in the ROC with the exception of Albania and Montenegro have **contingency plans** for ASF in place, most of which have been updated within the two last years. Most countries have not carried out a simulation exercise for the contingency plan of ASF (Table 19).

Registration and identification systems for DP at national level are in place in mainly all countries within the ROC, except Bosnia and Herzegovina where the registration system is not organised at national level. However, systems for **registration of pig movements** are not present in all countries within the ROC, namely Serbia has only a partial registration system for pig movements in place within the country, and there are no data available from Bosnia and Herzegovina. The **passive surveillance system** in Bosnia and Herzegovina and Montenegro is only partially implemented.

The overall estimation of the risk of spread within the ROC

A summary of the assessment of the above-mentioned indicators is provided in Table 20. Based on a collective evaluation of all indicators, experts of the standing working group on ASF estimated by consensus the likelihood of spread in the ROC as a whole and evaluated the uncertainty of their assessment. It was concluded that due to the high number of indicators present in most of the countries in the ROC and the known effect that these indicators can have on ASF spread, especially those related to the percentage of smallholder farms and risk of poverty, but also those related to the connectedness between the countries in the ROC through movement of people, the probability that ASF will spread once the disease is introduced in the ROC is between 66% and 100% (very high).

To determine whether a particular country within the ROC could be at higher probability of ASF spread given an introduction of ASF, the value of indicators for that country (e.g. percentages of smallholders) was compared to the median value of the indicators of the whole ROC. For quantitative factors, those indicators that were above the regional median were considered '+', and those below the median were '−'. For qualitative factors, binary indicators were given a '+' if they were fulfilled, and a '−' if they were not ((Table 20). A country was considered at relative risk of ASF spread if at least one qualitative indicator was present, or at least one quantitative indicator lay above the median (e.g. if '+' were present for a given country). It was concluded that the presence of indicators varies between countries in the ROC. Each of the assessed countries had several indicators present, suggesting that each country is at risk of ASF spread following introduction. However, there are some countries with higher numbers of pigs in combination with a high number of indicators present. This is likely to represent a higher probability of spread following introduction.

Table 20: Summary of the assessment of the indicators that could influence the spread of ASF of each country in the region of concern, compared with the median for each indicator value in the region of concern

	Domestic pigs			Wild boar		Connected-ness		Societal factors		Preparedness						
	Swill feeding is allowed in country	Presence free ranging pigs	% of small holdings (n ∨ 10)	Home-slaughtering allowed	Density*	Suitable wild boar habitat*	Trade Pig/products to ROC	Pork consumption*	At risk of poverty rate*	No movement registration	Absence of a contingency plan	Incomplete NRL capacity	Insufficient training of Vet. Authorities	Insufficient surveillance	+	?
ROC (Non-EU MSs)																
Albania	?	?	?	?	?	?	–	–	?	–	+	?	?	?	2	10
Bosnia and Herzegovina	–	–	?	+	?	?	–	–	?	?	–	–	+	+	3	5
Kosovo	–	–	+	+	?	+	–	?	?	–	–	+	+	–	6	3
Montenegro	+	–	–	+	–	+	–	+	?	–	+	–	+	+	7	1
North Macedonia	–	+	–	+	–	+	–	–	+	–	–	–	+	–	6	0
Serbia	–	+	–	+	–	+	+**	+	+	+	–	–	+	–	8	0
ROC (EU MSs)																
Croatia	–	+	+	+	+	–	–	+	–	–	–	–	–	–	5	0
Greece	–	+	–	–	+	–	–	+	–	–	–	–	+	–	4	0
Slovenia	–	+	+	+	+	+	–	+	–	–	–	–	+	–	7	0
Non-ROC ASF-affected countries in SE Europe																
Romania	–	+	+***	+	–	–	na	–	+	–	–	–	na	–	4	0
Bulgaria	–	+	+	+	+	–	na	–	+	–	–	–	na	–	4	0

*: Quantitative variables are compared to the median of the variable calculated for the countries in the region of concern. For quantitative factors, those indicators that were above the regional median were considered '+', and those below the median were '–'. For qualitative indicators, binary indicators were given a '+' if they were fulfilled, and a '–' if they were not.
The median of average WB density in the ROC = 0.6–1.0 WB/km; the median % of suitable WB habitat in the ROC = 81.9%; The median pork consumption in the ROC = 26.8 kg/year; the median of the poverty rate in the ROC = 31%.
?: Number of indicators without information available, na: not applicable.
**: Serbia is the major exporter of pigs and products to non-EU MS in the ROC.
***: A different definition for small holders in Romania is used, see Table 1.

4.1.2. Potential spread of ASF, given introduction, from the region of concern to non-affected EU countries

The main **potential** pathways of ASF spread from the ROC to non-affected MS are through transboundary WB population, movements of pigs infected products or contaminated materials. The presence of **shared borders** with non-affected countries was used as indicators of transboundary WB populations. Slovenia is the only country in the ROC that has shared land borders with non-affected MS in the EU. This could be an important indicator for potential transboundary spread of ASF through the WB population. In addition, WB density in Slovenia is one of the highest densities in the ROC, with 1.73–2.77 WB per km square on average (Table 5).

People movement, either under the form of migration (Figures 4, and 6), tourism (**Table 9**) and more in particular hunting tourism (Table 6), was used as an indicator for the potential movement of products that could contain infectious virus. Tourism from non-affected EU MSs outside the ROC to countries within the ROC is most important in Greece, Croatia, Slovenia and Albania (**Table 9**). As commercial WB hunting/hunting tourism is quite popular in the ROC, there is a risk for introduction to the non-affected MS outside the ROC through this pathway. However, there is no hunting tourism for wild boar in Albania, Montenegro and Greece (Table 6). Labour movement to non-affected MSs outside the ROC is highest from Albania (with immigrants especially going to Greece and Italy), second highest from Kosovo (with most immigrants going to Germany) and thirdly from Serbia (with immigrants going mainly to Austria and Germany). The median number of migrants from the western Balkan countries to Europe in 2015 was 0.76 million people. Albania, Bosnia and Serbia have higher numbers of migrants in Europe, whereas the other western Balkan countries have less migrants to the EU. Therefore, there is a risk of ASF introduction from the ROC through this route, given that the disease was introduced and established, especially when these labour migrants have potential direct or indirect contact with domestic pigs or wild boar. It should be noted that pork production and consumption is low in Albania, relatively low in Kosovo and high in Serbia (Figure 5).

As it could be a potential indicator for spread of ASF within the ROC, the high **percentage of smallholder farms** in the ROC (see above) could also be an indicator for spread towards the non-affected MS of the EU, mainly due to the lack of biosecurity and low traceability of pig movements to and from these type of farms.

Trade of live pigs from the ROC to non-affected EU MSs is only authorised from the three MSs (in accordance with Regulation 206/2010) i.e. Slovenia, Croatia and Greece, and is relatively more important from Croatia. The other countries within the ROC are currently not on the list of approved non-EU countries for export of live pigs or fresh/frozen pig meat. Trade from affected regions in the EU is allowed under certain derogations in Implementing Decision 2014/709, which requires periods of residency and pre-movement testing only for certain regions where ASF has not been detected in the wild boar or domestic pigs population, or if animals are destined to slaughter. The dispatch of wild boar caught from the wild from all MSs is prohibited to other MSs and to Third Countries (Point 3 of Article 15 of Commission Implementing Decision 2014/709).

Poverty is a recognised driver for ASF spread in the ROC, which in turn increases the risk of ASF spread to non-affected EU MS outside the ROC.

This assessment has included comparative information about Bulgaria and Romania, the two countries in south-eastern Europe already affected by ASF at the time of assignment of the mandate. The epidemiological presentation of ASF in these two countries has been very different, possibly due to the greater relative importance of the smallholder sector in Romania compared to Bulgaria (Table 21). The epidemiological circumstances at the time of the initial cases in each country may also have differed, with implications for the subsequent epidemic in each country. The first cases of ASF in Romania in July 2017 were a consequence of expansion of infection from known infected areas in Ukraine, whereas the first cases of ASF in Bulgaria in September 2018 were likely to be linked to recent Romanian cases near their shared border, possibly following one or several focal introductions.

The challenges and responses for these differing epidemiological situations have been presented previously (EFSA AHAW Panel, 2018). Romania and Bulgaria scored positive on nearly all indicators for the risk of spread out of the area to non-affected EU countries. However, both Romania and Bulgaria had less trade of pig and pork with non-affected EU countries outside the ROC, compared to the median of the countries in the ROC (Table 21).

The overall estimation of the risk of spread from the region of concern to non-affected EU countries

Table 21 finally summarises the presence of the indicators in the ROC, described previously, that could favour spread of ASF from the ROC into the non-affected area of the EU. Trade of pork and pigs from the ROC to non-affected MSs is very limited as EU rules do not permit the free trade of live pigs from third countries to MSs and there is only limited trade in pig meat or pork products (only Serbia can trade treated pig products from selected establishments); but also because the majority of pig farms in the ROC are smallholders, and therefore, the pig meat is mainly for local consumption. Furthermore, the contribution of natural movement of wild boar populations on the spread of ASF to not affected EU MS outside the ROC is limited to only one land border of a country in the ROC (Slovenia) to two non-affected EU MS outside the ROC. However, there is a high level of movement of people through tourism or migration.

Comparing the situation in the ROC with the presence of indicators in the already affected countries in south-eastern Europe, such as Bulgaria and Romania, where no evidence of spread of ASF to other EU MS was observed within one year after the first introduction in these two countries, the probability of spread of ASF from the ROC to non-affected MSs in the EU within one year after introduction of ASF in the ROC was estimated to be very low to low (from 0 to 15%).

The probability of spread from the ROC to non-affected MSs in the EU will be determined by the specific socioeconomic indicators and indicators related to connectedness present in individual countries of the ROC.

Table 21: Comparison of the assessment of indicators regarding the connectedness and societal context that could influence the probability of spread from the Region of Concern to non-affected EU MS outside the Region of Concern

Country	Connectedness					Societal context	
	Shared borders	Tourism	Labour Migration*	Commercial WB hunting/ hunting tourism	Pig and pork trade to non-affected EU countries**	At risk of poverty*	% small holders
ROC (Non-EU MSs)							
Albania	–	–	+	–	–	?	?
Bosnia and Herzegovina	–	–	+	+	–	?	?
Kosovo	–	–	–	?	–	?	+
Montenegro	–	–	?	?	–	?	–
North Macedonia	–	?	–	+	–	+	–
Serbia	–	–	+	+	–	+	–
ROC (EU MSs)							
Croatia	–	+	na	+	+	–	+
Greece	–	+	na	?	+	–	–
Slovenia	+	–	na	+	+	–	+
Countries in south-eastern Europe that are not part of the ROC							
Romania	+	+	+	+	–	+	+
Bulgaria	+	+	+	+	–	+	+

*: Quantitative variables are compared to the median of the variable calculated for the countries in the region of concern. For quantitative factors, those indicators that were above the regional median were considered '+', and those below the median were '–'. For qualitative indicators, binary indicators were given a '+' if they were fulfilled, and a '–' if they were not.
?: No information available, na: not applicable.
**: As soon as outbreaks are detected and regionalisation has been established in the EU countries, trade out of these regions is restricted. However, in the time between introduction and detection, legal trade of pigs or products could still contribute to spread.

5. Conclusions

Potential spread of ASF within the ROC once introduced

- It was estimated that the probability that ASF will spread **within** the ROC within one year following introduction is very high (between 66% and 100%). This estimate was determined after considering the high number of indicators present in most of the countries in the ROC and the known effect that these indicators can have on ASF spread, especially those related to the structure of the domestic pig sector, the presence of wild boar and social factors.

Comparison of potential spread of ASF between countries within the ROC, given introduction

- The presence of indicators varies between countries in the ROC. Each country is at risk of ASF spread following introduction, but every country had several indicators present.
- Some countries had higher numbers of pigs and a high number of indicators present. These may have a higher probability of ASF spread following introduction.

Potential spread of ASF, given introduction, from the ROC to non-affected EU countries outside the ROC

- The probability of spread of ASF from the ROC to non-affected MSs in the EU outside the ROC within one year following introduction of ASF in the ROC was estimated to be very low to low (from 0% to 15%). This estimate was based on the comparison of the indicators present in the ROC and the already affected countries in south-eastern Europe, such as Bulgaria and Romania, where there was no evidence of ASF spread to other EU MS within one year.
- Several risk factors are relevant to this part of the assessment:
  - Legal trade of live pigs and pig meat or products of pig origin from third countries of the ROC to non-affected MS is very limited as EU rules provide strict risk mitigating measures. These rules are also applicable to personal consignments.
  - The majority of pig farms in the ROC are smallholders, which can be expected to mainly produce for local consumption.
  - The local movement of wild boar populations across borders would have a limited impact on the probability of ASF spread from the ROC to MS outside the ROC, as there is only one country (currently not affected) in the ROC with a land border to a non-affected MSs.
  - There is movement of people, such as tourism or migration. There is the potential that people could carry pork products for personal consumption, which may end up in the environment or illegally fed to pigs.
- Timely intervention to prevent ASF spread to non-affected areas within the ROC, as well as from the ROC to non-affected EU MSs outside the ROC, is highly dependent on improved preparedness, early detection and effective control of the disease.

6. Recommendations

Activities that increase the probability of early detection and preparedness or the effectiveness of controlling disease can be recommended. However, the following recommendations can especially be highlighted, based on the identified risk indicators in the ROC:

- Surveillance activities, especially passive surveillance of wild boar and domestic pigs, should be reinforced in the ROC as it remains the most effective means for early detection of ASF, benchmarking should be considered, to determine a threshold of the minimum number of wild boar found dead to be tested.
- Awareness campaigns for travellers, hunters, farmers etc. should be further encouraged in the ROC, in order to limit the risk of spread via movements of people, as well as to increase the probability of early detection.
- Furthermore, regular repetitions and changes of awareness campaigns are recommended in order to maintain awareness.

- Active communication and collaboration among competent authorities and stakeholders should be encouraged at national and international level in order to optimise the awareness campaigns.
- Furthermore, increased collaboration, within and between countries, will increase the probability of early detection and the effectiveness of the control of ASF. It is encouraged that countries within the ROC share information regarding surveillance, suspicions etc. in order to facilitate early detection.
- Training activities for VA staff, other competent authorities and hunters should be organised frequently and cover all relevant ASF topics in order to increase the probability of early detection and effective control. This is especially important, as seven out of nine countries within the ROC felt that they have insufficient training of the VA staff.
- Few countries within the ROC had either no movement registrations (one country), no contingency plan (two countries), incomplete NRL capacity (one country) or insufficient surveillance (two countries). These deficiencies should be improved, as the first three reduce the effectiveness of controlling disease, while the last one decreases the probability of early detection as well as the effectiveness of control.
- To reduce the probability of spread through wild boar, preventive measures to reduce the wild boar carrying capacity of wild boar habitat (feeding bans + limiting wild boar access to attractive crops such as maize), along with actions to increase the annual wild boar hunting harvest (aiming at > 65% of the estimated population) are recommended.

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Abbreviations

ADNS	Animal Disease Notification System
AHAW	Animal Health and Welfare
ASF	African Swine Fever
ASFV	African swine fever virus
CA	Competent authorities
CP	Contingency plans
CSF	Classic swine fever
DP	Domestic pigs
EURL	European Reference Laboratory
FAO	Food and Agriculture Organisation
IPA	Instrument for Pre-Accession Assistance
MS	Member State
NRL	National Reference Laboratories
ROC	Region of concern
SEE	South East Europe
SOP	Standard Operating Procedure
VA	Veterinary authorities
WB	Wild boar

Appendix A – Legislative framework

Table A.1: EU Legislation related to ASF and the main control measures to eliminate the identified potential risks

Legislative documents		Main control measures
Council Directive 2002/60/EC	Specific provisions for the control of ASF	Measures on a holding following suspicion or confirmation of ASF; Measures and Epidemiological Investigation for contact holdings; Establishment of protection and surveillance zone; Depopulation and destruction of carcasses; Cleansing, Disinfection, insect control; Repopulation of the holdings; Measures following suspicion or confirmation in slaughterhouses; Measures following suspicion or confirmation in vehicles or other means of transport; Measures following suspicion or confirmation in feral pigs; Establishment of infected area and measures following confirmation in feral pigs; Contingency plan
Commission Decision 2003/422/EC	Diagnostic manual of ASF	Information on the causative agent; Differential diagnosis of ASF; Criteria to recognise the suspicion on the field; Guidelines on clinical examination; Sampling procedures (collection and transport of samples); Guidelines on repopulation; Serological tests and interpretation of the results; Virological tests and interpretation of the results; Laboratory biosafety
Commission Decision 2013/426/EU	Prevent the introduction of ASF from non-EU countries through vehicles for live animals' transportation	Measures for vehicles for live animals' transport; Official checks and controls to the vehicles at their entry to EU territory; Declaration document by the owner/operator of the vehicle; Cleansing and disinfection certification
Commission Implementing Decision 2014/709/EU Last amended by Commission Implementing Decision 2019/1247	Regionalisation measures	Specific regionalisation measures taken into consideration the evolution of ASF
Council Directive 2008/71/EC	Identification and registration system of pigs	Registration and identification of pig holding; Documents required for animal movements; Identification marks for pigs
Commission Decisions 2000/678/EC	National Databases for porcine animals	Characteristics of the national databases for domestic pig population
Commission Regulation 206/2009	Introduction into the European Union of personal Consignments of products of animal origin	Personal consignments of products of animal origin, for personal human consumption; Personal consignments of animal products destined for the feeding of pets; Information to be provided to the travellers and to the general public; Official controls by the competent authorities; Penalties and Sanctions

Table A.2: EU Guidelines related to ASF in order to support the implementation of measures

Legislative documents		Main control measures
SANCO/7112/2015 (rev 3)	Principles and criteria for regionalisation	• Factors to take into consideration • Main criteria for demarcating the areas of regionalisation • Main criteria for lifting the measures

Legislative documents		Main control measures
SANCO/7113/2015 (rev 10)	ASF strategy for the EU	• Pig farms classification (non-commercial, commercial, outdoor) • Biosecurity requirements for each farm category • Measures related to domestic pigs • Measures related to wild boars • Awareness campaigns

Table A.3: OIE standards for ASF

Legislative documents		Main control measures
Terrestrial Code (27th Edition 2018)	Chapter 15.1. Infection with ASFV	• Criteria for determination of the ASF status of a country zone or compartment • Country or zone or compartment free from ASF • Recovery of free status • Recommendations for importation from countries, or zones or compartments • Procedures for inactivation of ASFV in different pig products, trophies, animal by-products • Surveillance strategies (domestic pigs, wild boars, arthropod vectors)
Terrestrial Manual (version May 2012)	Manual of diagnostic tests and vaccines for terrestrial animals.	• Identification of the agent • Serological tests • No vaccines available for ASF
GF-TADs Handbook (version 25/09/2016) (Standing Group of Experts on African swine fever in Europe under the GF-TADs umbrella)	Handbook on African Swine Fever in wild boar and biosecurity during hunting	• Epidemiology of ASF in wild boar populations • Aspects of wild boar biology and demography relevant to control of ASF • Approaches to wild boar population management in the areas affected by ASF • Biosecurity in infected forests • Biosecurity during hunting • Effective communications between veterinary authorities and hunters • Data collection

Table A.4: Food and Agriculture Organisation (FAO) guidelines and manuals related to ASF

Food and Agriculture Organisation (FAO)		Main control measures
Manual for veterinarians (2017)	African swine fever (ASF) detection and diagnosis	• Transmission of the disease • Clinical signs and lesions • Diagnosis and differential diagnosis • Outbreak investigation • Biosecurity measures while visiting the farm • Sampling packaging and transport of samples • Laboratory diagnosis • Prevention and control
Good practices for biosecurity in the pig sector (2010)	Biosecurity in the pig sector	• Swine diseases, routes of transmission and implications for biosecurity • Structure of pig production and marketing chains: – Pig production systems – Service providers, suppliers and marketing chains • Biosecurity issues and good practices in the pig sector

Food and Agriculture Organisation (FAO)		Main control measures
Manual on the preparedness of ASF contingency plans (2011)	Contingency plans	• Nature of the disease • Risk analysis • Prevention strategies for ASF • Early warning contingency planning for ASF • Early reaction contingency planning for an ASF emergency • Organisational arrangements during an ASF emergency campaign • Support plans • Action plan • Training testing and revision of contingency plans

Appendix B – Pig meat, meat preparations and products moved within the EU with certificate model 2014/709

Origin	Destination	Declaration year		
		2016	2017	2018
		Quantity (kg)	Quantity (kg)	Quantity (kg)
Bulgaria	Czechia			201.08
Bulgaria	Germany	106,486		
Bulgaria	Italy	914		
Bulgaria	Romania			137,707.69
Bulgaria	Spain	1,116.68		
Croatia	Germany		1,622.1	555.7
Estonia	Finland	42,668.17	41,359.5	
Estonia	Hungary		4,182.96	
Estonia	Latvia	4,715,797.78	2,552,748.54	12,154.76
Estonia	Lithuania		17,470.5	
Estonia	Romania	22,022.5		
Germany	Spain	141.45	136	172.5
Greece	Romania	101.8	16,952.12	14,795.8
Hungary	Austria			325
Hungary	Czechia		270	
Hungary	France			5,390
Hungary	Romania			570
Italy	Austria	9,721.52	1,117.43	281.59
Italy	Belgium	16,973.57	17,914.6	17,542.59
Italy	Bulgaria	93.9	120.65	31.85
Italy	Croatia (Local Name: Hrvatska)	7,973.11		
Italy	Czechia	265.1	93.15	95.75
Italy	France	191,043.54	19,090.81	19,956.47
Italy	Germany	14,463.39	11,513.82	12,250.75
Italy	Hungary	133.67		
Italy	Ireland		132.7	485
Italy	Latvia	133.6		
Italy	Luxembourg	71.6	225.2	193.1
Italy	Malta		18.1	30.6
Italy	Poland			335.08
Italy	Portugal	38.75		
Italy	Slovakia (Slovak Republic)			17.6
Italy	Spain	11.46		93.32
Italy	Sweden	466.91	825.04	836.95
Italy	The Netherlands	3,216.04	3,250.44	3,427.04
Italy	United Kingdom	9,713.83	94,373.14	10,668.8
Romania	Austria	582.11	9278	2,240.56
Romania	Belgium	1,718.5	14,558.2	138,545.35
Romania	Bulgaria			200,284.2
Romania	Cyprus	4,709.2	11,282.2	30,486.86
Romania	Denmark		1,729	838.26
Romania	France	231,203	165,472.42	61,086.77
Romania	Germany	1,326.85	34,664	74,699.37
Romania	Greece	3,835	7,367	
Romania	Hungary	2,447.1	1,333.1	32,956.35

Origin	Destination	Declaration year		
		2016	2017	2018
		Quantity (kg)	Quantity (kg)	Quantity (kg)
Romania	Ireland			13,834.74
Romania	Italy	113,848.36	146,444.3	1,127,340.78
Romania	Poland		11,500	42,780
Romania	Slovakia (Slovak Republic)			1,686.38
Romania	Slovenia	3,950	3,700	
Romania	Spain	89,422.9	226,980.3	543,608.76
Romania	Sweden		31	1,639.05
Romania	The Netherlands			9,675.53
Romania	United Kingdom	5,775.6	20,162.7	175,934.27

Appendix C – Number of hunting permits issued by the Croatian Ministry of Agriculture to foreign hunters in 2018 and 2019

Country	Number of hunting permits 2018	Number of hunting permits 2019
Italy	4,718	2,810
Austria	2,463	814
Slovenia	899	450
Germany	496	171
Bosnia and Herzegovina	199	126
Denmark	113	16
Sweden	99	27
Hungary	93	58
Switzerland	89	14
Norway	82	22
Serbia	62	21
Finland	44	4
Czechia	40	8
Slovakia	38	34
Netherlands	34	11
Ireland	22	1
United Kingdom	20	2
San Marino	18	11
Spain	14	1
Luxembourg	6	0
Poland	5	2
Bulgaria	3	0
North Macedonia	3	0
Lithuania	2	1
Belgium	1	7
Romania	1	1
Turkey	1	0