

Wild boar / feral pig in (peri-)urban areas



International survey report as an introduction to the workshop:

”Managing wild boar in human-dominated landscapes”

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Introduction

During 2012-2013 a questionnaire on the presence of wild boar in (peri-)urban areas was sent to known contacts in different countries working on this species, and in addition the questionnaire was publicised in relevant international forums (conferences, internet forums, etc.) in order to achieve as broad a response as possible. To facilitate replies, the questionnaire was posted on Google docs¹. The purpose of this survey is to gather information with a view to gaining a better understanding of the phenomenon of wild boar / feral pig presence in (peri-)urban areas. The aims of the survey are:

1. to determine the geographic extent of the phenomenon, which is why the survey is international;
2. to better understand the causes of the phenomenon;
3. to list and assess the different management tools elaborated in order to control the phenomenon.

The results of this survey can be used as a general tool for the management of wild boar/feral pigs in (peri-)urban areas. The wide variety of case studies involved will hopefully allow for improved design of such management tools.

A clear definition of peri-urban areas does not exist, and definitions are often related to particular contexts. In our survey we understand peri-urban or (*peri-*)urban areas to be "land areas, often with dense human populations, adjacent to towns or cities". In such areas, normal hunting practise is either difficult or impossible to organize, and often may only take place with specific and strong constraints. In addition to damages caused by wild boar or feral pigs to agriculture, other nuisances and conflicts more specifically related to urban contexts are also significant and repeated over time.

Acknowledgements

This survey is the initiative of 3 Belgian institutes: Brussels Environment (BE), *Instituut voor Natuur- en Bosonderzoek* (INBO), *Département de l'Etude du Milieu naturel et agricole* (DEMNA).

The questionnaire was prepared in 2012 with the help of a working group made of managers from the administrations currently facing the peri-urban wild boar problem in Belgian cities and more specifically the managers from the Liège District of the *Département de la Nature et des Forêts* and the Brussels Forest and Nature Direction.

Hundreds of e-mails were necessary to gather 66 filled in questionnaires. Nevertheless this survey may be considered relevant and consistent thanks to all the participants.

¹ <https://docs.google.com/spreadsheet/embeddedform?formkey=dHpYaHZrRGxzTENhaXIEUjFNbl9TMUE6MQ>

Geographical scale of the survey and source of the data

Table 1 – List of participants to the survey and location

City	Region	Country	Name	Function and Institution	Latitude	Longitude
Baden-Württemberg		Germany	Geva Peerenboom	researcher, university of Freiburg	48° 31' 48" N	9° 3' 0" E
Freiburg im Briesgau		Germany	Schäfer Andreas	Stadt Freiburg, Forstamt & Kreisjagdamt	47° 59' 44" N	7° 51' 08" E
Bologna		Italy	Barbara Franzetti	researcher, Istituto Superiore per la Protezione e la Ricerca Ambientale	44° 30' 0" N	11° 21' 0" E
Hong Kong SAR		China	CT Shek	Agriculture, Fisheries and Conservation Department	22° 16' 55" N	114° 9' 43" E
Malaga		Spain	Jesus Duarte	Researcher, University of Malaga	36° 43' 15.42" N	4° 24' 54.22" W
Las Rozas de Madrid		Spain	Raúl López García	Biologist	40° 30' 0" N	3° 52' 12" W
Aveiro		Portugal	Carlos Fonseca	Teaching and Research; University of Aveiro	40° 38' 0" N	8° 39' 0" W
Pamplona		Spain	Gabi Bersategui	Freelance biologist	42° 49' 6" N	1° 38' 39" W
Neuquén		Argentina	Adela	professor. uncomahue	38° 58' 0" S	68° 4' 0" W
Wageningen		The Netherlands	G. Groot Bruinderink	Sr. wildlife ecologist	51° 58' 0" N	5° 40' 0" E
Barcelona		Spain	Nora Navarro	PhD student, Universitat Autònoma de Barcelona	41° 23' 0" N	2° 10' 0" E
Barcelona (Collserola Park)		Spain	Lluís Cabañeros & Francesc Llimona & Seán Cahill	Servei de Medi Natural, Consorci del Parc Natural de la Serra de Collserola	41° 23' 0" N	2° 10' 0" E
Belo Horizonte		Brazil	Junio Silva	Environmental Analyst/Federal Government	19° 49' 1" S	43° 57' 21" W
Thionville		France	Mark Ryan	Assistant division coordinator, International Council for Game and Wildlife Conservation	49° 21' 32" N	6° 10' 9" E
Vitoria-Gasteiz		Spain	Jorge Echegaray	GADEN www.faunadealava.org	42° 51' 0" N	2° 41' 0" W
Vienna		Austria	Manuela Habe	Researcher, Research Institute of Wildlife Ecology, University of Veterinary Medicine, Vienna	48° 12' 30" N	16° 22' 23" E
Terrassa		Spain	Encarna Casas-Díaz	Technical support for research - Servei d'Ecopatologia de Fauna Salvatge (Wildlife Health Research Group)	41° 33' 40" N	2° 0' 29.02" E
Matadepera		Spain			41° 36' 13" N	2° 1' 28" E

Sabadell		Spain			41° 32' 55" N	2° 6' 27" E
Cerdanyola del Vallès		Spain			41° 29' 31" N	2° 8' 20" E
Bell City Louisiana		USA	Rob Gosnel	US Fish & Wildlife	30° 6' 32" N	92° 55' 13" W
Sopron		Hungary	Andras Nahlik	professor	47° 41' 5.6" N	16° 34' 58.98" E
Brno		Czech Republic	Radim Plhal	Researcher, Mendel University in Brno	49° 11' 31.39" N	16° 36' 47.49" E
Liestal		Switzerland	Ignaz Bloch	Head of veterinnary, hunt and fisherie service	47° 28' 0" N	7° 44' 0" E
Ljubljana		Slovenia	Matija Stergar	Researcher at wildlife ecology group, university of Ljubljana, biotechnical faculty, departement of forestry	46° 3' 5.13" N	14° 30' 21.47" E
Not specified		Scotland	Steve Campbell	Wildlife biologiste SASA		
Saint Germain en Laye		France	Bedarida	ANCGG	48° 53' 56.04" N	2° 5' 37.68" E
Starkville		USA	S.W. Jack	Professor, Mississippi State College Vet Medicine	33° 27' 45" N	88° 49' 12" W
Not specified		England	Wilson	Natural England (statutory conservation body)		
Budapest		Hungary	Heltai/Miklos Gabor	Associate professor, deputy director, institute for wildlife conservation, Szent Istvan University	47° 29' 54" N	19° 2' 27" E
St John's		Canada	Frank Beatrice	Memorial University, Research Fellow	47° 36' 3.85" N	52° 41' 51.5" W
Siena and Siena County		Italy	Federico Morimando	Director ATC 18	43° 19' 7" N	11° 19' 50" E
Ostfold county		Norway	Asmund Fjellbakk	wildl.manag. County Govenor Office	59° 20' 0" N	11° 20' 0" E
Trippstadt		Germany	Hohmann Ulf	Head of wildlife research group of research institute of forest ecology and forestry	49° 21' 35" N	7° 46' 29" E
Oviedo		Spain	Carlos Nores	Professor at the University of Oviedo	43° 22' 0" N	5° 50' 0" W
San Carlos de Bariloche		Argentina	Sebastian Ballari	PhD student - Universidad Nacional de Cordoba - CONICET	41° 8' 0" S	71° 18' 37" W
Massa-Carrara (Massa)		Italy	Paolo Bongi	Freelance	44° 02' 00" N	10° 08' 00" E
Kraków		Poland	Tomasz Podgorski	PhD student, Mammal Research Institute, Polish Academy of Sciences	50° 3' 41" N	19° 56' 18" E
Not specified		The Netherlands	Montizaan Margriet	Wildlife biologist at the Royal Dutch Hunter Association (KNJV)		
Rostock		Germany	Zoller Hinrich	Reseach fellow	54° 5' 0" N	12° 8' 0" E
Berlin		Germany	Milena Stillfried	PhD student at leibniz Institute for Zoo and Wildlife Research	52° 31' 6.96" N	13° 24' 29.16" E
Edmonton		Canada	Guillermo Bueno	Postdoc, University of Alberta	53° 32' 0" N	113° 30' 0" W
Not specified		Australia	Brown	farming Company		

Not specified		Greece	Panoraia Alexandri	Aristotle University of Thessaloniki		
Ipswich, Queensland		Australia	Ted Mitchell	Pest Management Officer Local Gov.	27° 37' 0" S	152° 46' 0" E
Mackay		Australia	Michael Tuckett	Pest Management Mackay Regional Council	21° 8' 28.31" S	149° 11' 8.26" E
cities in IBARAKI pref.		Japan	Masahiko/ Takeuchi	NARO Agricultural Research Center		
Geneva		Switzerland	Claude Fischer	Professor, University of Applied Sciences of Western Switzerland	46° 12' 0.05" N	6° 8' 59.95" E
Not specified	Texas	USA	Michael Bodenchuk,	State Director-USDA-APHIS-Wildlife Services		
Sunshine Coast Queensland		Australia	Keith Salisbury	Pest and Vector Control Coordinator with the Sunshine Coast Regional Council	26° 38' 24" S	153° 4' 12" E
Rome		Italy	Andrea Monaco	Wildlife Biologist / Regional Park Agency - Regione Lazio (Italy)	41° 53' 19.43" N	12° 29' 11.65" E
Kraków		Poland	Grzegorz Baś	Institute of Nature Conservation Polish Academy of Sciences	50° 3' 41" N	19° 56' 18" E
Hannover		Germany	Oliver Keuling	researcher, Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover	52° 22' 0" N	9° 43' 0" E
Mendoza		Argentina	Fernanda Cuevas	Postdoctoral position	32° 53' 0" S	68° 49' 0" W
Not specified	Northern Queensland	Australia	Mitchell	Senior Zoologist Biosecurity Queensland (retired)		
Gympie		Australia	Ben Curley	Lands Protection Manager, Gympie Regional Council	26° 11' 24" S	152° 39' 36" E
Hódmezővásárhely		Hungary	Erika Skobrák Bodnár	zege		
Tartu		Estonia	Rauno Veeroja	leading specialist of game monitoring, Estonian Environment Information Centre		
Gympie & SE Qld		Australia	Brice Kaddatz	Grower Support - Suncoast Gold Macadamias - Co-op Macadamia processor		
Not specified	Northrhine-Westphalia	Germany	Petrak, Michael	Wildlife Research Institute, Pützchens Chaussee 228, D - 53229 Bonn		
Fontainebleau		France	Cacouault Jean-Marc		48° 24' 35" N	2° 42' 9" E
Nancy		France	Deroy Marc		48° 41' 36.96" N	6° 11' 4.56" E
Namur		Belgium	Pierret Hervé	Département de la Nature et des Forêts	50° 28' 1.2" N	4° 52' 1.2" E

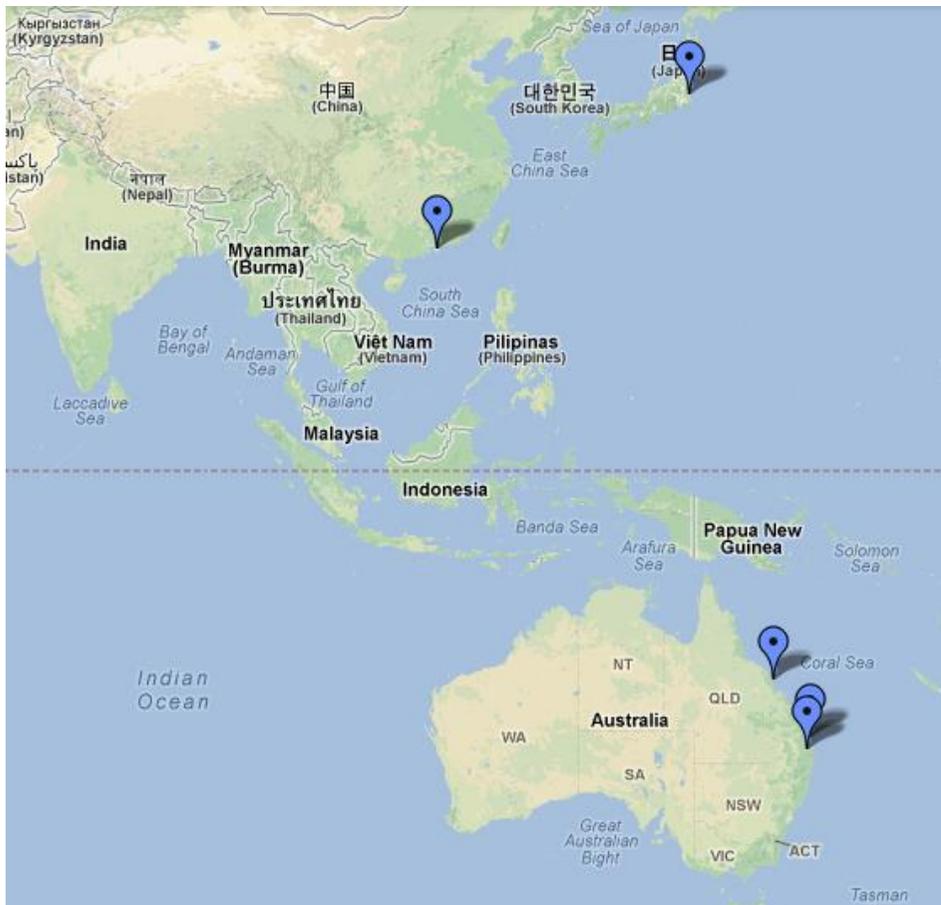
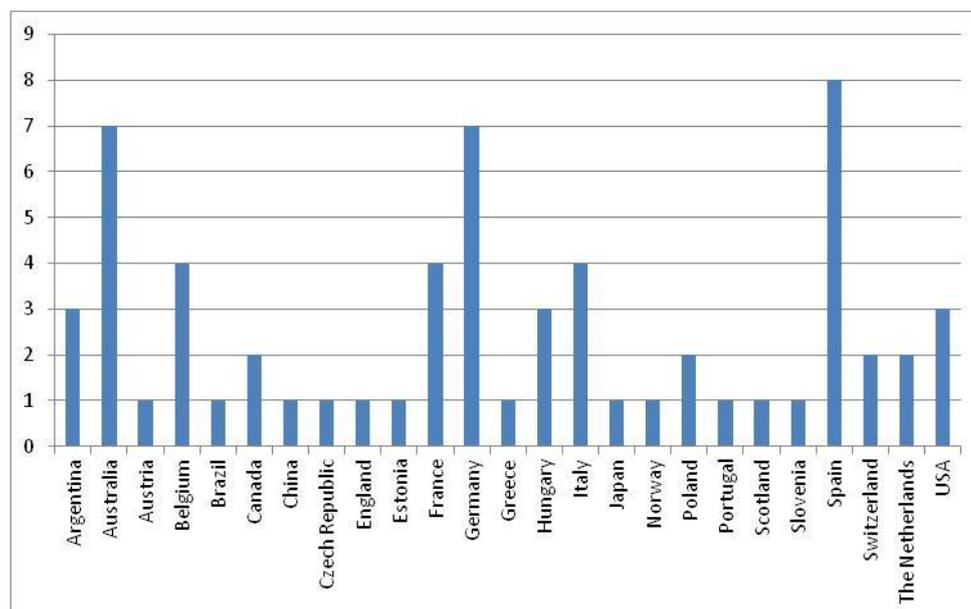


Figure 2 – Origin of the questionnaires (n participants)

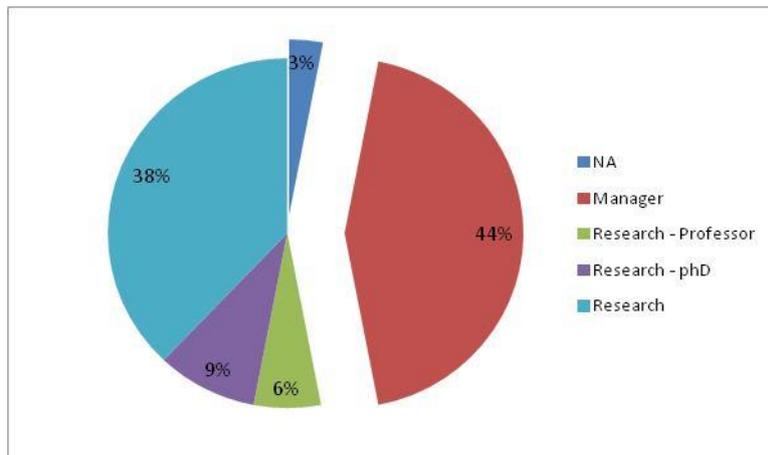


Most of the participants (67%) also informed about other (peri-)urban areas located in their region where boar/pig are generating the same kind of troubles.

Table 2 – List of other (peri-)urban areas pointed out by the participants with identified problems with wild boar / feral pig

Country	Other cities mentioned in the survey
Germany	Heidelberg, Mannheim, Baden-Baden, Wolfsburg, Hamburg
Spain	Torrelodones, Galapagar, San Sebastián de los Reyes, Lleida (Mitjana periurban Park),
Portugal	Coimbra, Bragança, Viseu
Argentina	General Roca (Paso Cordoba Protected Area)
The Netherlands	Epe, Hoenderloo, Ermelo, Otterlo, Apeldoorn
USA, Louisiana	Lake Charles, Hackberry, Hayes, lake Arthur, Longville, DeQuincy, DeRideer, Rosepine
Czech republic	Ústí nad Labem
Switzerland	Olten
France	Versailles, Saint Quentin en Yvelines, Verneuil, Forêt de Montmorency, Veneux les sablons, Barbizon
England	Plymouth
Poland	Warsaw, Katowice, Hel, Krynica Morska
Australia	Escalona, Boltaña, Nerin
Japan	Kobe (HYOGO prefecture)
Italy	Genova
Belgium	Andenne, Profondeville, Huy

Figure 3 – According to the participant’s function and/or the institution we tried to distinguish between researchers (including pHD students) and managers

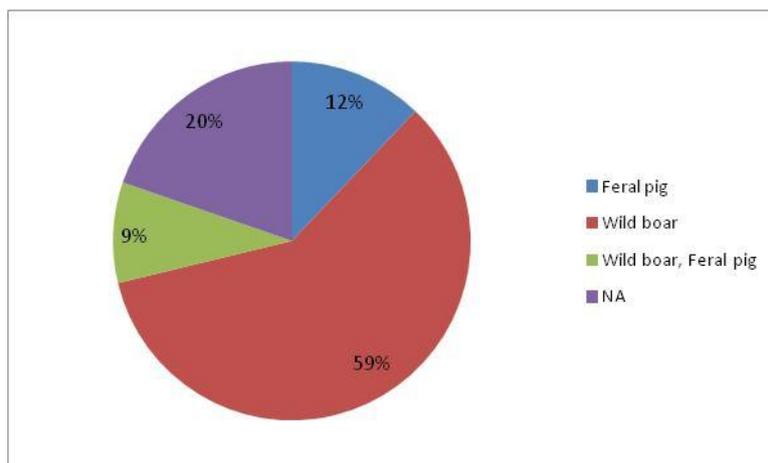


Managers will be able to give practical tools to control populations or prevent damages while scientists will probably have more global point of view on the situation.

Species, legal status, population history and trends within and beyond (peri-)urban areas

Wild boar or *Sus scrofa* versus feral pig / hog or *Sus (scrofa) domesticus*

Figure 4 – Species concerned by the participants to the survey



The wild boar is mentioned in Europe, Argentina, Canada, China and Japan. Survey respondents mentioned ‘feral pigs’ in all cases in the USA and in some places in Australia. Both are mentioned in Spain (Malaga), Scotland, Greece, Brazil and Argentina.

National or regional status of wild boar / feral pig

Table 3 – Gradient of the protection status according to the species

Protection gradient	Legal status at the country/region scale	Feral pig	Wild boar	Wild boar, Feral pig	NA
	Pest		6	3	2
Game species, Pest		2	4	1	
Game species			28	2	10
Protected (partially hunted), Pest			2		
Protected (not hunted or partially hunted)			1		1
No legal status (emerging species)			1	1	

The feral pig is mainly considered as a pest (USA, Australia, Argentina, Brazil) while wild boar are generally managed as game species. Consequently, the Eurasian management approach seems to be essentially different compared to the situations found in America and Oceania.

Population history

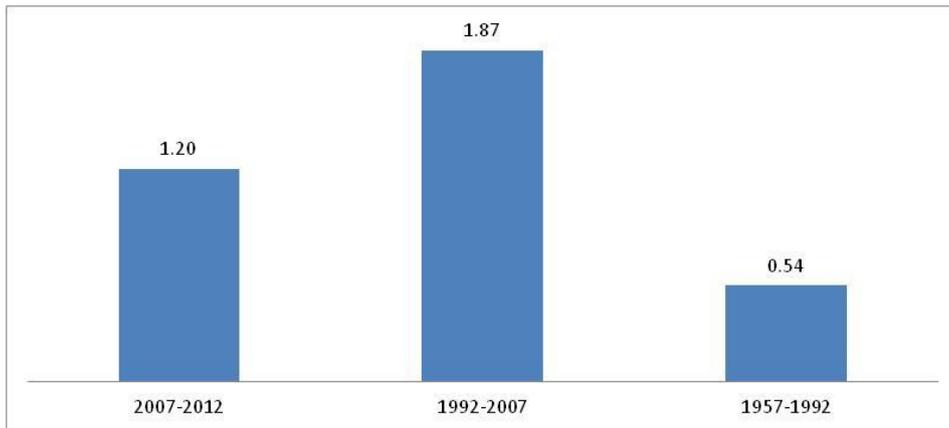
Table 4 – Emergence of (peri-)urban populations according to national/regional history

Presence in the country / region	Presence in the (peri-)urban area				
	< 5 years	Between 5 and 15 years	Between 15 and 50 years	Always	Unknown
Between 5 and 15 years	2				
Between 15 and 50 years	1	3	3		3
Always	2	25	13	4	2
Unknown	1		3		3
%	9%	42%	29%	8%	12%
period	2007-2012	1992-2007	1957-1992		
(peri)urban invasions / year	1.20	1.87	0.54		

In a few cases, the very recent (< 5 years) (peri-)urban utilization by boar is consequent to a relatively recent regional occupation (Scotland and Norway). They both concern wild boar (with some doubt about feral pigs in Scotland). In 4 surveyed cities, the colonization of the (peri-)urban areas took place a long time ago (> 50 years): in France (Nancy), in Spain (Pamplona, Vitoria-Gasteiz) as well in Canada (Edmonton).

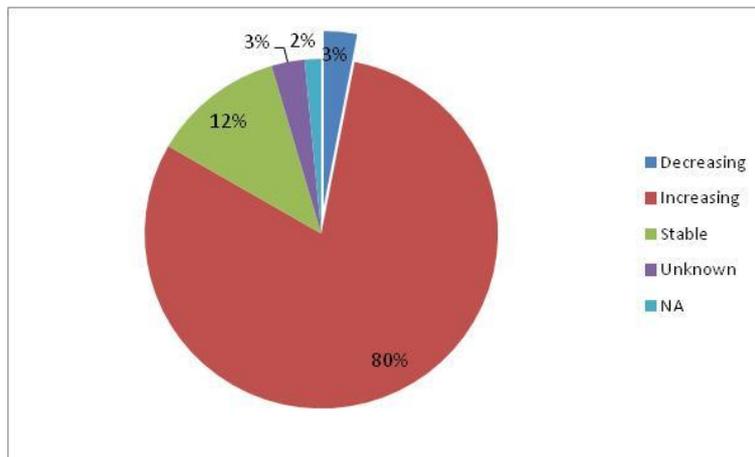
The intrusion of wild boar into (peri-)urban areas is not solely a recent phenomenon, but nevertheless it would seem that most cases arose during the period 1992-2007.

Figure 5 – Mean number of first invasions by wild boar or feral pig of the (peri-)urban areas



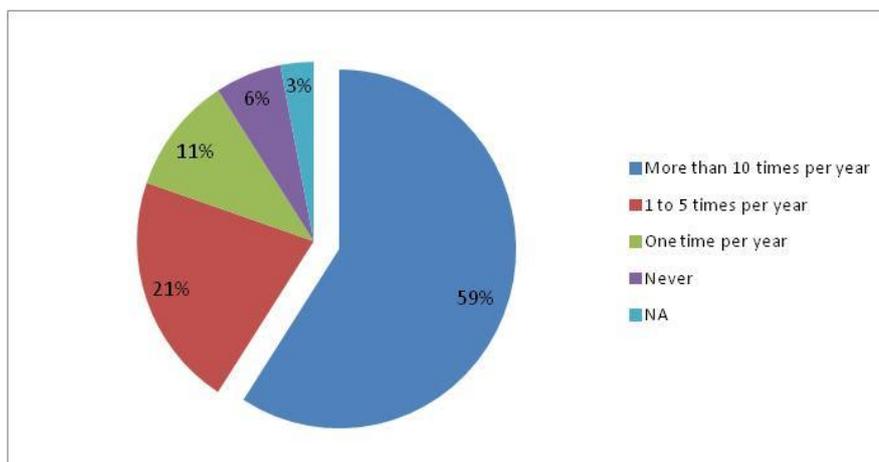
Overall, the respondents feel that boar populations are still increasing (80%). An apparent decrease in boar density is only described in 2 cases: Berlin (Germany) and Fontainebleau (France).

Figure 6 – Population density trend of wild boar or feral pig as perceived in the survey



According to the specific situation, wild boar may establish in a park or in a forest interspersing or surrounding the city, or may colonize a “green” residential or mixed urban-rural area. Because of the diversity of the situations and the unclear definition of (peri-)urban area, the following answers may be too vague to interpret.

Figure 7 – Frequency of wild boar / feral pig intrusions in urban areas during the last 5 years



The causes of the colonization of the (peri)urban habitat

Table 5 – Impact of some parameters potentially favourable for wild boar/pig establishment in (peri-)urban areas calculated as the frequency of answers in each different level of impact (high to not relevant). N=66 survey respondents. “Global impact” = frequency of high impact x 3 + frequency of medium impact x 2 + frequency of low impact x 1. Rank 1 = red, rank 2 = orange, rank 3 = yellow

	X not relevant	1 yes but low	2 yes but medium	3 yes and high	NA	Global impact
Impact (high = 3, medium = 2, low = 1, X = not relevant)						
There is easy access to food and/or water in the urban/peri-urban area	3	29	17	12	5	99
Absence of or insufficient hunting pressure outside the peri-urban area (overpopulation effect)	8	18	18	14	8	96
Expanding urbanization into the countryside/forested areas occupied by boar	10	15	26	9	6	94
Penetration axis going into the city (rivers with riparian habitats, dry river beds, etc.)	9	18	16	12	11	86
Excessive hunting outside the peri-urban area (refuge effect)	17	10	11	17	11	83
Private areas not maintained	14	17	16	8	11	73
Disturbance or extreme conditions in adjacent natural habitat (fire, drought, snow, other...)	20	8	10	15	13	73
Large hunted woodlands (> 100 ha) in peri-urban area	19	13	14	7	13	62
Animals escaped or illegally released	30	7	8	13	8	62
Small spinney/thickets (<100 ha) in peri-urban area	16	17	12	6	15	59
Large un hunted woodlands (>100 ha) in peri-urban area	17	21	13	3	12	56
Overgrown abandoned industrial/commercial areas ('brownfield')	24	12	12	5	13	51
Animals legally released for reintroduction or hunting	38	6	6	6	10	36

The first step of the survey aimed to identify the causes of the intrusion of (peri-)urban areas by wild boar or feral pigs. The causes will clearly vary according to the environmental and climatic conditions, hunting presence, hunting pressure and methods, urbanization regulation, ...

As such, there is apparent variety of causes considered by respondents and the differing evaluations they provided for them, In order to simply overall interpretation of the evaluated variables involved, a global impact index was calculated taking into account the frequency of answers together with their weighted importance (3 = high, 2= medium, 1 = low) as a possible cause. This global impact index thus ranks the three most important potential variables to explain wild boar (peri-)urban use as follows:

- easy access to food and water [1],
- overabundant boar density [2],
- expanding urbanization [3].

Briefly summarized, (peri-)urban areas can offer resources such as food, water and refuge when conditions change in surrounding areas (winter, drought, hunting season), making these areas even more attractive when population densities are high. The juxtaposition of urban, rural and forest areas facilitates boar presence in urban settings, as does the existence in cities of corridors such as rivers or even highways. Conversely, some variables are judged as not being relevant: e.g. animals legally or illegally released.

Some other causes were suggested by the participants as answers to an open question. They are summarised in the following table, with the geographical situation when relevant.

Table 6 – Other causes of colonization of (peri-)urban areas by wild boar / pig

Other causes	example
Behaviour	
Habituation	<i>Direct feeding by humans (for wildlife watching in the Netherlands, France, Berlin, Barcelona,...)</i>
Opportunism	<i>Indirect feeding by humans (garbage, garden, bins,...e.g. Barcelona)</i>
Disturbance by predators	<i>Looking for refuge urban areas in Tuscany (Massa – Carrara) because of the predation risk by wolf (?)</i>
Culture	
Human behaviour	<i>Indifferent behaviour of humans to wildlife (a kind of fatalism?,) damage to crops in Japan (Ibaraki)</i>
Climate	
Shelter and food resources	<i>Very contrasting oceanic weather conditions creating abundant food and shelter for several years (in Australia) Milder climatic conditions in winter in Poland (favours population expansion? Cold winters favour intrusion in urban setting?)</i>
Policy / Society	
Survival rate enhanced	
Lack of juridical coherence about feral animal control	<i>Australia</i>
Disturbance by non-hunting public	
Shelter resources	<i>Abandonment of traditional farming and livestocking in Spain</i>

Concerning the behaviour of wild boar / feral pig, many survey respondents inform about the fact that the animals are indifferent to human presence (41 %) (form of habituation). This could be partially explained by the direct feeding provided by people (41 %), except for some places where feeding is highlighted without any

habituation (Krakow, Nancy,...) and vice-versa (Massa-Carrara, Gympie). This possible habituation concerns wild boar as well as feral pigs.

Figure 9 – Proportion of questionnaires reporting wild boar / feral pig habituation (indifferent behaviour)

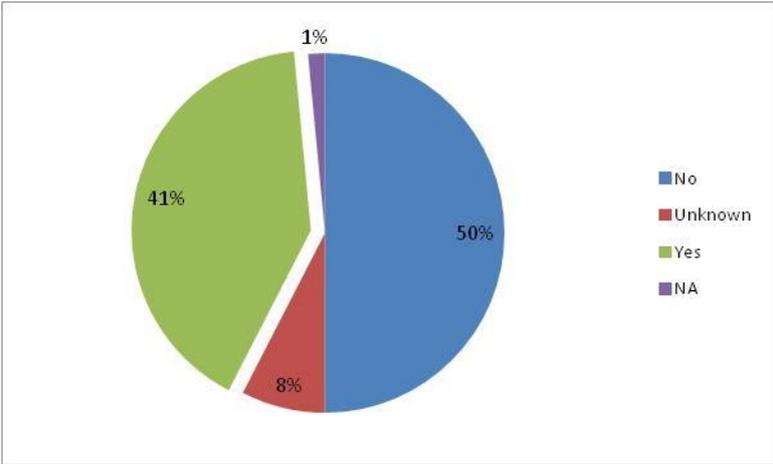
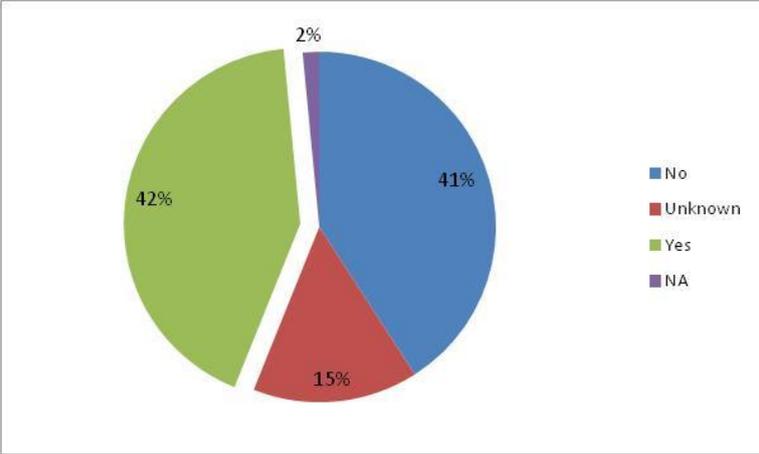
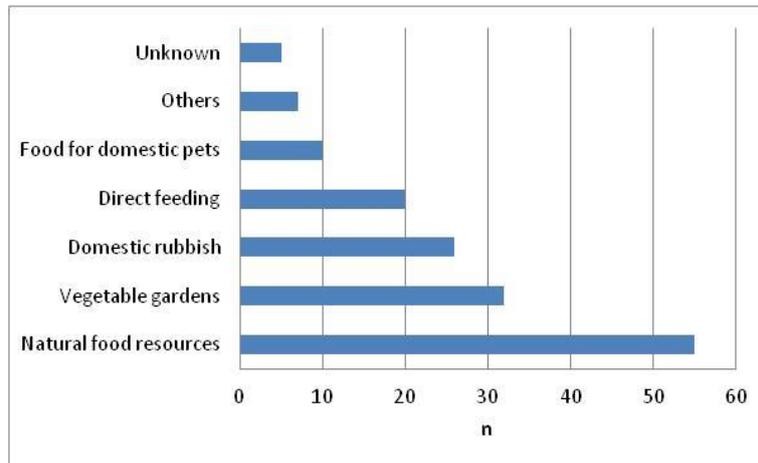


Figure 10 – Proportion of questionnaires reporting direct feeding of wild boar / feral pig by people



Given that “easy access to food and water” has been identified as one of the major reasons for boar intrusion of (peri-)urban areas, it is interesting to analyse the main food resources available in such areas according to our survey. In addition to natural food items present in these areas, two possible anthropogenic food resources appear to be used: firstly vegetable material found in gardens, and secondly, domestic garbage.

Figure 11 – Food resources available in (peri-)urban areas



Impacts and conflicts caused by wild boar / feral pigs in (peri-)urban areas

Table 7 – Type of conflict, recurrent and occasional impact of boar/pigs on humans in (peri-)urban areas and feared impacts

Impact on human and related	Recurrent impact	Occasional impact	Total impact	Never	Not concerned	Feared impact	n/66
Damage to agriculture/horticulture within urban/periurban area	27	28	55	1	2	5	63
Damage to private gardens	14	40	54	1	2	3	60
Collisions between wild/feral boar and vehicles	21	33	54	4	2	5	65
Damage to public city parks and other public areas	14	28	42	5	3	9	59
Damage to sports fields (golf courses, football fields, ...)	6	34	40	6	4	5	55
Incursion of boar into areas often frequented by people	5	34	39	6	5	9	59
Social conflicts (fear, public security, ...)	10	21	31	10	2	17	60
Damage to biodiversity (endangered habitat or species)	10	13	23	10	3	14	50
Attacks on pets	1	22	23	18	2	11	54
Poaching in urban/suburban areas	6	14	20	14	3	12	49
Attacks on people	1	14	15	17	2	23	57
Sanitary/public health problems	1	9	10	15	5	22	52

The most important impacts of boars in (peri-)urban areas are due to their feeding behaviour: agriculture and horticulture (rank 1 in recurrent impact category), gardens and parks (rank 3) are mainly concerned. The main damages are caused by rooting (in meadows and lawns), and feeding on fruit (vineyards), vegetables, young trees and crops, but some cases of destruction of fences (along gardens) and irrigation systems are also reported (in gardens but also in sport fields like golf clubs). In Australia, feral pigs are responsible for important losses in the sheep industry due to predation.

Collisions with vehicles (rank 2) are another major source of conflict.

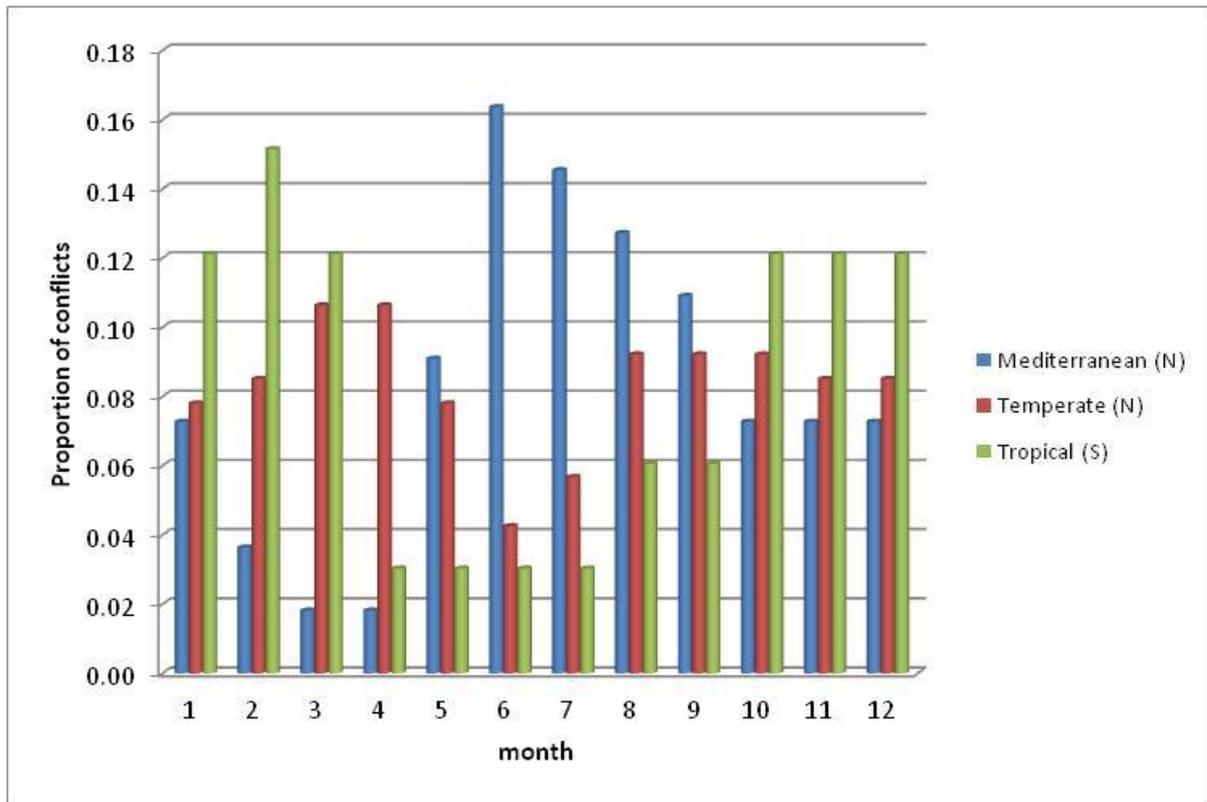
More occasionally, boars are found in public areas (gardens, parks, but also buildings) when public frequentation is high (rank 2 in occasional impact category). Even if they are less often mentioned, attacks on people or sanitary / public health problems are reported. Except in Brazil (Belo Horizonte), attacks on people remain the exception in (peri-)urban areas. Concerning public health problems, feral pigs are considered to be responsible for the *E. Coli* contamination of waterways, which causes bacterial contamination of drinking water in Texas. Both (attacks and health) are considered as the main risks (ranks 1 and 2 in feared impact category) by the surveyed study sites.

Given the wide diversity of climatic conditions among our surveyed sites, we present the occurrence of the conflicts or damages in (peri-)urban areas according to the month of the year. As damages seem to be correlated with food and water availability we separated our results according to 3 different very simplified climatic situations for which the sample was large enough to be representative: Mediterranean and temperate (both atlantic and continental) in the northern hemisphere, and tropical in the southern one (mainly corresponding to the situation in Australia).

Table 8 – representativeness of the study sites according to basic climate types in both hemispheres

Hemisphere	Climate type			Total
	Mediterranean	Temperate	Tropical	
North	13	39	3	55
South		1	10	11
Total	13	40	13	66

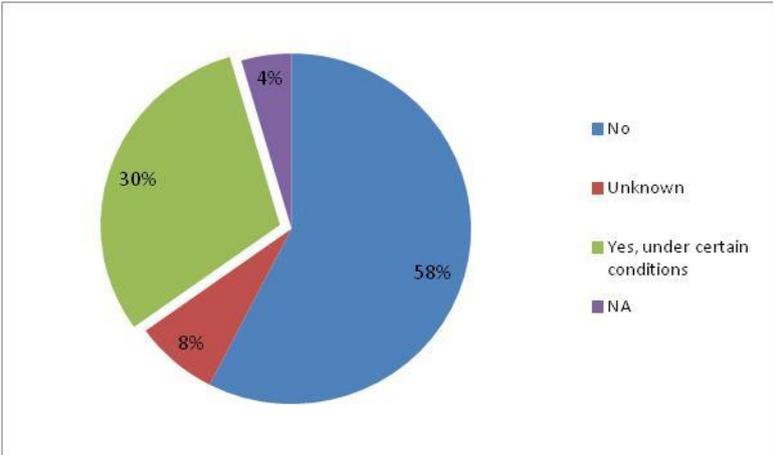
Figure 12 – Proportion of conflicts or damages throughout the year and according to the climate type



In the Mediterranean area the conflicts are highest in summer, decrease in early autumn, remain stable during winter and decrease in spring. Under temperate conditions, conflicts are higher at the end of the winter, are low in summer and increase in autumn. Under tropical situations, conflicts seem to be low in winter (April to July), and then increase in spring and reach a maximum in summer (February).

The main difference between Mediterranean and Temperate climates concerns the peak of damages: during summer when water resources are low for the former, during late winter when food resources are low in the latter. A relatively high level of conflicts during autumn and the beginning of winter could partly reflect the effect of disturbance by hunting (mainly during autumn till mid-winter for most countries involved). In tropical areas, the shape of conflict occurrence throughout the year seems to fit the curves of temperature and rainfall. To our knowledge, feral pigs are hunted all year long in Australia, the most represented country under this climate in our survey.

Figure 13 – Economic compensation possibility for wild boar / feral pig damages

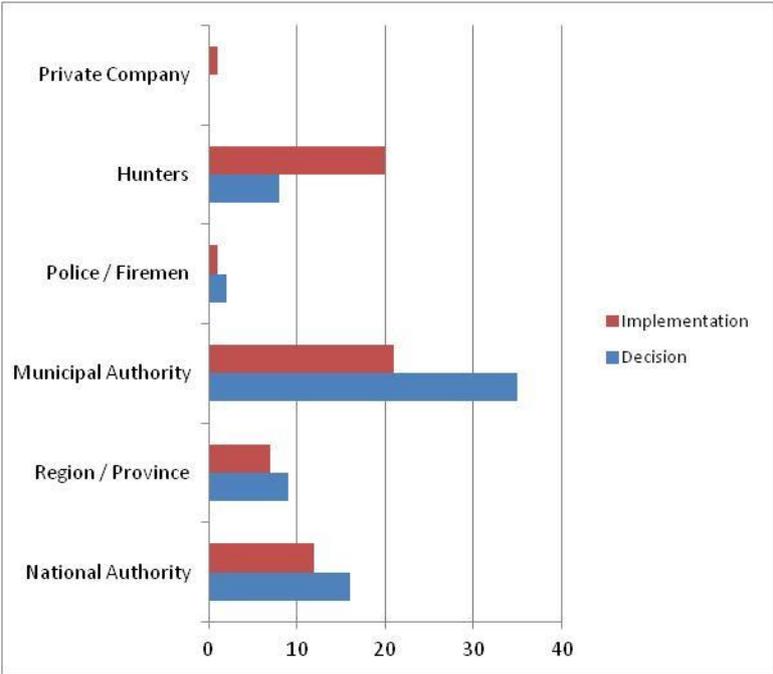


First of all, it should be noted that damages caused by feral pigs are not compensated for in any of the cases reported by the respondents of the survey. Eventual compensation is provided by hunters if the area is hunted (rarely the case in peri-urban areas) or by the municipality when occurring to agricultural crops. Concerning accidents involving vehicles, damages are normally covered by insurance, although some cases exist where the Government (or other public administration) and/or the hunters may be obliged to compensate (Spain). Private insurances sometimes also cover damages to agricultural crops (only for rice and some fruit crops in Japan, for example).

Management of the (peri-)urban boar / pig population

In some places peri-urban boar/pigs are managed. This management can be undertaken at different levels according to the choice of the management strategy and its implementation.

Figure 14 – Stakeholders involved in the decision and implementation process of peri-urban boar/pig management



The most 'classical' schemes of the organisation of urban boar management consist of the decisions being made and implemented by the affected municipality (19), or the decisions being taken by the municipality and implemented by specially commissioned hunters (11). In some cases, different categories of stakeholders are involved in the decision process (municipality and regional/national authority, municipality and hunters,...). For example, the cities of Nancy (F), Budapest (H), Seraing (B) have 3 or more different categories of stakeholders involved in both decision and implementation processes.

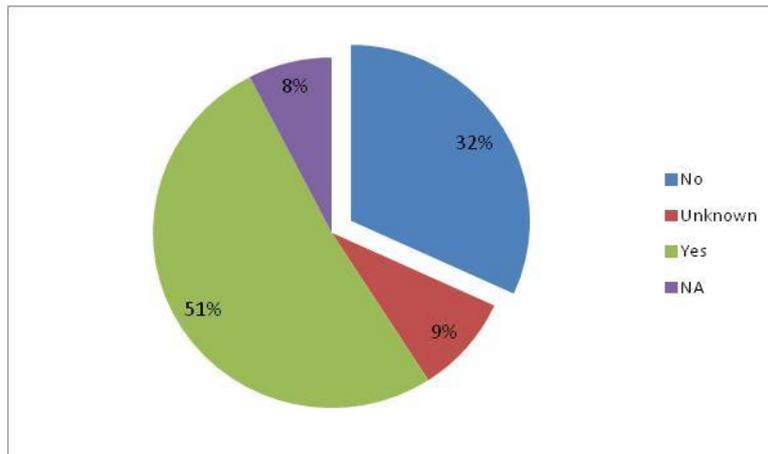
Some municipalities have also established working groups on this issue.

Table 9 – Municipalities / regions having established a working group about peri-urban boar / pigs, and institutions responsible for coordination

City, Country	Working group under the coordination of :
All of Texas, USA	
Baden-Württemberg, Germany	Baden-Württemberg Federal State
Barcelona (Collserola Park), Spain	Ajuntament de Barcelona & Generalitat de Catalunya
Bologna, Italy	Local police of Bologna
Brno, Czech Republic	State administration of Hungary
Bruxelles, Belgium	Bruxelles Environnement - Brussel Leefmilieu
Budapest, Hungary	
Freiburg, Germany	City of Freiburg
Greece	4th Hunting Federation of Sterea Hella
Gympie & SE Qld - Australia	Task force (landholders + Queensland State)
Hannover, Germany	
Hódmezővásárhely, Hungary	
Mackay, Australia	Pest Management Officers in the local Authority
Northern Queensland, Australia	
Queensland, Australia	Department of Primary Industries - Queensland
Saint Germain en Laye, France	Office national des Forêts (ONF)
Seraing, Belgium	Département de la Nature et des Forêts
Starkville, USA	Wild Hog Working Group (Mississippi Dept Wildlife, Fisheries, and Parks, Jackson, MS).
Sunshine Coast Queensland, Australia	Macadamia Growers Group and Individual Local Governments
Vienna, Austria	Forestry and Veterinary Office of the City of Vienna

As the use of (peri-)urban areas by wild boar and feral pigs is a quite recent phenomenon, it appears that in many cases (32 %) legal specifications for their management do not exist.

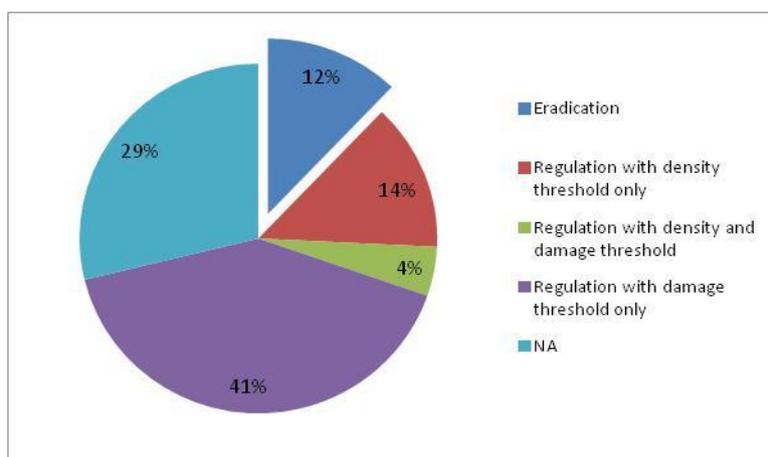
Figure 15 – Existence of legal specifications for boar / pig management



Population control

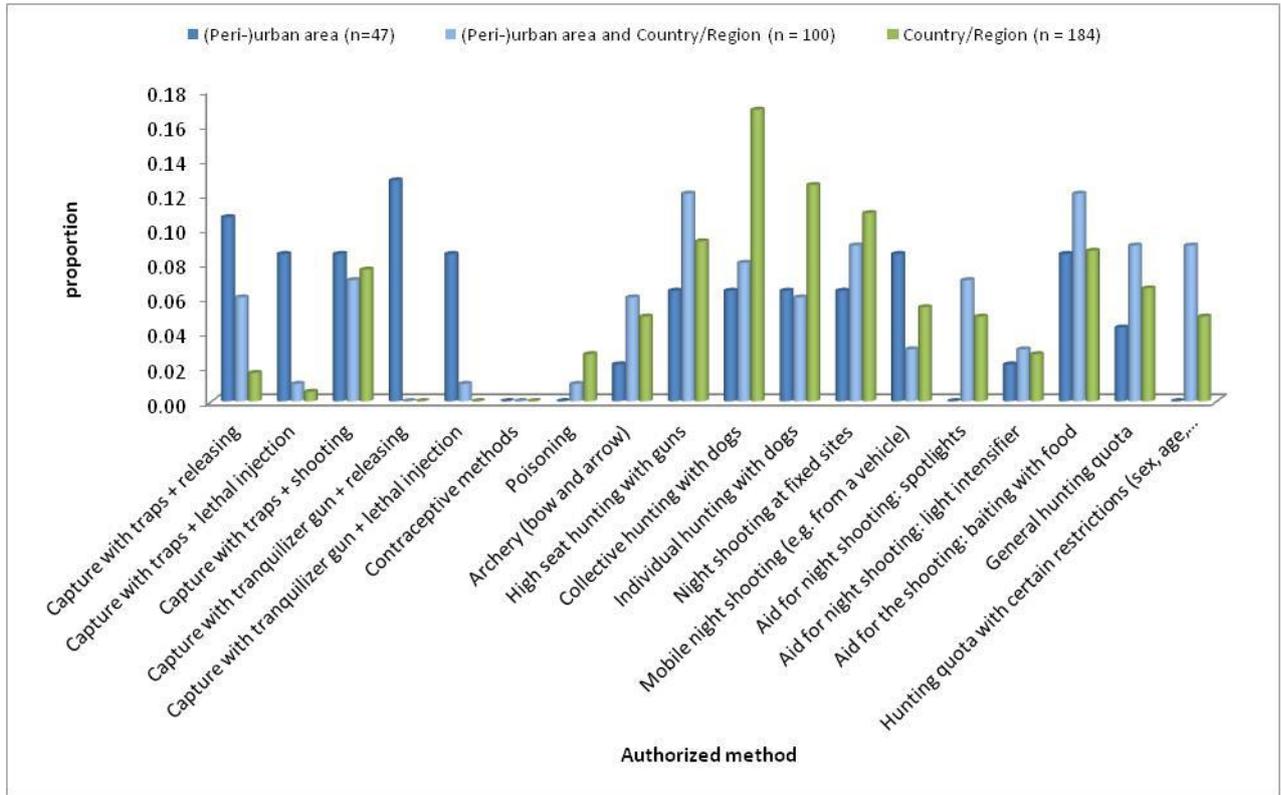
The management objectives differ strongly between the cases reported by respondents. They vary between eradication and regulation, according to density and/or damage thresholds. The aim of eradication corresponds to 12% (33 % when considering feral pig only) of the respondents. Because the population size of wild boar / feral pig is difficult to assess, most respondents (41 %) prefer to establish control strategies in accordance with damage thresholds rather than density thresholds (with absolutely no case of density threshold concerning feral pig). When density thresholds are provided, they range between 2 and 4 individuals / km² of forest. When the damage tolerance is provided, thresholds are, for example: zero tolerance in the urban area (Barcelona) or a certain damage tolerance for agriculture crops (Freiburg).

Figure 16 – Population control objectives



Concerning the authorized control methods, the capture of boars prior to euthanasia or translocation is more widely allowed in peri-urban areas than in the rest of the country. As yet there are no experiences with contraception or sterilisation, and very few cases of poisoning are reported as a control method (mainly with feral pigs in Queensland).

Figure 17 – Frequency of the methods authorized for controlling wild boar / feral pigs according to the location: (peri-urban area, country including (peri-urban area, country except (peri-urban area



When considering only the (peri-)urban areas, some municipalities are able to use different methods for controlling boars/pigs.

Table 10 – Detailed control methods authorized in the areas reported by respondents of the survey: immobilization methods

City	Capture with traps + releasing	Capture with traps + lethal injection	Capture with traps + shooting	Capture with tranquilizer gun + releasing	Capture with tranquilizer gun + lethal injection
All of Texas, USA			1		
Aveiro, Portugal					1
Barcelona (Collserola Park), Spain		1			1
Bologna, Italy	1		1		
Brno, République Tchèque	1				
Budapest, Hongrie	1		1		
cities in IBARAKI pref. Japan		1			
Cracow, Pologne	1				
Gympie & SE Qld - Australia	1		1		
Hanovre, Allemagne			1		
Hódmezővásárhely, Hungary				1	
Ipswich, Queensland, Australia			1		
Kraków, Poland	1				
Las Rozas de Madrid, Spain	1	1		1	1
Mackay, Australia			1		
Malaga, Spain	1	1		1	1
Massa-Carrara (Tuscany)			1		
Northern Queensland Australia			1		
Oviedo, Espagne			1		
Roma, Italy	1				
Saint Germain en Laye, France			1		
Siena and Siena County, Italy	1				
Sopron, Hungary	1				
Tartu, Estonia	1			1	
Terrassa - Matadepera - Sabadell - Cerdanyola del Vallès - Castellar del Vallès, Spain		1			1
Thionville, France				1	
Vienna, Austria				1	
Total	12	5	11	6	5

Trapping (72%) is clearly a more authorized/used method than anaesthesia (28%), and captured animals are quite often released (46%). The release of trapped animals often responds to public goodwill towards the wild boar, and may be indicative of sites where problems with (peri-)urban boar are still at an incipient stage. Translocated habituated wild boar will often return to urban areas, and so capture and translocation soon becomes an inviable management option (e.g. tried for early cases in Barcelona). In Rome, boar trapping is used in (peri-)urban areas and also in the country. The animals are then translocated to the slaughterhouse, or to a fenced area before being butchered.

Table 11 – Detailed control methods authorized in the areas reported by respondents of the survey: shooting methods

City	Archery (bow and arrow)	High seat hunting with guns	Collective hunting with dogs	Individual hunting with dogs	Night shooting at fixed sites	Mobile night shooting (e.g. from a vehicle)	Aid for night shooting: spotlights	Aid for night shooting: light intensifier	Aid for the shooting: baiting with food	General hunting quota	Hunting quota with certain restrictions (sex, age, etc.)
All of Texas, USA					1	1	1	1	1		
Barcelona (Collserola Park), Spain			1		1		1		1		
Bell 1 Louisiana			1							1	1
Berlin, Allemagne		1	1	1	1				1	1	1
Bologna, Italy							1	1	1	1	1
Brno, République Tchèque		1			1		1		1	1	1
Budapest, Hongrie	1	1							1	1	
Cracow, Pologne		1							1		
Edmonton, Canada			1	1					1	1	
Fontainebleau, France		1	1								
Friebourg-en- Brisgau, Germany		1	1	1					1		1
Geneva, Switzerland										1	
Greece											1
Hanovre, Allemagne		1									
Hong Kong SAR, China					1			1	1		
Kraków, Poland		1			1				1		1
Las Rozas de Madrid, Spain	1										
Ljubljana, Slovenia		1			1				1		
Mackay, Australia	1	1	1	1		1	1			1	
Massa-Carrara (Tuscany)		1	1	1						1	
Nancy, France	1	1	1	1	1	1	1				1
Netherlands						1	1		1	1	1
Northern Queensland Australia				1							
Rostock, Allemagne		1			1				1		
Seraing, Belgique			1						1	1	
Seraing, Belgique		1	1		1				1		
Siena and Siena County, Italy				1	1	1			1		
Sopron, Hungary	1										
Terrassa - Matadepera - Sabadell - Cerdanyola del Vallès - Castellar del Vallès, Spain		1	1	1	1						
Thionville, France	1				1	1	1	1			
Wageningen, The Netherlands						1					
Total	6	15	12	9	13	7	8	4	17	11	9

Most of the respondents point out the exceptional circumstances in which shooting is permitted in the (peri-)urban areas, often subject to many restrictions. City shooting is, for example, permitted for government officials in Texas, professional game keepers in Geneva, or “lieutenants de louveterie” in Fontainebleau, and more generally in France.

The authorized control methods are linked to the required security level which is determined by the degree of urbanization and the human population density. However, it may also be driven by the acceptance of the local population to hunting or to the specific methods used, or by the importance of the conflicts (see

Communication and public awareness). For example, the use of bow and arrows was briefly authorised as a trial control method for controlling wild boar in periurban areas of Collserola Park (Barcelona, Spain) in early 2011, but this measure was subsequently withdrawn after just a few days, largely because of public opposition.

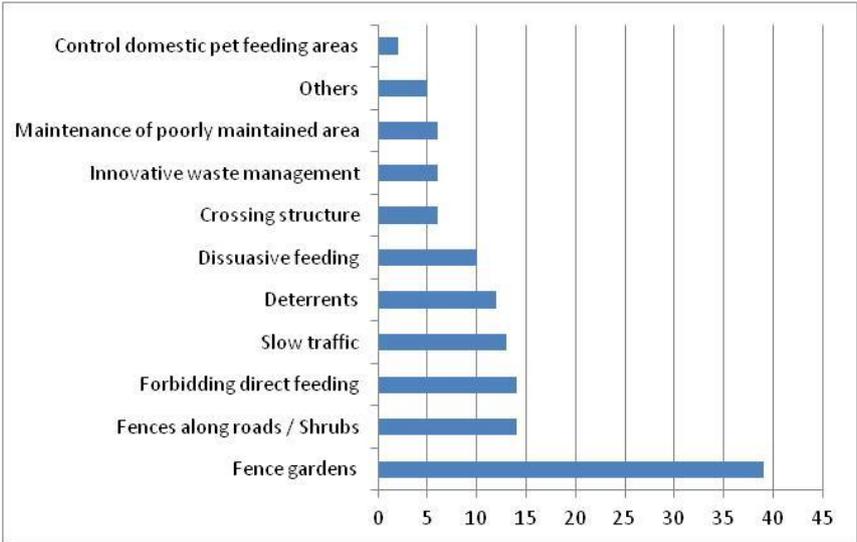
Another tool allowed and used to control the feral pig populations in Australia is the use of helicopters for shooting: about 800 individuals are slaughtered per month by pest management officers, even quite close to small peri-urban areas.

In Norway (Ostfold County), they are currently using scare shooting to frighten wild boar back to the forest. In Fontainebleau, dissuasive feeding is used to keep boar away from the city.

When slaughtered by hunting or destruction, the meat is usually consumed (67 %) and generally follows the same path (94%) as normal game meat, without any complementary sanitary analysis as a consequence of their urban environment.

Prevention

Figure 18 – Kinds of prevention measures used against wild boar / feral pigs

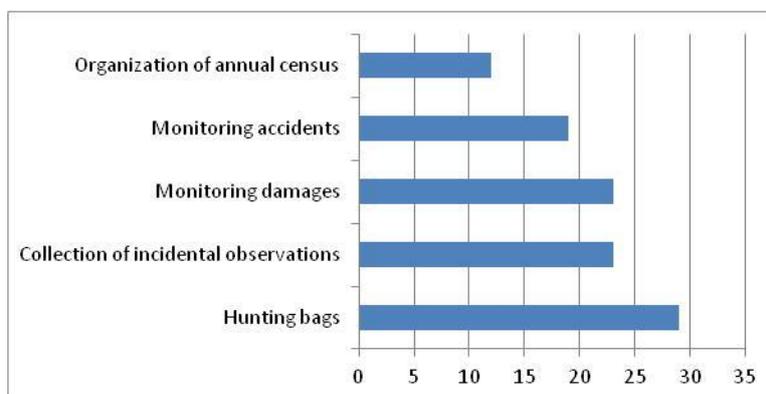


The main prevention tool used is fencing, mostly to protect gardens and to prevent collisions with vehicles. Some municipalities (20%) have a regulation banning direct feeding in order to limit the risk of habituation of the animals towards humans. The survey does not highlight any relevant results about the efficiency of these measures and points out that there is not one unique preventive solution.

For example, fences are considered as a good solution (mainly exclusion fences, but also electric fencing when this is well maintained), in combination with high hunting seats or other removal pressures. Deterrent systems are found to be inefficient or of only short-term effect in Rostock (Germany). Dissuasive feeding shows encouraging results in Massa-Carrara (Italy), but nevertheless it is found to be the worst measure applied in Thionville (France) because there it is not applied under strict conditions. In Spain (Pamplona, Terrassa,...), wildlife crossing structures seem to show interesting results in relation to reducing collisions with vehicles, whilst in Edmonton (Canada) they consider that slowing down traffic is the only efficient measure aimed at preventing collisions with vehicles. In most cases, population control itself is considered to be the key to preventing conflicts in (peri-)urban areas.

Monitoring

Figure 19 – Kinds of monitoring measures implemented



Respondents are usually well aware of the limitations of the methods used, specifically when attempting to assess population density. For example, hunting bags are collected by the hunters in the surrounding forests but these data are often suspected as being inaccurate. When censuses are organized, they are generally carried out with remotely triggered trail cameras. When boar density is low or emerging, passive methods are used, such as the collection of incidental direct or indirect observations (Brussels, UK,...). The monitoring of damage to crops and vehicle-boar collisions is complaint driven and requires well organized centralization of data. In some cases, a sample of boars are captured and released with GPS collars to gather information on their “peri-urban” behaviour. Some municipalities (Vienna, Berlin,...) are experimenting with new monitoring methods.

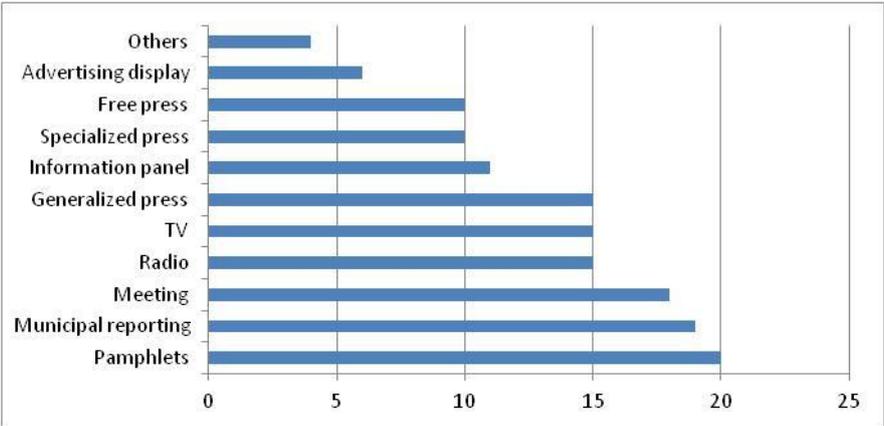
When density estimates are available, the range between surveyed areas is very wide, and the highest densities concern feral pigs in Australia.

Table 12 – Estimated densities of wild boar / feral pig

Respondent	mean density (n/km ²)	range (n/km ²)
Barcelona (Collserola Park), Spain	12	11-13
Terrassa - Matadepera - Sabadell - Cerdanyola del Vallès - Castellar del Vallès, Spain	4.5	
Brno, Czech Republic	3.5	0-7
Siena and Siena County, Italy	7.5	5-10
Massa-Carrara, Italy	5.3	
Cracow, Poland	0.15	
Australia	30	
Brussels, Belgium		<0.4

Communication and public awareness

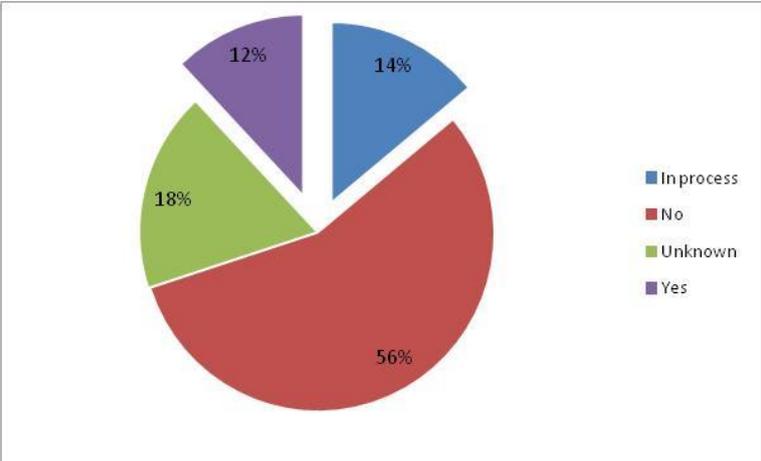
Figure 20 – Kinds of communication measures implemented



Another form of prevention is through communication to the public concerned. Different media are used and the most frequent are the very local ones (pamphlets, municipal reporting and meetings). Many municipalities or administrative authorities also inform the public via their website. The main objective of communication is to make citizens more sensitive to possible conflicts with wild boar / feral pig in order to protect their property against possible damages (by fencing the garden), and to prevent any indirect feeding (by managing domestic waste) and to publicise regulations concerning direct feeding, as examples.

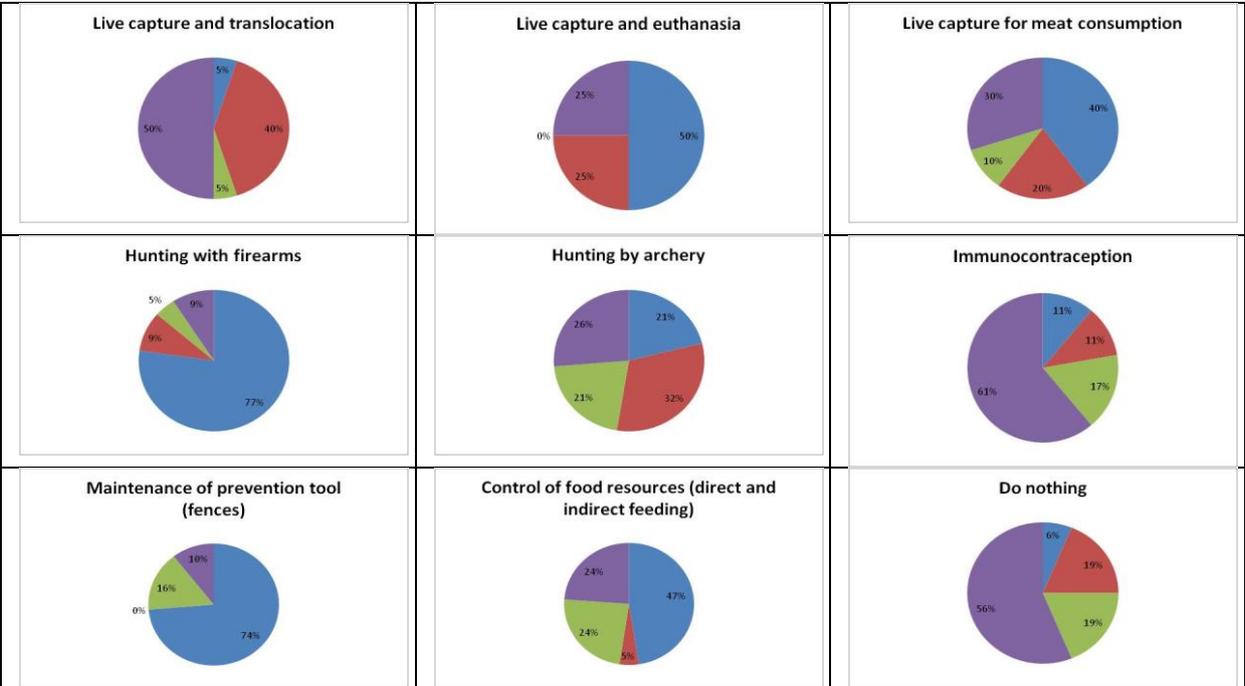
Public perception will partially drive strategies and methods to counteract peri-urban intrusions by boars/pigs. Our survey enquired about the existence of local surveys aimed at ascertaining the general public opinion about (peri-)urban wild boar / feral pig. Such surveys do already exist in some places and some others were also in process. At this stage, public opinion concerning wild boars and feral pigs within peri-urban areas is negative (75%) or ambiguous (25%). No survey mentioned any positive opinion.

Figure 21 – Existence of local surveys about the public opinion on wild boar and feral pig in (peri-)urban areas



Considering the most acceptable management methods, population control using traps is not systematically suggested to the public. Among the proposed capture techniques, the public generally supports capture with subsequent euthanasia of the animal, and rejects capture followed by translocation. However, the analysis shows an important difference between public perception between Europe (mainly Germany and Belgium) and Australia (+ USA and Canada), in that the latter support trapping methods for population regulation. In Pamplona (Spain), the public only support trapping when this is carried out for subsequent translocation of the captured animals. Concerning control by hunting, firearms (except in Wageningen and Aveiro) are preferred to archery, and the latter method generates very mixed reactions (for Europe in comparison to Australia and the USA). When proposed prevention tools as fencing or food control (direct or indirect feeding) are well accepted by the public. . It is worth noting that immuno-contraception is rarely proposed in local surveys (except in the USA, Germany and Portugal) and, when proposed, this gives rise to very contrasting reactions. In any case, the public normally demand some kind of solution.

Figure 22 – Management methods of wild boar / feral pig, supported, rejected, indifferent to and not proposed according to the local surveys reported



When no local survey is available, the respondents to our survey gave their own opinion about the public perception regarding the presence of boars in (peri-)urban areas. The general attitude is ambivalent or negative. Positive attitudes are reported in four locations, namely Liestal, Massa-Carrarra, Northrhine-Westphalia and Brussels.

Figure 23 – Supposed public attitude regarding the wild boar / feral pig presence in (peri-)urban areas

