Appendix A



Harmonia^{+PL} – procedure of negative impact risk assessment for invasive alien species and potentially invasive alien species in Poland

Questionnaire

A0 | Context

Questions from this module identify the assessor and the biological, geographical & social context of the assessment.

a01. Name(s) of the assessor(s):

first name and family name Izabela Sachajdakiewicz

first name and family name Marian Szewczyk

first name and family name Barbara Tokarska-Guzik

> acomm01. Comments: degree affiliation assessment date MSc Expert group Barszcz.edu.pl 18.12. 2017 degree affiliation assessment date PhD Jan Grodek State Vocational 18. 12. 2017 Academy in Sanok degree affiliation assessment date Professor Faculty of Biology and 22. 12. 2017 **Environmental Protection**, University of Silesia in Katowice

a02. Name(s) of the Species under assessment:

Polish name barszcz Sosnowskiego

Latin name Heracleum sosnowskyi MANDEN.

English name Sosnowsky's hogweed

acomm02.	Comments: Polish and Latin names are based on Flowering plants and pteridophytes of Poland – a checklist (Mirek et al. 2002 - P). The most often used Polish and English synonyms include: cow parsnip, giant cow, parsnip, giant hogweed (Tokarska-Guzik et al. 2015 and literature cited therein - I).					
	Polish name (synonym I) barszcz kaukaski (often together with H. mantegazzianum)	Polish name (synonym II)				
	Latin name (synonym I) <i>Heracleum wilhelmsii</i> Fischer et Avé- Lallemant	Latin name (synonym II) <i>Heracleum pubescens</i> (Hoffmann) Marschall von Bieberstein				
	English name (synonym I) giant hogweed	English name (synonym II) cow parsley				

a03. Area under assessment:

Poland

acomm03. Comments:

a04. Status of the Species in Poland. The Species is:

native to Poland

alien, absent from Poland

alien, present in Poland only in cultivation or captivity

alien, present in Poland in the environment, not established

alien, present in Poland in the environment, established

aconf01.

Answer provided with a

low medium

high level of confidence X



acomm04.	Comments: in "Comments" (questions acomm04-41) experts should provide explanations for their answers and list sources of information . In particular, Comments should explain the decision in cases when data is lacking, incomplete or uncertain, or if the available information is contradictory.
	Source of the information should also be provided here, with author and year of publication; data sources should be divided into P – published results of scientific research; B - databases; N – unpublished data; I - other; A – author's own data. Detailed information (including full bibliographic record) should be provided at the end of the questionnaire "Data sources". Guidance on data sources citation is available at the end of the <i>Harmonia</i> ^{+PL} – procedure of negative impact risk assessment for invasive alien species and potentially invasive alien species in Poland.
	Invasive alien species established in Poland (Sachajdakiewicz et al.2014, Tokarska-Guzik et al. 2012 - P). It is widespread all over the country (Stanowiska kaukaskich barszczy w Polsce – database of the Expert group barszcz.edu.pl, <u>http://barszcz.supportit.pl,</u> access: 08.12.2017 r B).
	Because of difficulties in distinguishing H. <i>Sosnowskyi</i> from H. <i>mantegazzianum</i> in Poland, these species are often confused or considered as one due to toxic and invasive nature of both species. In this survey – in questions where it was not possible to find direct data about the discussed species, information was extrapolated from the kin species or sources combining both species were used.

a05. The impact of the Species on major domains. The Species may have an impact on:

environmental domain	
cultivated plants domain	х
domesticated animals domain	
human domain	
other domains	х

Х	
х	
Х	
х	

acomm05. Comments:

> The species has impact on all the considered domains (Sachajdakiewicz and Mędrzycki 2014, Gałczyńska et al. 2016 - P).

> Heracleum sosnowskyi causes displacement of native species and loss of biodiversity in natural habitats (Sobisz 2007, Sachajdakiewicz et al. 2014 - P). Since it contains toxic components, it is dangerous for health and life of humans and animals, and also for livestock (Guzik 1994, Applegate et al. 1997, Nielsen et al. 2005, Wrzesińska 2006, Rzymski et al.2014, Sachajdakiewicz et al.2014 - P). Probably it has negative impact on food products of animal origin (meat, milk) (Guzik 1994, Sachajdakiewicz et al. 2014 - P).

> Dense patches of H. sosnowskyi, as well as its management, are also likely to increase soil erosion along stream banks where the plant occurs (EPPO Report of a Pest Risk Analysis 2009 - B).

> Heracleum sosnowskyi may cause some damage indirectly (Sachajdakiewicz et al. 2014 - P), but no data about such impact is available. The Species causes very relevant threats for ecology, society and economy (EPPO Report of a Pest Risk Analysis 2009 - B, Tokarska-Guzik et al. 2012 – P, Tokarska-Guzik et al. 2015 - I).

A1 | Introduction

Questions from this module assess the risk for the Species to overcome geographical barriers and - if applicable subsequent barriers of captivity or cultivation. This leads to Introduction, defined as the entry of The Organism

within the limits of The Area and subsequently into the wild.

a06. The probability for the *Species* to expand into Poland's natural environments, **as a result of self-propelled expansion** after its earlier introduction outside of the Polish territory is:

low medium high		x			
aconf02.	Answer provided with a	low	medium	high X	level of confidence
acomm06.	Poland (Mędrzycki et al. 2 level of confidence was se High seed production (fro (Nielsen et al. 2005, own	017; Sacha lected. om 20 000 n observati ikiewicz ar	jdakiewicz to 100 000 on, M. Sze nd Mędrzy	et al. 20), long s wczyk - cki 201	or species, which are established in p14 – P), high probability with a high seed viability and early germination A) combined with rapid spread in 4 - P) causes high probability of near existing localities.

The species occurs in countries neighbouring Poland – Belarus and Ukraine (Tokarska-Guzik et al. 2015 - I), from where it can expand in favourable conditions .

a07. The probability for the *Species* to be introduced into Poland's natural environments by **unintentional human actions** is:

low					
medium					
high		x			
aconf03.	Answer provided with a	low	medium	high X	level of confidence
acomm07.	Poland (Mędrzycki et al. 2 level of confidence was se Unintentional human action in areas affected by the sp	017; Sacha lected. ons include pecies, and	jdakiewicz activities then spre	et al. 20 related t ading its	or species, which are established in 14 – P), high probability with a high to the use of agricultural equipment around, as well as transport of hay or with soil (Sachajdakiewicz and

a08. The probability for the *Species* to be introduced into Poland's natural environments by **intentional human actions** is:

low					
medium					
high		x			
aconf04.	Answer provided with a	low	medium	high X	level of confidence

acomm08. Comments: According to the instruction (protocol Harmonia^{+PL}) – for species, which are established in Poland (Mędrzycki et al. 2017; Sachajdakiewicz et al. 2014 – P), high probability with a high level of confidence was selected. The species was introduced to Poland in 1950s, initially as a medicinal plant and then as fodder. From areas of cultivation it started spreading (Zając and Zając eds. 2015 - P). Nowadays the species is rarely used to feed animals. However, it is possible to intentionally propagate the species because of its melliferous qualities, as well as ornamental values and still low level of awareness about threats it may pose (Tokarska-Guzik et al. 2015 - I, Gałczyńska et al. 2016 - P).

A2 | Establishment

Questions from this module assess the likelihood for the Species to overcome survival and reproduction barriers. This leads to Establishment, defined as the growth of a population to sufficient levels such that natural extinction within The Area becomes highly unlikely.

a09. Poland provides **climate** that is:

blishment of the Species	x			
Answer provided with a	low	medium	high X	level of confidence
Poland (Mędrzycki et al. 2 level of confidence was sel The species originates fro Caucasus, which is more Europe includes countries continental moderate clin	017; Sacha lected. om areas c continenta s with clin nates, with	jdakiewicz of tempera al than in I nates simil a hot sumn	et al. 20 ate clima Poland. I ar to th	14 – P), high probability with a high ate in the Caucasus and the South Its secondary (introduced) range in e one in Poland. It tolerates both
	Comments: According to the instruction Poland (Mędrzycki et al. 2 level of confidence was see The species originates from Caucasus, which is more Europe includes countries continental moderate clim	Answer provided with a low Comments: According to the instruction (protoc Poland (Mędrzycki et al. 2017; Sacha level of confidence was selected. The species originates from areas of Caucasus, which is more continenta Europe includes countries with clin continental moderate climates, with	Answer provided with a low medium Comments: According to the instruction (protocol Harmon Poland (Mędrzycki et al. 2017; Sachajdakiewicz level of confidence was selected. The species originates from areas of tempera Caucasus, which is more continental than in Europe includes countries with climates simil	Answer provided with a low medium high X Comments: According to the instruction (protocol Harmonia ^{+PL}) – f Poland (Mędrzycki et al. 2017; Sachajdakiewicz et al. 20 level of confidence was selected. The species originates from areas of temperate clima Caucasus, which is more continental than in Poland. Europe includes countries with climates similar to th continental moderate climates, with hot summers and

a10. Poland provides habitat that is:

non-optimal

sub-optimal

optimal for establishment of the Species



aconf06.

Answer provided with a

low	medium	high	level of confidence
		х	

acomm10.	Comments: According to the instruction (protocol Harmonia ^{+PL}) – for species, which are established in Poland (Mędrzycki et al. 2017; Sachajdakiewicz et al. 2014 – P), high probability with a high level of confidence was selected.
	In the area of its natural occurrence, the species grows along mountain streams, along forests edges and in anthropogenic habitats (Vinogradova et al. 2011). In Poland it is found in similar habitats (Sachajdakiewicz and Mędrzycki 2014 - P). In the Carpathians it is most widespread along rivers and streams (Zając and Zając eds. 2015). Its occurrence is correlated with areas in which it was cultivated (Zając and Zając eds. 2015 – P). Also the rate of invasion and the size of the plant, much larger than in the area of its natural presence, also indicate optimum habitat conditions in Poland.

A3 | Spread

Questions from this module assess the risk of the *Species* to overcome dispersal barriers and (new) environmental barriers within Poland. This leads to spread, in which vacant patches of suitable habitat become increasingly occupied from (an) already-established population(s) within Poland.

Note that spread is considered different from range expansions that stem from new introductions (covered by the *Introduction* module).

a11. The capacity of the *Species* to disperse within Poland by natural means, with no human assistance, is:

very low					
low					
medium		x			
high					
very high					
	A second s			la 1 - la	laure la francé de sera
aconf07.	Answer provided with a	low	medium	high X	level of confidence
					-

acomm11.	Comments: Heracleum sosnowskyi spreads to new areas by zoo-, anemo- or hydrochory (Tokarska-Guzik et al. 2015 – I). Particularly dangerous in Poland are areas in which the species was cultivated. When cultivation was abandoned in 1980s and 1990s, the existing crops were not completely destroyed (Guzik 1994 - P). As a consequences, the species still expands from these areas without any further human intervention, invading e.g. abandoned land, roads, melioration channels ditches and river valleys; Tokarska-Guzik et al. 2015 – I). It also spreads along watercourses (Zając and Zając 2015 - P).
	A: single source dispersal: single individuals may produce as many as 20 000 seeds; up to 90% falls within 4 m from the parental plant (Nielsen et al. 2005 - P); <u>very low dispersal.</u>
	B: population expansions: seeds may be transported for longer distances in animal fur, with wind, or water from nearby watercourses (Wojtkowiak et al. 2008; EPPO 2009 - P); moderate expansion ability.
	 C: estimation of the species biological mobility: high seed production ; seeds transported by wind, on animals, and on clothes and shoes; hydrochory plays a role in dispersal for different distances, with longest dispersal by floods (Nielsen et al. 2005 - P); It was demonstrated that a single individual may start a new invasion (Nielsen et al. 2005); mobility high.
	Biological characteristics of the species and seed ability to utilise different dispersal methods, including long-distance dispersal, classify overall dispersal ability of the species as medium.
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a12. The frequency of the dispersal of the Species within Poland by human actions is:

low		
medium		
high	х	

aconf08.	Answer provided with a	low	medium	high X	level of confidence

acomm12. Comments:

Introducing the species into a new environment is forbidden by law in Poland (Sachajdakiewicz et al. 2014 - P); however it is still possible that the species is intentionally spread by humans. Its flowers are known to be a preferred nectar and pollen sources for honeybees (Datasheet on *Heracleum mantegazzianum, H. sosnowskyi* and *H. persicum* 2009 - B, Tokarska-Guzik et al. 2012, Sachajdakiewicz et al. 2014 - P). Due to the size and attractive appearance it used to be planted as an ornamental plant (Lutyńska 1977, Bracia Dębscy 2003, Tokarska-Guzik et al.2012, Sachajdakiewicz et al. 2014 - P). Seeds of *H. sosnowskyi* are unintentionally dispersed along roads (Sachajdakiewicz et al. 2014, Mędrzycki et al.2017 - P). Accidental transport with soil and crops may also play

some role (Sachajdakiewicz et al.2014 - P).

A4a | Impact on environmental domain

Questions from this module qualify the consequences of the *Species* on wild animals and plants, habitats and ecosystems.

Impacts are linked to the conservation concern of targets. Native species that are of conservation concern refer to keystone species, protected and/or threatened. See, for example, Red Lists, protected species lists, or Annex II of the 92/43/EWG Directive. Ecosystems that are of conservation concern refer to natural systems that are the habitat of many threatened species. These include natural forests, dry grasslands, natural rock outcrops, sand dunes, heathlands, peat bogs, marshes, rivers & ponds that have natural banks, and estuaries (Annex I of the 92/43/EWG Directive).

Native species population declines are considered on the local scale: limited decline is considered as a (mere) drop in numbers; severe decline is considered as a (near) extinction. Similarly, limited ecosystem change is considered as transient and easily reversible; severe change is considered as persistent and hardly reversible.

a13. The effect of the Species on native species, through predation, parasitism or herbivory is:

inapplicable		x			
low					
medium					
high					
aconf09.	Answer provided with a	low	medium	high	level of confidence
acomm13.	Comments: The species is a plant.				

a14. The effect of the Species on native species, through competition is:

low	
medium	
high	x

ac

onf10.	Answer provided with a	low	medium	high X	level of confidence
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 Comments: The species forms dense patches, dominating and altering conditions for other species. Most of native plants cannot compete successfully with the plant of this size and vigour (own observation in Sanok county, M. Szewczyk – A). H. mantegazzianum and H. sosnowskyi are strong competitors, both with individuals of their own species and with other species. As many as 98% of seedlings die because of shading by fully-grown plants. However, in the following years the few survivors form dense dtands (Nielsen et al. 2005 - P). Shading is also the jey driver of displacement of seedlings of other species (Sachajdakiewicz et al. 2014 - P). According to Sachajdakiewicz et al. (2014 - P), the mechanisms of the impact of both species include: Forming dense patches thanks to very high seed production and their close dispersal, and forming dense and persistent soil seed bank (up to 80 seeds/m² - Pyšek et al. 2007 - P), Shading of other species by elevated, flat leaves with high light-filtering capacity (Tappeiner and Cernusca 1996 - P), Tendency to form monocultures thanks to high reproduction (Pytlarczyk et al. 2013 - P), Allelopathic interactions (to a lesser degree; Jandova et al. 2014a, Wille et al. 2013 - P). These mechanisms may decrease the number of plant species by 50-60 % (Hejda et al. 2009) or even by 62-69% (Sobisz 2007 - P) in comparison with not invaded areas, although
after some time new ecological stability may develop (Dostal et al. 2013 - P).

a15. The effect of the Species on native species, through interbreeding is:

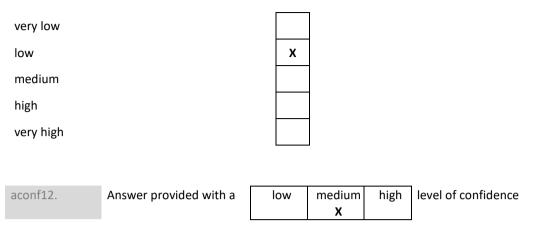
no / very low					
low					
medium		х			
high					
very high					
aconf11.	Answer provided with a	low	medium X	high	level of confidence
acomm15.	•	-			nature are known (Stewart 1979,

-

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Klingenstein 2007 - P, Klingenstein 2007, Datasheet on *Heracleum mantegazzianum*, *H. sosnowskyi* and *H. persicum* 2009 - B). In Poland native species, which may interbreed with *H. sosnowskyi* are common (e.g. species from the same genera). Hybrids between *H. mantegazzianum* and *H. sibricum* were reported from Lithuania (EPPO 2009 – P, B). Hybrids between *H. mantegazzianum* and *H. -sosnowskyi* are also known (Kligenstein 2007 - B). Assessed impact – medium (no detailed data exists). More in: Sachajdakiewicz et al. 2014 – P, Tokarska-Guzik at al. 2015 - I.

a16. The effect of the Species on native species by hosting pathogens or parasites that are harmful to them is:



acomm16.	Comments:
	Both in native and secondary range, fungal pathogens have been recorded on the leaves of
	H. mantegazzianum (Seier et al. 2003, Seier and Evans 2007 - P). Initially, it was assumed
	that the species may be a carrier of crop diseases (Gray and Noble 1965 - P), however, no
	cases of pathogen or parasite transfer to native species in the introduced range have been
	recorded so far. Mycobiota associated with Heracleum genus is narrowly specialized (Seier
	and Evans 2007 - P). The same may be assumed for <i>H. sosnowskyi.</i>

a17. The effect of the *Species* on ecosystem integrity, by affecting its abiotic properties is:

low					
medium		х			
high					
aconf13.	Answer provided with a	low	medium	high	level of confidence
			Х		
acomm17.	and biological characteristi may cause similar effec	ics of soil (. ts (Sachaj	Jandova et dakiewicz	al.2014b et al.20	cause changes in physical, chemical o - P) – <i>per analogiam H. Sosnowskyi</i> D14 - P). Dense patches of the ground zone (own observation, M.

a18. The effect of the *Species* on ecosystem integrity, by **affecting its biotic properties** is:

low			
medium			
high		х	
aconf14.	Answer provided with a	low	

h a	low	medium	high	level of confidence
			Х	

acomm18. Comments:

The species composition in areas seized by the Sosnowsky's hogweed are completely different from adjacent areas free of this species. Dense fields of the Sosnowsky's hogweed are only accompanied by a few other species (own observation, M. Szewczyk - A). The effects of the species on wild animals and birds sometimes found in dense patches are unknown. Traces of snail foraging on stems were observed in several places (Sanok county). Insect Liparus glabrirostris was found twice the species. Negative effects on animals can be expected due to the content of toxic substances in essential oils (Gałczyńska et al. 2016 - P). According to Sachajdakiewicz et al. (2014 - P), the number of species in phytocoenoses with H. sosnowskyi may decrease by 50-60% (Hejda et al. 2009) or even by 62-69% (Sobisz 2007 -P), but in a long time (50 yrs) a new ecological balance may arise (Dostal et al. 2013 - P). Those mechanisms are similar to mechanisms of high competitive native species, characteristic of meadows and grasslands (e.g. Urtica dioica, Thiele and Otte 2006 - P). However, the impact of invasive alien Heracleum species seems to be more persistent and pervasive, and therefore it more profoundly changes the structure of plant communities. Toxic compounds of H. sosnowskyi discourage vertebrate, and invertebrate herbivores to feed on the plants, except for the species which are specialised to feed on plants in Apiaceae family, Hansen et al. 2006 - P). Size and persistence of patches of H. sosnowskyi induce more significant negative influence on biocoenoses than that of native expansive species.

A4b | Impact on cultivated plants domain

Questions from this module qualify the consequences of the *Species* on cultivated plants (e.g. crops, pastures, horticultural stock).

For the questions from this module, consequence is considered 'low' when presence of the *Species* in (or on) a population of target plants is sporadic and/or causes little damage. Harm is considered 'medium' when The Organism's development causes local yield (or plant) losses below 20%, and 'high' when losses range > 20%.

a19. The effect of the Species on cultivated plants targets through herbivory or parasitism is:

inapplicable					
very low		x			
low					
medium					
high					
very high					
aconf15.	Answer provided with a	low	medium	high	level of confidence
				Х]
acomm19.	Comments: The species in a non-parasi	itic plant			

a20. The effect of the Species on cultivated plants targets through competition is:

inapplicable	
very low	
low	
medium	

high very high		x			
aconf16.	Answer provided with a	low	medium X	high	level of confidence
acomm20.	not normally weeds of cro example in potatoes in S <i>Heracleum mantegazziana</i> The species overgrows (Sachajdakiewicz et al. 20 cultivated fields, due to numbers of seeds – it is po a potential competitor for Using herbicides limits the effects of pollution by furd Mędrzycki ed. 2014 - P).T Proper land cultivation is 2006, MacDonald 2012 - treatments (Sachajdakiew	bps but the Sweden; th <i>im, H. sosn</i> meadows 14 - P). Si its remar ossible, tha crop plant he negativ ocumarines the only m P). Its pres vicz 2008 -	ere are rep ney have a <i>cowskyi</i> and and pastu nce the sp kable com t in case or s. re influenc s are unkno nethod of s ence in cro N). If it is	orts of the also been d <i>H. persi</i> res, it a ecies oft petition f massive e on cro pwn and uccessfu uccessfu pps may found i	n crops. The <i>Heracleum</i> species are neir penetration into crop fields, for n invading pastures (Datasheet on <i>icum</i> 2009 - B). also disturbs agricultural practices ten grows in close neighborhood of capacity and production of large e spread, <i>H. mantegazzianum</i> will be op plants; however, the long-term hardly predictable (Sachajdakiewicz, I control of the species (Wrzesińska reduce the efficiency of agricultural n the cultivation of cereals or root observation, M. Szewczyk - A).

a21. The effect of the Species on cultivated plants targets through interbreeding with related species, including the plants themselves is:

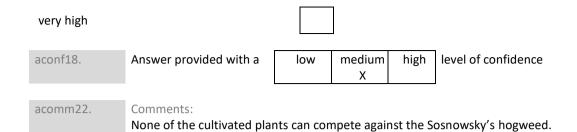
inapplicable							
no / very low		х					
low							
medium							
high							
very high							
aconf17.	Answer provided with a	low	medium X	high	level of conf	idence	
acomm21.	Comments: No data available. Plants o possible that hybridizatio		-				•

case of H. mantegazzianum) and that the hybrids may have some impact on meadow plant communities.

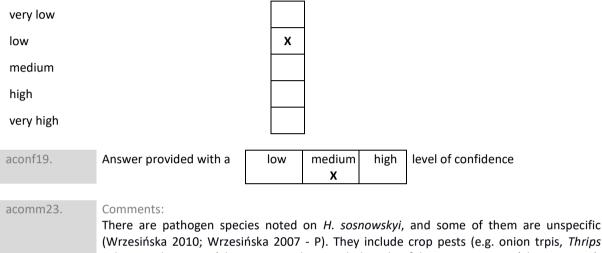
Hybrids of H. sosnowskyi i H. sibricum were reported from Lithuania (EPPO 2009 - P).

a22. The effect of the Species on cultivated plants targets by affecting the cultivation system's integrity is:

very low	
low	
medium	
high	х



a23. The effect of the Species on cultivated plants targets by hosting pathogens or parasites that are harmful to them is:



(Wrzesińska 2010; Wrzesińska 2007 - P). They include crop pests (e.g. onion trpis, Thrips tabaci Lind., Wrzesińska 2006 - P, bean aphid, Aphis fabae Scop. Wrzesińska 2005 - P). However, these are not species of any importance to crops.

A4c | Impact on domesticated animals domain

Questions from this module qualify the consequences of The Organism on domesticated animals (e.g. production animals, companion animals). It deals with both the well-being of individual animals and the productivity of animal populations.

a24. The effect of the Species on individual animal health or animal production, through predation or parasitism is:

г

inapplicable		х			
very low					
low					
medium					
high					
very high					
aconf20.	Answer provided with a	low	medium	high	level of confidence
acomm24.	Comments: The species is a plant.				

a25. The effect of the Species on individual animal health or animal production, by having properties that are hazardous upon contact, is:

			_		
very low					
low					
medium					
high		х			
very high					
aconf21.	Answer provided with a	low	medium	high X	level of confidence
acomm25.	is dangerous for health an Nielsen i in. 2005, Rzymsk other systemic symptoms They can also be carcinoge Consumption of raw leav diarrhea, which leads to l (Kees and Krumrey 1983, A According to Sachajdakiew can affect animals, espec animals injuries occurs us	d life of hu Guzik 2004 (Guzik 200 enic (Archie ves by cov losses in th Andrews 19 vicz et al. (2 ially those ually on br	mans and - P). This 5, Nielsen er et al. 201 vs causes ne cattle s 285 - P). 2014 – P), with bright parts of	animals, substanc i in. 2005 L2 - P). burns o tock. Poi tock. Poi the nega the nega the of body (ty- Hattendorf et al. 2007 - P), which including farmed ones (Guzik 2005, ces may cause photodermatosis and 5, Klima 2014, Rzymski i in. 2014 - P). f the digestive system and bloody isoning was also observed in sheep ative influence of <i>Heracluem</i> species Nielsen et al. 2005 - P). In piebald (Tymszan 2014 - P). The wounds are that cows. which udders have been

have been burnt, should be killed (Klima 2014 - P). Cattle willingly eats young specimens of the Sosnowsky's hogweed, without any negative effects (A: Self-observation in Płonna near Sanok).

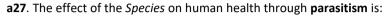
The skin of wild animals is probably more resistant for toxic impact of the invasive alien Heracleum species. There are no specific data about relations between these plants and wild animals but some observations of boars hiding or birds nesting in invasive alien Heracleum species stands were published (Łyszczarz 2012 - P). However, specific information on interactions between H. sosnowskyi and wild animals is not available.

a26. The effect of the Species on individual animal health or animal production, by hosting pathogens or parasites that are harmful to them, is:

inapplicable		х			
very low					
low					
medium					
high					
very high					
aconf22.	Answer provided with a	low	medium	high	level of confidence
acomm26.	Comments: The <i>Species</i> is a plant.				

A4d | Impact on human domain

Questions from this module qualify the consequences of The Organism on humans. It deals with human health, being defined as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (definition adopted from the World Health Organization).



inapplicable		x			
very low					
low					
medium			_		
high			_		
very high					
aconf23.	Answer provided with a	low	medium	high	level of confidence
acomm27.	Comments:				
	The species is not a parasit	te.			

a28. The effect of the Species on human health, by having properties that are hazardous upon contact, is:

very low					
low					
medium					
high					
very high		X			
aconf24.	Answer provided with a	low	medium	high X	level of confidence
acomm28.	Comments:				

Sap of *H. sosnowskyi* contains psolarens (in high density - Hattendorf et al. 2007 - P), which are dangerous for health and life of humans and animals, including farmed ones (Guzik 1994, Nielsen et al. 2005, Rzymski et al. 2014 - P). This substances may cause photodermatosis and other systemic symptoms (Guzik 1994, Nielsen et al. 2005, Klima 2014, Rzymski et al.2014 - P). They can also be carcinogenic (Archier et al. 2012 - P). Contact with the plant causes skin burns and other health disorders (Sahajdakiewicz and Mędrzycki 2014 - P). according to some researchers, burns can occur even without direct contact (Klima 2014 - P).

a29. The effect of the *Species* on human health, by hosting **pathogens or parasites** that are harmful to humans, is:

inapplicable	
very low	
low	

medium high very high					
aconf25.	Answer provided with a	low	medium	high	level of confidence
acomm29.	Comments: The species is a plant. Plan humans.	its are not l	hosts or ve	ctors for	pathogens or parasites threatening

A4e | Impact on other domains

Questions from this module qualify the consequences of the Species on targets not considered in modules A4a-d.

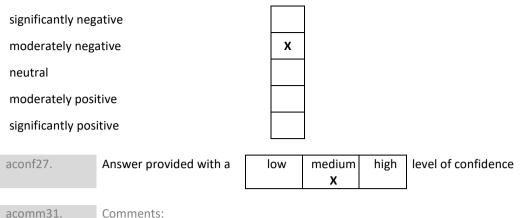
a30. The effect of the *Species* on causing damage to **infrastructure** is:

very low					
low					
medium					
high		x			
very high					
aconf26.	Answer provided with a	low	medium	high X	level of confidence
acomm30.	 Heracleum sosnowskyi are: decreasing area Sachajdakiewicz 2 2008 - N), decreasing turistic N), including prote decreasing atractiv decreasing road vi negative influence There are no statistics about increase. More research in 	indirect d of mea 008 - N) a c atractive ected area veness for isibility (Sa e on beaut ut those d this field ral equipr	amages ca adows an and making eness (Rozy s (Wróbel 2 investmer achajdakiev y of landsc lamages in is required	aused by ad past g agricult wadowsk 2002, Wr ots (Sach vicz 2008 apes (Sac Poland, (Sachajo	y Heracleum mantegazzianum and ures (Rozwadowska 2003 - P, tural works harder (Sachajdakiewicz a 2003 - P, Sachajdakiewicz 2008 - rzesińska 2006 - P), ajdakiewicz 2008 - N),

A5a | Impact on ecosystem services

Questions from this module qualify the consequences of The Organism on ecosystem services. Ecosystem services are classified according to the Common International Classification of Ecosystem Services, which also includes many examples (CICES Version 4.3). Note that the answers to these questions are not used in the calculation of the overall risk score (which deals with ecosystems in a different way), but can be considered when decisions are made about management of the *Species*.

a31. The effect of the Species on provisioning services is:



Comments:

No research is known on this topic. Taking into account the possible damages caused by the species, the species may impede access to infrastructure (e.g. it may overgrow storage facilities/ areas/ premises), may make agricultural practices more complicated, or may decrease areas of meadows and pastures (Sachajdakiewicz 2008; Sachajdakiewicz and Mędrzycki eds. 2014 - P). These effects may in turn contribute to lower food production. Probably the species also has negative impact on food products of animal origin (meat, milk) (Guzik 1994, Sachajdakiewicz et al. 2014).

a32. The effect of the Species on regulation and maintenance services is:

significantly neg	ative				
moderately neg	ative	x			
neutral					
moderately posi	tive				
significantly pos	itive]		
aconf28.	Answer provided with a	low	medium X	high	level of confidence
acomm32.	Comments:			intin out	incompany these it offer

The species significantly alters the biotic and abiotic environment, thus it affects regulatory services, but currently there is no data on its positive and negative impact. However, the possibility of migration of traces of toxic compounds to the air through the transpiration, leaks or burst cannot be excluded (Sachajdakiewicz et al. 2014).

a33. The effect of the Species on cultural services is:

significantly neg	ative					
moderately nega	ative	2	X			
neutral						
moderately positive						
significantly pos	itive					
aconf29.	Answer provided with a	low		medium	high X	level of confidence

acomm33. Comments:

No direct research is known on this topic. The species influences the native natural systems and damaging their aesthetics. It hinders recreation (fishing, collection of herbs, recreation along streams and in meadows). This plant causes fear of the effects of contact (skin burns and other health disorders) and inadvertently causes destruction of similar native species (Sahajdakiewicz and Medrzycki 2014 - P, own observation - A). It may cause difficulties in access to rivers, touristic areas (EPPO Report of a Pest Risk Analysis 2009 - B, Sachajdakiewicz et al. 2014 - P).

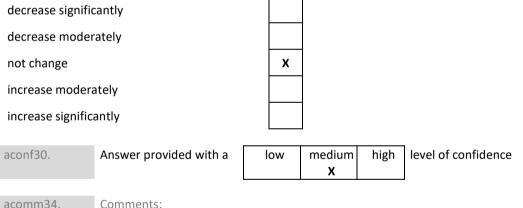
For several years threat posed by H. sosnowskyi and H. mantegazzianum is a topic of TV and press news. It may be considered as positive side effect, which increases awareness about invasive alien species in general.

A5b | Effect of climate change on the risk assessment of the negative impact of the Species

Below, each of the Harmonia+ modules is revisited under the premise of the future climate. The proposed time horizon is the mid-21st century. We suggest to take into account the reports of the Intergovernmental Panel on Climate Change. Specifically, the expected changes of atmospherical variables listed in its 2013 report on the physical science basis may be used for this purpose. The global temperature is expected to rise by 1 to 2 °C by 2046-2065.

Note that the answers to these questions are not used in the calculation of the overall risk score, but can be but can be considered when decisions are made about management of the Species.

a34. INTRODUCTION - Due to climate change, the probability for the Species to overcome geographical barriers and - if applicable - subsequent barriers of captivity or cultivation in Poland will:



Comments:

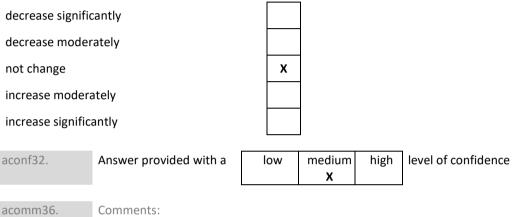
The species already occupies a wide range of habitats in warmer climates than the one in in Poland, which indicates that its expansion will not change with climate. There may be more competition and displacement of H. sosnowskyi by Heracleum mantegazzianum which is more thermophilous and more frequent in countries south of Poland (Sachajdakiewicz and Mędrzycki 2014 - P).

a35. ESTABLISHMENT – Due to climate change, the probability for the Species to overcome barriers that prevented its survival and reproduction in Poland will:

decrease significantly	
decrease moderately	
not change	х
increase moderately	

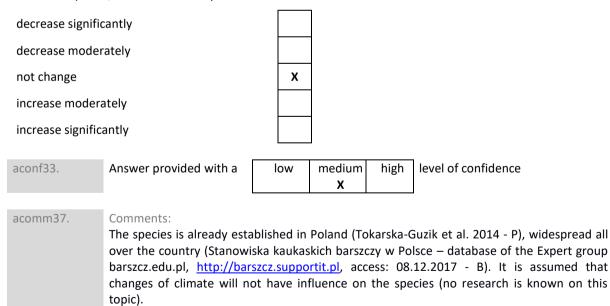
increase significantly]		
aconf31.	Answer provided with a	low	medium X	high	level of confidence
acomm35.	Comments: The species is already esta	blished (T	okarska-Gu	zik et al.	. 2014 - P).

a36. SPREAD – Due to climate change, the probability for the *Species* to overcome barriers that prevented its spread in Poland will:



The species is already established in Poland (Tokarska-Guzik et al. 2014 - P), widespread all over the country (Stanowiska kaukaskich barszczy w Polsce – database of the Expert group barszcz.edu.pl, <u>http://barszcz.supportit.pl</u>, access: 08.12.2017 - B). The high tolerance of the species to the climatic factors suggests that it will maintain the current rate of spread.

a37. IMPACT ON ENVIRONMENTAL DOMAIN – Due to climate change, the consequences of the *Species* on wild animals and plants, habitats and ecosystems in Poland will:

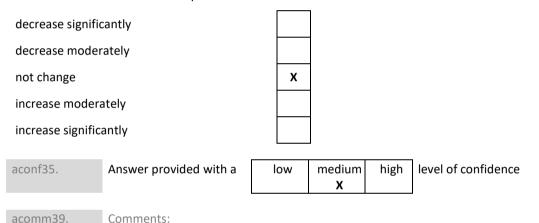


a38. IMPACT ON CULTIVATED PLANTS DOMAIN – Due to climate change, the consequences of the *Species* on cultivated plants and plant domain in Poland will:

decrease significantly

decrease mode	rately]		
not change		х			
increase moder	ately				
increase signific	antly				
aconf34.	Answer provided with a	low	medium X	high	level of confidence
acomm38.	over the country (Stanowi barszcz.edu.pl, <u>http://bar</u>	ska kauka <u>szcz.supp</u> ot have ir	skich barszo <u>prtit.pl</u> , acc ofluence on	czy w Po cess: 08 the spe	Guzik et al. 2014 - P), widespread all Isce – database of the Expert group 12.2017 - B). It is assumed that ecies (no research is known on this aintained.

a39. IMPACT ON DOMESTICATED ANIMALS DOMAIN – Due to climate change, the consequences of the *Species* on domesticated animals and animal production in Poland will:



commiss.	connients.
	The species is already established in Poland (Tokarska-Guzik et al. 2014 - P), widespread all
	over the country (Stanowiska kaukaskich barszczy w Polsce – database of the Expert group
	barszcz.edu.pl, http://barszcz.supportit.pl, access: 08.12.2017 - B). It is assumed that
	changes of climate will not have influence on the species (no research is known on this
	topic). Because almost same animals are bred in warmer climates (south of Poland), no
	change is expected.

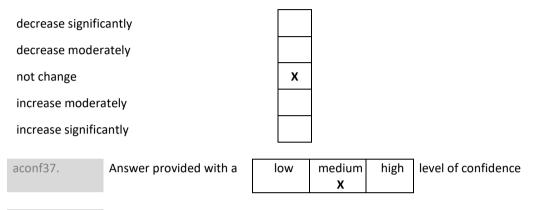
a40. IMPACT ON HUMAN DOMAIN – Due to climate change, the consequences of the *Species* on human in Poland will:

decrease signific	cantly					
decrease moder	rately					
not change			х			
increase moderately						
increase significantly						
aconf36.	Answer provided with a	lo	w	medium X	high	level of confidence

acomm40. Comments:

The species is already established in Poland (Tokarska-Guzik et al. 2014 - P), widespread all over the country (Stanowiska kaukaskich barszczy w Polsce – database of the Expert group barszcz.edu.pl, <u>http://barszcz.supportit.pl</u>, access: 08.12.2017 - B). It is assumed that changes of climate will not have influence on the species (no research is known on this topic). The effects on humans are related to sunlight and humidity or sweating. It is therefore possible to assume a slight increase of the impact in case of climate warming.

a41. IMPACT ON OTHER DOMAINS – Due to climate change, the consequences of the *Species* on other domains in Poland will:



acomm41. Comments:

The species is already established in Poland (Tokarska-Guzik et al. 2014 - P), widespread all over the country (Stanowiska kaukaskich barszczy w Polsce – database of the Expert group barszcz.edu.pl, <u>http://barszcz.supportit.pl</u>, access: 08.12.2017 - B). It is assumed that changes of climate will not have influence on the species (no research is known on this topic).

Summary

Module	Score	Confidence		
Introduction (questions: a06-a08)	1.00	1.00		
Establishment (questions: a09-a10)	1.00	1.00		
Spread (questions: a11-a12)	0.75	1.00		
Environmental impact (questions: a13-a18)	0.65	0.70		
Cultivated plants impact (questions: a19-a23)	0.40	0.60		
Domesticated animals impact (questions: a24-a26)	0.75	1.00		
Human impact (questions: a27-a29)	1.00	1.00		
Other impact (questions: a30)	0.75	1.00		
Invasion (questions: a06-a12)	0.92	1.00		
Impact (questions: a13-a30)	1.00	0.86		
Overall risk score	0.92			
Category of invasiveness	very invasive alien species			

A6 | Comments

acomm42.

This assessment is based on information available at the time of its completing. It has to be taken into account. however. that biological invasions are. by definition. very dynamic and unpredictable. This includes introductions of new alien species and detection of their negative impact. As a result. the assessment of the species may change in time. For this reason it is recommended that it regularly repeated.

Below you can include your own comments on the assessment.

Comment: Heracleum Sosnowskyi was classified in this assessment as very invasive alien species, scoring high in all modules used for calculations except for impact cultivated plants (0.40; questions: a19-a23). In the human impact module (questions: a27-a29), the species scored the maximum value (1.0) and in the environmental impact module (questions: a13-a18) – 0.65. It is noteworthy that the value of 0.75, scored in the two remaining modules (on domesticated animals impact (questions: a24-a26 and other impact (question: a30) is merely 0.01 lower than the threshold value that allows classification of species as very invasive.

As the species is widespread in Poland and its dispersal capacity is high, the score for modules related to the process of invasions (questions: a06-a12) is high - 0.92.

This assessment was carried out using the expert knowledge and available sources of information. Because of its invasiveness and toxicity it is recommended to control the species (Tokarska-Guzik et al. 2015 - I). With no control, further invasion will continue. Threat to human health should be the primary argument for considering *H. Sosnowskyi* as the priority species that requires control (Tokarska-Guzik et al. 2015 - I).

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5. Author's own data (A)

Realization of the project "Native flora protection program for Sanok District against invasive species and their spreading limitation and penetration in the area of "The International Biosphere Park East Carpathians".