

Scenarios	Species	Animal categories	Means of transport	Transport duration	Thermal environment
1	cattle	heifers	road	short	above
2	cattle	heifers	road	short	below
3	cattle	heifers	road	short	neutral
4	cattle	heifers	road	long	above
5	cattle	heifers	road	long	below
6	cattle	heifers	road	long	neutral
7	cattle	heifers	sea	long	above
8	cattle	heifers	sea	long	neutral
9	cattle	heifers	air	long	neutral
10	cattle	beef cattle	road	short	above
11	cattle	beef cattle	road	short	below
12	cattle	beef cattle	road	short	neutral
13	cattle	beef cattle	road	long	above
14	cattle	beef cattle	road	long	below
15	cattle	beef cattle	road	long	neutral
16	cattle	beef cattle	sea	long	above
17	cattle	beef cattle	sea	long	below
18	cattle	beef cattle	sea	long	neutral
19	cattle	cows	road	short	above
20	cattle	cows	road	short	below
21	cattle	cows	road	short	neutral
22	cattle	cows	road	long	above
23	cattle	cows	road	long	below
24	cattle	cows	road	long	neutral
25	cattle	calves	road	short	above
26	cattle	calves	road	short	below
27	cattle	calves	road	short	neutral
28	cattle	calves	road	long	above
29	cattle	calves	road	long	below
30	cattle	calves	road	long	neutral
31	cattle	calves	air	long	neutral

Figure 1. Different transport scenarios in cattle

HAZARD	Hazard description	Adverse effect description	Adverse effect type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
				Heifers									Beef Cattle									Cows						Calves									
				RSA	RSB	RSN	RLA	RLB	RLN	SLA	SLN	PL	RSA	RSB	RSN	RLA	RLB	RLN	SLA	SLB	SLN	RSA	RSB	RSN	RLA	RLB	RLN	RSA	RSB	RSN	RLA	RLB	RLN	PLA			
TRANSPORT																																					
Vehicle / Container design																																					
a.) Floors																																					
Floor surface	Slippery	Bruising, wounds, fractures	Injuries																																		
Floor surface	Slippery	Problems maintaining balance, strug	Ease of movement																																		
Floor surface	Slippery	Problems maintaining balance, strug	Fear																																		
Floor condition	Gaps, potholes, steps, slopings	Bruising, wounds, fractures	Injuries																																		
Floor condition	Gaps, potholes, steps, slopings	Difficult movement	Ease of movement																																		
Floor condition	Lack of bedding	Cold stress	Thermal discomfort				n.a.								n.a.										n.a.												
Floor condition	Lack of bedding	Bruising, wounds	Comfort around resting																																		
Floor condition	Lack of bedding	Respiratory disorders	Disease	n.a.			n.a.						n.a.			n.a.								n.a.													
b.) Partitions																																					
Unsuitable design	Sharp protrusion, sharp edges, grate (causes trapping extremities or head)	Bruising, wounds, fractures	Injuries										n.a.																								
Unsuitable design	< 1,5 min height	Bruising, wounds	Injuries										n.a.																								
Unsuitable design	Not solid	Bruising, wounds	Injuries										n.a.																								
Unsuitable design	Closed at the top (disturbs airflow)	Disturbed thermoregulation	Thermal comfort										n.a.																								
Absence of partions	No partitions, open sides between adjacent pens	Bruising, wounds	Injuries										n.a.																								
Absence of partions	No partitions, open sides between adjacent pens	Aggression	social Behaviour										n.a.																								
c.) Roof																																					
Roof colour	No reflecting bright colour	Heatstress, overheating	Thermal comfort										n.a.				n.a.																	n.a.		n.a.	
Roof colour	No reflecting bright colour	Heatstress, overheating	Thirst				n.a.						n.a.				n.a.																		n.a.		n.a.
Roof condition	Gaps, holes, protrusions, projections	Soaked animals	Thermal comfort										n.a.																								n.a.
Roof condition	Gaps, holes, protrusions, projections	Soaked animals	Comfort around resting										n.a.																								n.a.
Roof condition	Gaps, holes, protrusions, projections	Bruising, wounds	Injuries										n.a.																								n.a.
Roof condition	Gaps, holes, protrusions, projections	solar radiation	Thermal comfort					n.a.					n.a.				n.a.																		n.a.		n.a.
Unsuitable insulation	Solar gain heat	Heatstress, overheating	Thermal comfort										n.a.				n.a.																			n.a.	
Unsuitable insulation	Solar gain heat	Heatstress, overheating	Thirst					n.a.					n.a.				n.a.																			n.a.	
Unsuitable insulation	Condence water	Soaked animals	Comfort around resting	n.a.			n.a.						n.a.	n.a.			n.a.																			n.a.	
Unsuitable insulation	Condence water	Soaked animals	Thermal comfort	n.a.			n.a.						n.a.	n.a.			n.a.																				
Unsuitable insulation	Condence water/air draught	Soaked animals	Disease										n.a.																							n.a.	
d.) Sensory input (Sound Smell Light)																																					
Noise	Overall noise	Aversion	Fear																																		
Light	Sudden change of light (tunnels), poor lighting, glaring lights	Aversion	Fear																																		
Smell	Unfamiliar smell	Aversion	Fear																																		
e.) Space allowance/Tier height																																					
Deck height	< 20 cm min height above withers	Heatstress, overheating	Thermal comfort																																		
Deck height	< 20 cm min height above withers	blocked air exchange	Disease																																		
Deck height	< 20 cm min height above withers	Bruising, wounds	Injuries																																		
Deck height	< 20 cm min height above withers	Inability to express natural behavio	Ease of movement																																		
Deck height	> 50 cm man.a. height above withers	Mounting, bruising, wounds	Injuries				n.a.			n.a.			n.a.																								n.a.
f.) Suspension																																					
Poor suspension	Vibration, acceleration	Travel sickness	Disease																																	n.a.	
Poor suspension	Vibration, acceleration	Struggling, loss of balance, falling,	Ease of movement																																		n.a.
Poor suspension	Vibration, acceleration	Struggling, loss of balance, falling,	Injuries																																		n.a.
g.) Inspection possibilities																																					
Inspection opening	<min size, < min deck height, inadequate access	Heat stress, cold stress, panting fo	Thermal comfort																																		n.a.
Inspection opening	<min size, < min deck height, inadequate access	Bruising, wounds, fractures	Injuries																																		n.a.
Feeding and watering																																					
a.) Watering																																					
Lack of drinking facilities	No supply of water	Dehydration	Thirst																																	n.a.	
Lack of drinking facilities	No supply of water	Heat stress	Thermal comfort																																		n.a.
Inappropriate drinking facilities	Facilities not adjusted to cattle, no open water expanse, < 3 cm water depth	Dehydration	Thirst																																		n.a.
Inappropriate drinking facilities	Facilities not adjusted to cattle, no open water expanse, < 3 cm water depth	Heat stress	Thermal comfort																																		n.a.
Quantity of watering cups	< less than two watering cups per pen	Dehydration	Thirst																																		n.a.
Position of drinkers	Inadequate position in the vehicle/pen	Dehydration	Thirst																																		n.a.
Position of drinkers	Inadequate position in the vehicle/pen	Heat stress	Thermal comfort																																		n.a.
Insufficient flow rate	< 3 l min water flow rate	Dehydration	Thirst																																		n.a.
Shutdown water supply	Uncontrolled water intake of calves	Water intoxication	Disease	n.a.			n.a.						n.a.	n.a.			n.a.																			n.a.	
Non-isolated cups/conduits/tank (cold temperature)	Freezing during cold temperature	Dehydration	Thirst																																	n.a.	
Insufficient tank capacity	Insufficient watering during the trip	Dehydration	Thirst																																		n.a.
Insufficient tank capacity	Insufficient watering during the trip	Heat stress	Thermal comfort																																		n.a.
Refilling facilities (adapters)	Impossibility to refill tanks during the trip	Dehydration	Thirst																																		n.a.
Refilling facilities (adapters)	Impossibility to refill tanks during the trip	heat stress	Thermal comfort																																		n.a.

Table 1. Hazards related to transport of cattle (cont.)

HAZARD	Hazard description	Adverse effect description	Adverse effect type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
				Heifers									Beef Cattle									Cows						Calves									
				RSA	RSB	RSN	RLA	RLB	RLN	SLA	SLN	PL	RSA	RSB	RSN	RLA	RLB	RLN	SLA	SLB	SLN	RSA	RSB	RSN	RLA	RLB	RLN	RSA	RSB	RSN	RLA	RLB	RLN	PLA			
b.) feeding																																					
Lack of appropriate feeding devices	No supply of feedstuff	Desnutrition, loss of body weight	Hunger	n.a.	n.a.	n.a.							n.a.	n.a.	n.a.								n.a.	n.a.	n.a.			n.a.	n.a.	n.a.							
Lack of appropriate feeding devices	No supply of feedstuff	Desnutrition, loss of body weight	Social behaviour	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.									n.a.	n.a.	n.a.			n.a.	n.a.	n.a.							
Lack of feeding stuff storage	No supply of feedstuff	Desnutrition, loss of body weight	Hunger	n.a.	n.a.	n.a.							n.a.	n.a.	n.a.								n.a.	n.a.	n.a.			n.a.	n.a.	n.a.							
Lack of feeding stuff storage	No supply of feedstuff	Desnutrition, loss of body weight	Social behaviour	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.									n.a.	n.a.	n.a.			n.a.	n.a.	n.a.							
Inappropriate position of storage	Contamination of feed stuff	Low/no appetite	Hunger	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.									n.a.	n.a.	n.a.			n.a.	n.a.	n.a.					n.a.		
Inappropriate position of storage	Contamination of feed stuff	Low/no appetite	Social behaviour	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.									n.a.	n.a.	n.a.			n.a.	n.a.	n.a.					n.a.		
Microclimate throughout transportation																																					
Ventilation																																					
Natural Ventilation total surface area opened	< min air exchange/distribution (rising T°, rising humidity, low air velocity, increase of noxi)	Heat stress, dyspnoeic, panting for	Disease		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Natural Ventilation total surface area opened	< min air exchange/distribution (rising T°, rising humidity, low air velocity, increase of noxi)	Heat stress	Thermal comfort		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Natural Ventilation total surface area opened	< min air exchange/distribution (rising T°, rising humidity, low air velocity, increase of noxi)	Heat stress	Thirst		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Natural Ventilation total surface area opened	< min air exchange/distribution (rising T°, rising humidity, low air velocity, increase of noxi)	Heat stress	Comfort around resting		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Natural/forced ventilation total surface area opened	> max air exchange/distribution (draught, decreasing T°, <lower critical T°, high air velocity)	Cold stress	Disease	n.a.		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.								
Natural/forced ventilation total surface area opened	> max air exchange/distribution (draught, decreasing T°, <lower critical T°, high air velocity)	Cold stress	Thermal comfort	n.a.		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.								
Natural/forced ventilation total surface area opened	> max air exchange/distribution (draught, decreasing T°, <lower critical T°, high air velocity)	Cold stress	Comfort around resting	n.a.		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.								
Inadequate natural/forced ventilation	Air contaminated with exhaust gases	Intoxication	Disease	n.a.		n.a.		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Inadequate forced ventilation	Lack of forced ventilation	Heat stress	Thirst		n.a.			n.a.				n.a.	n.a.										n.a.					n.a.							n.a.		
Inadequate forced ventilation	Lack of forced ventilation	Heat stress	Thermal comfort		n.a.			n.a.				n.a.	n.a.										n.a.					n.a.								n.a.	
Inadequate forced ventilation	Lack of forced ventilation	Heat stress	Disease		n.a.		n.a.					n.a.	n.a.										n.a.					n.a.								n.a.	
Inadequate forced ventilation	Lack of forced ventilation	Heat stress	Comfort around resting		n.a.							n.a.	n.a.										n.a.					n.a.								n.a.	
Inadequate forced ventilation	Max Ventilation rate lower than 60m3/h per 100 kg live weight	Heat stress	Thirst		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate forced ventilation	Max Ventilation rate lower than 60m3/h per 100 kg live weight	Heat stress	Thermal comfort		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate forced ventilation	Max Ventilation rate lower than 60m3/h per 100 kg live weight	Heat stress	Disease		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate forced ventilation	Max Ventilation rate lower than 60m3/h per 100 kg live weight	Heat stress	Comfort around resting		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate forced ventilation	Max Ventilation rate lowering about protection plates on fans	Heat stress	Thermal comfort		n.a.	n.a.						n.a.	n.a.		n.a.	n.a.							n.a.	n.a.				n.a.	n.a.							n.a.	
Inadequate forced ventilation	Max Ventilation rate lowering about protection plates on fans	Heat stress	Thermal comfort		n.a.	n.a.						n.a.	n.a.		n.a.	n.a.							n.a.	n.a.				n.a.	n.a.							n.a.	
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Heat stress	Thirst	n.a.	n.a.			n.a.					n.a.	n.a.									n.a.	n.a.				n.a.	n.a.								
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Heat stress	Thermal comfort	n.a.	n.a.								n.a.	n.a.									n.a.	n.a.				n.a.	n.a.								
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Heat stress	Disease	n.a.	n.a.		n.a.						n.a.	n.a.									n.a.	n.a.				n.a.	n.a.								
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Heat stress	Comfort around resting	n.a.	n.a.								n.a.	n.a.									n.a.	n.a.				n.a.	n.a.								
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Cold stress	Disease	n.a.			n.a.						n.a.			n.a.							n.a.			n.a.			n.a.				n.a.				
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Cold stress	Thermal comfort	n.a.			n.a.						n.a.			n.a.							n.a.			n.a.			n.a.				n.a.				
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Disease	n.a.	n.a.			n.a.					n.a.	n.a.									n.a.	n.a.				n.a.	n.a.								
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Comfort around resting	n.a.	n.a.								n.a.	n.a.									n.a.	n.a.				n.a.	n.a.								
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Thirst	n.a.	n.a.			n.a.					n.a.	n.a.									n.a.	n.a.				n.a.	n.a.								
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Thermal comfort	n.a.	n.a.								n.a.	n.a.									n.a.	n.a.				n.a.	n.a.								
Inadequate forced ventilation	Lack of alert system in the driver compartment	Cold stress	Disease	n.a.			n.a.						n.a.			n.a.							n.a.			n.a.			n.a.				n.a.				
Inadequate forced ventilation	Lack of alert system in the driver compartment	Cold stress	Thermal comfort	n.a.			n.a.						n.a.			n.a.							n.a.			n.a.			n.a.				n.a.				
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution in the vehicle)	Heat stress	Disease		n.a.			n.a.						n.a.										n.a.					n.a.								
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution in the vehicle)	Heat stress	Comfort around resting		n.a.									n.a.										n.a.					n.a.								
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution in the vehicle)	Heat stress	Thirst		n.a.			n.a.						n.a.										n.a.					n.a.								
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution in the vehicle)	Heat stress	Thermal comfort		n.a.									n.a.										n.a.					n.a.								
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution in the vehicle)	Cold stress/draught	Disease																																		
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution in the vehicle)	Cold stress/draught	Thermal comfort																																		

Table 1. Hazards related to transport of cattle (cont.)

HAZARD	Hazard description	Adverse effect description	Adverse effect type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
				Heifers									Beef Cattle									Cows						Calves									
				RSA	RSB	RSN	RLA	RLB	RLN	SLA	SLN	PL	RSA	RSB	RSN	RLA	RLB	RLN	SLA	SLB	SLN	RSA	RSB	RSN	RLA	RLB	RLN	RSA	RSB	RSN	RLA	RLB	RLN	PLA			
MANAGEMENT																																					
PREPARATION TO THE TRANSPORT																																					
a.) Fasting																																					
Fasting duration	> 12h fasting duration	Desnutrition, loss of body weight	Hunger																																		
Fasting duration	> 12h fasting duration	Aggression	Injuries																																		
Fasting duration	> 12h fasting duration	Aggression	Social behaviour																																		
b.) Feeding																																					
Feed quality	No adaption to feed stuff during transport	Desnutrition, loss of body weight	Hunger	n.a.	n.a.	n.a.																															
Feed quality	No adaption to feed stuff during transport	Desnutrition, loss of body weight	Social behaviour	n.a.	n.a.	n.a.																															
c.) Watering																																					
Water withdrawal	Lack of water up until loading	Dehydration	Thirst																																		
Water withdrawal	Lack of water up until loading	Heatstress, overheating	Thermal comfort																																		
d.) Management																																					
Lack of previous human contact	Inappropriate previous positive contacts with humans	Scape attempt	Human-animal relationship																																		
Lack of previous human contact	Inappropriate previous positive contacts with humans	Scape attempt	Injuries																																		
Lack of previous human contact	Inappropriate previous positive contacts with humans	Fear	Fear																																		
Selection of animals to transport	Poor fitness, poor health status prior to transport	Incapacity of animals to travel	Injuries																																		
Selection of animals to transport	Poor fitness, poor health status prior to transport	Incapacity of animals to travel	Disease																																		
Selection of animals to transport	Late state of pregnancy	Incapacity of animals to travel	Disease										n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.															
Selection of animals to transport	Milking cattle	Incapacity to milk	Pain	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.															
Cleanliness of vehicle	Uncleanliness of vehicle and insufficient disinfection	Disease spread, contamination, pa	Disease																																		
Inadequate planning of the transport	Stationary vehicle due to delay in traffic operation/ferry times, stops etc.	Heat stress, overheating	Thermal comfort																																		
Inadequate planning of the transport	Stationary vehicle due to delay in traffic operation/ferry times, stops etc.	Heat stress, overheating	Thirst																																		
Inadequate planning of the transport	Stationary vehicle due to delay in traffic operation/ferry times, stops etc.	Heat stress, overheating	Disease			n.a.																															
Inadequate planning of the transport	Stationary vehicle due to delay in traffic operation/ferry times, stops etc.	Lowering air quality (NH3)	Disease			n.a.																															
Inadequate planning of the transport	Stationary vehicle due to delay in traffic operation/ferry times, stops etc.	Disease spread, contamination, pa	Disease			n.a.																															
Inadequate planning of the transport	Stationary vehicle due to delay in traffic operation/ferry times, stops etc.	Desnutrition, loss of body weight, f	Hunger			n.a.																															
Inadequate planning of the transport	No planning of loading/unloading schedule	Heat stress, overheating	Thermal comfort																																		
Inadequate planning of the transport	Inappropriate plans for emergency (catering/killing)	Severe wounds, fractures	Injury			n.a.																															
Inadequate planning of the transport	Inappropriate plans for emergency (catering/killing)	Severe wounds, fractures	Disease																																		
Inadequate planning of the transport	Inadequate planning of the route (road conditions, traffic, stop+go, climate, duration)	Problems maintaining balance, str	Ease of movement																																		
Inadequate planning of the transport	Inadequate planning of the route (road conditions, traffic, stop+go, climate, duration)	Problems maintaining balance, str	Disease																																		
LOADING																																					
a.) Handling																																					
Handlers	Inappropriate handling (hitting, lack of motivation, shouting, inappropriate use of driving to	Bruising, wounds	Injuries																																		
Handlers	Inappropriate handling (hitting, lack of motivation, shouting, inappropriate use of driving to	Escape attempts, balking	Human-animal relationship																																		
Handlers	Inappropriate handling (hitting, lack of motivation, shouting, inappropriate use of driving to	Escape attempts, balking	Fear																																		
Handlers	Inappropriate use of driving tools (prods, electric goads, sticks)	Bruising, wounds	Injuries																																		
Handlers	Inappropriate use of driving tools (prods, electric goads, sticks)	Bruising, wounds	Pain																																		
Handlers	Too short loading time according to animals	Fatigue	Ease of movement																																		
Handlers	Too short loading time according to animals	Stress	Fear																																		
Handlers	Number of animals in the moving group too high	Balking	Human-animal relationship																																		
Handlers	Incorrect tethering	Falling, bruising, wounds	Injuries																																		
Composition of groups	Mixing unfamiliar animals	Aggression, bruising, wounds	Injuries																																		
Composition of groups	Mixing unfamiliar animals	Social stress	Fear																																		
Composition of groups	Mixing unfamiliar animals	Spreading of diseases	Disease																																		
Composition of groups	Separating familiar animals	Social stress	Fear																																		
Composition of groups	Mixing of animals of different size/age (10% differences)	Aggression, bruising, wounds	Injuries																																		
Composition of groups	Mixing of animals of different size/age (10% differences)	Social stress	Fear																																		
Composition of groups	Mixing horned/ unhorned animals	Bruising, wounds	Injuries																																		
Composition of groups	Mixing horned/ unhorned animals	Aggression	Social behaviour																																		

Table 1. Hazards related to transport of cattle (cont.)

HAZARD	Hazard description	Adverse effect description	Adverse effect type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
				Heifers									Beef Cattle									Cows						Calves									
				RSA	RSB	RSN	RLA	RLB	RLN	SLA	SLN	PL	RSA	RSB	RSN	RLA	RLB	RLN	SLA	SLB	SLN	RSA	RSB	RSN	RLA	RLB	RLN	RSA	RSB	RSN	RLA	RLB	RLN	PLA			
TRANSPORT																																					
Vehicle design																																					
a.) Bedding																																					
Inadequate Quality of bedding material	Type of bedding according to climate	Heat stress, cold stress	Thermal comfort																																		
Inadequate Quality of bedding material	Type of bedding according to climate	Heat stress, cold stress	Disease																																		
Inadequate Quality of bedding material	Type of bedding, high level of wetness, high level of dirt/dust	Dyspnoeic, panting for air	Disease																																		
Quantity of bedding material	Availability	Restless, fatigue	Comfort around resting																																		
Feeding and watering																																					
a.) Feeding																																					
Inadequate feed quality	Hazardous to health, less energie content, acceptability, nutrition not adjusted to demand	Desnutrition, loss of body weight, f	Hunger	n.a.	n.a.	n.a.							n.a.	n.a.	n.a.								n.a.	n.a.	n.a.												
Inadequate feed quantity	Less feed according to number of animal, inadequate energie content	Desnutrition, loss of body weight, f	Hunger	n.a.	n.a.	n.a.							n.a.	n.a.	n.a.								n.a.	n.a.	n.a.												
Inadequate feed quantity	Less feed according to number of animal, inadequate energie content	Fatigue	Ease of movement	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.	n.a.								n.a.	n.a.	n.a.												
Inadequate feed quantity	Less feed according to number of animal, inadequate energie content	Aggression	Social behaviour	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.	n.a.								n.a.	n.a.	n.a.												
Inadequate feed quantity	Less feed according to number of animal, inadequate energie content	Aggression	Injuries	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.	n.a.								n.a.	n.a.	n.a.												
Inadequate Feeding intervall	>8 h duration, intervall of application of feed according animal needs	Desnutrition, loss of body weight, f	Hunger	n.a.	n.a.	n.a.							n.a.	n.a.	n.a.								n.a.	n.a.	n.a.												
Inadequate Duration of feeding	<3 h duration, less feed intake because of short feeding duration	Desnutrition, loss of body weight, f	Hunger	n.a.	n.a.	n.a.							n.a.	n.a.	n.a.	n.a.							n.a.	n.a.	n.a.												
Inadequate Duration of feeding	<3 h duration, less feed intake because of short feeding duration	Aggression	Injuries	n.a.	n.a.	n.a.							n.a.	n.a.	n.a.	n.a.							n.a.	n.a.	n.a.												
b.) Watering																																					
Water supply	> 4h period between water applications	Dehydration, vocalising, restless	Thirst		n.a.																		n.a.														
Lack of training to use the drinking facilities	Different drinking facilities as in husbandry system	Dehydration	Thirst		n.a.																		n.a.														
Lack of training to use the drinking facilities	Different drinking facilities as in husbandry system	Heatstress, overheating	Thermal comfort		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.													n.a.	n.a.	n.a.												
Inadequate water quality	Unfamiliar taste/Different tasting water	Dehydration	Thirst		n.a.																		n.a.														
Inadequate water quality	Unfamiliar taste/Different tasting water	Heatstress, overheating	Thermal comfort		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.													n.a.	n.a.	n.a.												
Floor allowance, resting periods and driving skills																																					
a.) Stocking density																																					
Inadequate Stocking density according to animal size	>1.6 m2 stocking density (500 kg BW)	Aggression, bruising, wounds	Injuries										n.a.																								
Inadequate Stocking density according to animal size	>1.6 m2 stocking density (500 kg BW)	Aggression	Comfort around resting										n.a.																								
Inadequate Stocking density according to animal size	>1.6 m2 stocking density (500 kg BW)	Aggression	Thermal comfort										n.a.																								
Inadequate Stocking density according to animal size	>1.6 m2 stocking density (500 kg BW)	Lack of possibility to lie down/ to gr	Comfort around resting										n.a.																								
Inadequate Stocking density according to animal size	>1.6 m2 stocking density (500 kg BW)	Lack of possibility to lie down / star	Fear / Fatigue										n.a.																								
Inadequate Stocking density according to animal size	>1.6 m2 stocking density (500 kg BW)	Lack of possibility to feed	Hunger	n.a.	n.a.	n.a.							n.a.	n.a.	n.a.	n.a.																					
Inadequate Stocking density according to animal size	>1.6 m2 stocking density (500 kg BW)	Lack of possibility to drink	Thirst		n.a.	n.a.							n.a.	n.a.	n.a.																						
b.) Resting periods																																					
Multiple loading during the same trip	Mixing animals, multiple loading procedure	Aggression, bruising, wounds	Injuries									n.a.	n.a.	n.a.								n.a.	n.a.	n.a.											n.a.		
Multiple loading during the same trip	Mixing animals, multiple loading procedure	Fatigue, physical stress	Comfort around resting									n.a.	n.a.	n.a.								n.a.	n.a.	n.a.											n.a.		
Multiple loading during the same trip	Mixing animals, multiple loading procedure	Social stress	Fear									n.a.	n.a.	n.a.								n.a.	n.a.	n.a.											n.a.		
Multiple loading during the same trip	Mixing animals, multiple loading procedure	Spread disease	Disease									n.a.	n.a.	n.a.								n.a.	n.a.	n.a.											n.a.		
Inadequate resting time	<12 h	Inappropriate recovering from trans	Comfort around resting	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.											n.a.		
Inadequate resting time	<12 h	Lack of possibility to feed	Hunger	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.											n.a.		
Inadequate resting time	<12 h	Lack of possibility to drink	Thirst	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.											n.a.		
Resting station	Stocking density too high	Aggression, bruising, wounds	Injuries	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.											n.a.		
Resting station	Stocking density too high	Lack of possibility to lie down/ to gr	Comfort around resting	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.											n.a.		
Resting station	Inadequate feed quality	Desnutrition, loss of body weight, f	Hunger	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.											n.a.		
Resting station	Inadequate feed quantity	Desnutrition, loss of body weight, f	Hunger	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.											n.a.		
Resting station	Inadequate feed quantity	Fatigue	Ease of movement	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.											n.a.		
Resting station	Mixing animals	Aggression	Social behaviour	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.											n.a.		
Resting station	Mixing animals	Aggression	Injuries	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.	n.a.	n.a.						n.a.	n.a.	n.a.											n.a.		
c.) driving skills																																					
Driver	Rough driving, bad driving technique, swaying of vehicle	Problems maintaining balance, fall	Injuries									n.a.	n.a.	n.a.								n.a.	n.a.	n.a.											n.a.		
Driver	Rough driving, bad driving technique, swaying of vehicle	Physical stress	Ease of movement									n.a.	n.a.	n.a.								n.a.	n.a.	n.a.											n.a.		
Driver	Rough driving, bad driving technique, swaying of vehicle	Physical stress	Comfort around resting									n.a.	n.a.	n.a.								n.a.	n.a.	n.a.											n.a.		
Driver	Lack of monitoring during transport, lack of education/competence, untrained handlers, la	No feeding during transport	Hunger	n.a.	n.a.	n.a.							n.a.	n.a.																							
Driver	Lack of monitoring during transport, lack of education/competence, untrained handlers, la	Dehydration, heatstress	Thirst		n.a.	n.a.								n.a.																							
Driver	Lack of monitoring during transport, lack of education/competence, untrained handlers, la	Dehydration, heatstress, coldstress	Thermal discomfort																																		

Table 1. Hazards related to transport of cattle (cont.)

Scenarios	Animal categories	Species	Means of transport	Transport duration	Thermal environment
1	fish	salmon	road	short	above
2	fish	salmon	road	short	below
3	fish	salmon	road	short	neutral
4	fish	trouts	road	short	above
5	fish	trouts	road	short	below
6	fish	trouts	road	short	neutral
7	fish	eels	road	short	above
8	fish	eels	road	short	below
9	fish	eels	road	short	neutral
10	fish	catfish	road	short	above
11	fish	catfish	road	short	below
12	fish	catfish	road	short	neutral
13	fish	carps	road	short	above
14	fish	carps	road	short	below
15	fish	carps	road	short	neutral

Figure 2. Different transport scenarios in fish

HAZARD	Hazard description	Adverse effect description	Adverse effect type	1	2	3				4	5	6	7	8	9	10	11	12	13	14	15
				salmon						trout			eels			catfish			carps		
				RSA	RSB	RSN	ASA	ASB	ASN	SSA	RSA	RSB	RSN	RSA	RSB	RSN	RSA	RSB	RSN	RSA	RSB
FACILITIES and STRUCTURES																					
				road	road	road	air	air	air	sea											
LOADING/UNLOADING																					
				short	short	short	short	short	short	short											
				above	below	neutral	above	below	neutral	above											
a.) Installations																					
Inadequate pumping sytem	Aspiration pressure above	Skin, heath, eyes and fin lesions	Injuries							n.a											
Inadequate pumping sytem	Aspiration pressure below	Bruising, wounds, trapped animal	Injuries							n.a											
Inadequate pumping sytem	Pipe section below the average size	Skin lesion, wounds	Injuries							n.a											
Inadequate water flow speed		Skin, heath, eyes and fin lesions	Injuries							n.a											
b.) access hole																					
Inadequate hole design	Sharp edges	Bruising, skin and fin lesions, wounds	Injuries							n.a											
Insufficient width	Pipe section below the average size	Trapped animal, skin lesions	Injuries							n.a											
TRANSPORT																					
Vehicle design																					
a.) Container design																					
Inappropriate container design	Sharp protrusion, sharp edges	Skin lesions, wounds	Injuries																		
Inappropriate container design	Inadequate inspection facilities	Rising T°, hypoxia, toxicity	Disease																		
b.) Vehicle mantainance																					
Poor suspension	Excess of vibrations	Balance stress (lateral line)	Ease of movement				n.a	n.a	n.a	n.a											
Excessive pression in tyres of the vehicle	Excess of vibrations	Balance stress (lateral line)	Ease of movement				n.a	n.a	n.a	n.a											
Vehicle in bad condition	Excess of vibrations	Balance stress (lateral line)	Ease of movement				n.a	n.a	n.a	n.a											
Microclimate during transport																					
a.) water temperature																					
Inadequate water temperature	Lack of a temperature monitoring system	Rising T°	Thermal comfort	n.a		n.a	n.a	n.a	n.a	n.a		n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	
Inadequate water temperature	Failure of cooling system	Rising T°	Thermal comfort	n.a		n.a	n.a	n.a	n.a	n.a		n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	
Inadequate water temperature	Temperature above maximum (according to categorie)	Rising T°	Thermal comfort		n.a	n.a		n.a	n.a	n.a		n.a	n.a		n.a	n.a		n.a	n.a	n.a	
Inadequate water temperature	Temperature below minimum (according to categorie)	Fallen T°	Thermal comfort	n.a		n.a	n.a		n.a	n.a		n.a	n.a		n.a	n.a		n.a	n.a	n.a	
Inadequate water temperature	Sudden change of T°		Thermal comfort			n.a			n.a	n.a		n.a	n.a		n.a	n.a		n.a	n.a	n.a	
b.) water quality																					
Oxygen level of water too high (according to categorie)	Failure in the oxigen delivery system	Hypoxia, unconsciousness, death	Disease							n.a											
Oxygen level of water too high (according to categorie)	Lack of a oxygen level monitoring system	Hypoxia, unconsciousness, death	Disease							n.a											
Oxygen level of water too high (according to categorie)	Super saturation	Gas bubble disease	Disease							n.a											
CO2 level of water too high (according to categorie)	Decrease in gas exchange	Hypoxia, foam from fish mucos	Disease							n.a											
Saturation of water	Super saturation	Gas bubble disease	Disease							n.a											
NH3 level of water too high	Higher than maximum mg/l (according to categorie)	Acute toxicity	Disease							n.a											
Nitrite level of water too high	Higher than maximum mg/l (according to categorie)	Acute toxicity	Disease							n.a											
Aluminium contamination of water	pH reduction	Acute toxicity	Disease							n.a											
Other metals contamination of water		Chronic toxicity	Disease							n.a											
Inadequate water exchange	Raccomanded minimum /min/kg biomass (according to categorie)	Acute toxicity	Disease							n.a											
Inadequate areation system	Not sufficient	Acute toxicity	Disease							n.a											

Table 2. Hazards related to transport of fish

HAZARD	Hazard description	Adverse effect description	Adverse effect type	1	2	3	salmon			trout			eels			catfish			
				RSA	RSB	RSN	ASA	ASB	ASN	SSA	RSA	RSB	RSN	RSA	RSB	RSN	RSA	RSB	RSN
MANAGEMENT																			
HANDLING																			
Lack of previous interaction with humans	Animals inappropriate reactions to handling procedures	Aversion	Fear																
Untrained personal	Rough handling	Bruising, skin and fin lesions, wounds	Injuries																
Untrained personal	Crowding	Intra specific aggression, fin lesion	Injuries																
PREPARATION FOR TRANSPORT																			
a.) Preparation																			
Inadequate cleaning and disinfection of transport vehicles	Transport vehicles contaminated with pathogen agents or contaminants	Spread of disease	Disease							n.a.									
Inappropriate selection of animals to transport	Poor fitness, poor health status prior to transport	Spread of disease	Disease																
b.) Inappropriate fasting																			
Inappropriate fasting	Fasting too short (according to categorie)	Rising toxic catabolites	Disease							n.a.									
Inappropriate fasting	Fasting period too long (according to categorie)	Hunger, intra specific aggression	Hunger							n.a.									
c.) Inappropriate planning of the transport																			
Inappropriate planning of the transport	Selection of a inadequate vehicle for the transport conditions	Thermal comfort, lack of a oxygen level monitoring system, rising toxic catabolites	Disease							n.a.									
Inappropriate planning of the transport	Stationary vehicle due to delay in traffic operation/ferry times	Thermal comfort, lack of a oxygen level monitoring system, rising toxic catabolites	Disease				n.a.	n.a.	n.a.	n.a.									
Inappropriate planning of the transport	Stops for inspection/BIP's/Customs	Thermal comfort, lack of a oxygen level monitoring system, rising toxic catabolites	Disease				n.a.	n.a.	n.a.	n.a.									
Inappropriate planning of the transport	Inappropriate planning of loading/unloading hour	Thermal comfort, lack of a oxygen level monitoring system, rising toxic catabolites	Disease				n.a.	n.a.	n.a.	n.a.									
Inappropriate planning of the transport	Inappropriate emergency plan	Thermal comfort, lack of a oxygen level monitoring system, rising toxic catabolites	Disease							n.a.									
Inappropriate planning of the transport	Inadequate planning of the route (road conditions, climate, duration)	Thermal comfort, lack of a oxygen level monitoring system, rising toxic catabolites	Disease							n.a.									
Inappropriate planning of the transport	Delay for the animals to be unloaded	Thermal comfort, lack of a oxygen level monitoring system, rising toxic catabolites	Disease				n.a.	n.a.	n.a.	n.a.									
LOADING																			
Inappropriate handling	Unproperly operated pumps and pips (too high water pressure)	Skin lesions, fatigue, muscular stress	Injuries							n.a.									
Inappropriate handling	Unproperly operated nets (too crowded)	Skin lesions, fatigue, muscular stress	Injuries																
Inappropriate composition of groups	Mixing unfamiliar animals	Intra specific aggression, fin lesion	Injuries																
Inappropriate composition of groups	Mixing animals of different incompatible sizes and species	Intra specific aggression, fin lesion	Injuries																
TRANSPORT																			
a.) Stocking density																			
Stocking density	> max stocking density	lesion, rising toxic catabolites	Injuries																
b.) Handling methods and driving																			
Driver	Rough driving, bad driving technique	Balance stress (lateral line)	Ease of movement				n.a.	n.a.	n.a.	n.a.									
Driver	Swaying of vehicle	Balance stress (lateral line)	Ease of movement				n.a.	n.a.	n.a.	n.a.									
Driver	Lack of monitoring during transport	Balance stress (lateral line)	Ease of movement				n.a.	n.a.	n.a.	n.a.									
Driver	Lack of education/competence	Thermal comfort, lack of a oxygen level monitoring system, rising toxic catabolites	Disease				n.a.	n.a.	n.a.	n.a.									
Driver	Lack of motivation	Thermal comfort, lack of a oxygen level monitoring system, rising toxic catabolites	Disease				n.a.	n.a.	n.a.	n.a.									
Driver	Disregarding temperature measurement	Thermal comfort, lack of a oxygen level monitoring system, rising toxic catabolites	Disease				n.a.	n.a.	n.a.	n.a.									
UNLOADING																			
Inappropriate handling	Unproperly operated pumps and pips (too high water pressure)	skin lesions, fatigue, muscular stress	Injuries							n.a.									
Inappropriate handling	Unproperly operated nets (too crowded)	skin lesions, fatigue, muscular stress	Injuries							n.a.									

Table 2. Hazards related to transport of fish (cont.)

Scenarios	Species	Animal categories	Means of transport	Transport duration	Thermal environment
1	equine	broken	road	short	above
2	equine	broken	road	short	below
3	equine	broken	road	short	neutral
4	equine	broken	road	long	above
5	equine	broken	road	long	below
6	equine	broken	road	long	neutral
7	equine	broken	sea	long	above
8	equine	broken	sea	long	below
9	equine	broken	sea	long	neutral
10	equine	unbroken	road	short	above
11	equine	unbroken	road	short	below
12	equine	unbroken	road	short	neutral
13	equine	unbroken	road	long	above
14	equine	unbroken	road	long	below
15	equine	unbroken	road	long	neutral
16	equine	unbroken	sea	long	above
17	equine	unbroken	sea	long	below
18	equine	unbroken	sea	long	neutral
19	equine	mares with foals	road	short	above
20	equine	mares with foals	road	short	below
21	equine	mares with foals	road	short	neutral
22	equine	stallions	road	short	above
23	equine	stallions	road	short	below
24	equine	stallions	road	short	neutral
25	equine	stallions	road	long	above
26	equine	stallions	road	long	below
27	equine	stallions	road	long	neutral
28	equine	stallions	sea	long	above
29	equine	stallions	sea	long	below
30	equine	stallions	sea	long	neutral

Figure 3. Different transport scenarios in horses

HAZARD	Hazard description	Adverse effect description	Adverse effect type
FACILITIES and STRUCTURES			
LOADING / UNLOADING			
a.) Driveway			
Inadequate driveway design	< minimum width (according to category)	Bruising, wounds	Injuries
Inadequate driveway design	< minimum width (according to category)	Balking	Human-animal relationship
Inadequate driveway design	Continuity of race (dead ends)	difficult movement, balking	Human-animal relationship
Inadequate structure of driveway sides	Sharp protrusions, sharp angles, open sides, short sides	Bruising, wounds	Injuries
Inadequate floor surface of driveways	Slippery	Bruising, wounds, fractures, ruptures	Injuries
Inadequate floor surface of driveways	Slippery	Difficult movement	Ease of movement
Inadequate floor surface	Slippery	Reluctant to move	Fear
Inadequate floor condition of driveways	Gaps, potholes, steps	Bruising, wounds, fractures	Injuries
Inadequate floor condition of driveways	Gaps, potholes, steps	Difficult movement	Ease of movement
Steps	> maximum height and/or <minmum tread lenght	Bruising, wounds, fractures	Injuries
Steps	> maximum height and/or <minmum tread lenght	Difficult movement	Ease of movement
b.) Gates			
Inadequate gate design	Sharp edges, sharp protrusion, sharp projections	Bruising, wounds	Injuries
Inadequate gate design	< minimum width (according to category)	Bruising, wounds	Injuries
Inadequate gate design	< minimum width (according to category)	Need of human intervention to move animals	Human-animal relationship
c.) Ramp			
Inadequate ramp design	Too steep up/down (according to category)	Bruising, wounds, fractures	Injuries
Inadequate ramp design	Too steep up/down (according to category)	Balking	Fear
Inadequate ramp design	Too steep up/down (according to category)	Need of human intervention to move animals	Human-animal relationship
Inadequate ramp design	< minimum width (according to category)	Bruising, wounds	Injuries
Inadequate ramp design	< minimum width (according to category)	Need of human intervention to move animals	Human-animal relationship
Inadequate structure of sides	Sharp protrusion, sharp projections, sharp angles, open sides	Bruising, wounds	Injuries
Inadequate structure of sides	<minimum height	Bruising, wounds	Injuries
Inadequate floor surface of ramps	Slippery	Bruising, wounds	Injuries
Inadequate floor surface of ramps	Slippery	Difficult movement	Ease of movement
Inadequate floor surface of ramps	Slippery	Difficult movement	Fear
Inadequate floor condition of ramps	Gaps, potholes, steps	Bruising, wounds, fractures	Injuries
Inadequate floor condition of ramps	Gaps, potholes, steps	Balking	Fear
Inadequate cleat ramps	> maximum inter-cleat distance, missing cleat, inadequate dir	Bruising, wounds, fractures	Injuries
Inadequate cleat ramps	> maximum inter-cleat distance, missing cleat, inadequate dir	Difficult movement	Ease of movement
Inadequate cleat ramps	> maximum inter-cleat distance, missing cleat, inadequate dir	Difficult movement	Fear
Steps between ground and ramp and loading decks	> maximum height (according to category)	Bruising, wounds	Injuries
Steps between ground and ramp and loading decks	> maximum height (according to category)	Balking	Fear
d.) Container			
Inadequate container sidewall design	Sharp protrusion, sharp edges, grate (causes trapping extrem	Bruising, wounds, fractures	Injuries
Inadequate container sidewall design	< minimum height (according to category)	Bruising, wounds	Injuries
Inadequate container sidewall design	Not solid	Bruising, wounds	Injuries
Inadequate container sidewall design	Closed at the top (disturbs airflow)	Disturbed Thermoregulation	Thermal comfort
Inadequate container roof design	Gaps, holes, protrusions, projections	Bruising, wounds	Injuries
e.) Sensory input (Sound Light)			
Light	Poor lighting, shadows, sudden change of light, glaring light, g	Balking/Disorientation	Fear
Noise	Hissing noise	Balking/Disorientation	Fear
Smell	Unfamiliar smell	Balking/Disorientation	Fear
Drafts	Air blowing to animal	Balking/Disorientation	Fear
TRANSPORT			
Vehicle / Container design			
a.) Floors			
Floor surface	Slippery	Bruising, wounds, fractures	Injuries
Floor surface	Slippery	Problems maintining balance, struggling, falling	Ease of movement
Floor surface	Slippery	Problems maintining balance, struggling, falling	Fear
Floor condition	Gaps, potholes, steps, slopings	Bruising, wounds, fractures	Injuries
Floor condition	Gaps, potholes, steps, slopings	Difficult movement	Ease of movement
Floor condition	Lack of bedding	Cold stress	Thermal discomfort
Floor condition	Lack of bedding	Bruising, wounds	Comfort around resting
b.) Partitions			
Unsuitable design	Sharp protrusion, sharp edges, grate (causes trapping extrem	Bruising, wounds, fractures	Injuries
Unsuitable design	< minimum height (according to category)	Bruising, wounds	Injuries
Unsuitable design	Not solid	Bruising, wounds	Injuries
Unsuitable design	Closed at the top (disturbs airflow)	Disturbed Thermoregulation	Thermal comfort
Absence of partions	No partitions, open sides between adjacent pens	Bruising, wounds	Injuries
Absence of partions	No partitions, open sides between adjacent pens	Aggression	Social behaviour

Table 3. Hazards related to transport of horses

HAZARD	Hazard description	Adverse effect description	Adverse effect type
c.) Roof			
Roof colour	No reflecting bright colour	Heatstress, overheating	Thermal comfort
Roof colour	No reflecting bright colour	Heatstress, overheating	Thirst
Roof condition	Gaps, holes, protrusions, projections	Soaked animals	Comfort around resting
Roof condition	Gaps, holes, protrusions, projections	Soaked animals	Thermal comfort
Roof condition	Gaps, holes, protrusions, projections	Bruising, wounds	Injuries
Roof condition	Gaps, holes, protrusions, projections	solar radiation	Thermal comfort
Unsuitable insulation	Solar gain heat	Heatstress, overheating	Thermal comfort
Unsuitable insulation	Solar gain heat	Heatstress, overheating	Thirst
Unsuitable insulation	Condence water	Soaked animals	Comfort around resting
Unsuitable insulation	Condence water	Soaked animals	Thermal comfort
Unsuitable insulation	Condence water/air draught	Soaked animals	Disease
d.) Sensory input (Sound Smell Light)			
Noise	Overall noise	Aversion	Fear
Light	Sudden change of light (tunnels), poor lighting, glaring lights	Aversion	Fear
Smell	Unfamiliar smell	Aversion	Fear
e.) Space allowance/Tier height			
Deck height	< minimum height above withers (according to category)	Heatstress, overheating	Thermal comfort
Deck height	< minimum height above withers (according to category)	Blocked air exchange	Disease
Deck height	< minimum height above withers (according to category)	Bruising, wounds	Injuries
Deck height	< minimum height above withers (according to category)	Inability to express natural behaviour	Ease of movement
f.) Suspension			
Poor suspension	Vibration, acceleration	Travel sickness	Disease
Poor suspension	Vibration, acceleration	Struggling, loss of balance, falling, fatigue, restless	Ease of movement
Poor suspension	Vibration, acceleration	Struggling, loss of balance, falling, fatigue, restless	Injuries
g.) Inspection possibilities			
Inspection opening	<min size, < min deck height, inadequate access	Heat stress, cold stress, panting for air, dehydration	Thermal comfort
Inspection opening	<min size, < min deck height, inadequate access	Bruising, wounds, fractures	Injuries
Feeding and watering			
a.) Watering			
Lack of drinking facilities	No supply of water	Dehydration	Thirst
Lack of drinking facilities	No supply of water	Heat stress	Thermal comfort
Inappropriate drinking facilities	Facilities not adjusted to equine, no open water expanse, < m	Dehydration	Thirst
Inappropriate drinking facilities	Facilities not adjusted to equine, no open water expanse, < m	Heat stress	Thermal comfort
Quantity of watering cups	Insufficient numbers of watering cups	Dehydration	Thirst
Position of drinkers	Inadequate position in the vehicle/pen	Dehydration	Thirst
Position of drinkers	Inadequate position in the vehicle/pen	Heat stress	Thermal comfort
Non-isolated cups/conduits/tank (cold temperature)	Freezing during cold temperature	Dehydration	Thirst
Insufficient tank capacity	Insufficient watering during the trip	Dehydration	Thirst
Insufficient tank capacity	Insufficient watering during the trip	Heat stress	Thermal comfort
Refilling facilities (adapters)	Impossibility to refill tanks during the trip	Dehydration	Thirst
Refilling facilities (adapters)	Impossibility to refill tanks during the trip	Heat stress	Thermal comfort
b.) feeding			
Lack of appropriate feeding devices	No supply of feedstuff	Desnutrition, loss of body weight	Hunger
Lack of appropriate feeding devices	No supply of feedstuff	Desnutrition, loss of body weight	Social behaviour
Lack of feeding stuff storage	No supply of feedstuff	Desnutrition, loss of body weight	Hunger
Lack of feeding stuff storage	No supply of feedstuff	Desnutrition, loss of body weight	Social behaviour
Inappropriate position of storage	Contamination of feed stuff	Low/no appetite	Hunger
Inappropriate position of storage	Contamination of feed stuff	Low/no appetite	Social behaviour

Table 3. Hazards related to transport of horses (cont.)

HAZARD	Hazard description	Adverse effect description	Adverse effect type
Microclimate throughout transportation			
Ventilation			
Inadequate natural ventilation	< min air exchange/distribution (rising T°, rising humidity, low	Heat stress, dyspnoeic, panting for air	Disease
Inadequate natural ventilation	< min air exchange/distribution (rising T°, rising humidity, low	Heat stress	Thermal comfort
Inadequate natural ventilation	< min air exchange/distribution (rising T°, rising humidity, low	Heat stress	Thirst
Inadequate natural ventilation	< min air exchange/distribution (rising T°, rising humidity, low	Heat stress	Comfort around resting
Inadequate natural ventilation	> max air exchange/distribution (draught, decreasing T°, <low	cold stress	Disease
Inadequate natural ventilation	> max air exchange/distribution (draught, decreasing T°, <low	cold stress	Thermal comfort
Inadequate natural ventilation	> max air exchange/distribution (draught, decreasing T°, <low	cold stress	Comfort around resting
Inadequate forced ventilation	Lack of forced ventilation	Heat stress	Thirst
Inadequate forced ventilation	Lack of forced ventilation	Heat stress	Thermal comfort
Inadequate forced ventilation	Lack of forced ventilation	Heat stress	Disease
Inadequate forced ventilation	Lack of forced ventilation	Heat stress	Comfort around resting
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Heat stress	Thirst
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Heat stress	Thermal comfort
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Heat stress	Disease
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Heat stress	Comfort around resting
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Cold stress	Disease
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Cold stress	Thermal comfort
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Disease
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Comfort around resting
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Thirst
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Thermal comfort
Inadequate forced ventilation	Lack of alert system in the driver compartment	Cold stress	Disease
Inadequate forced ventilation	Lack of alert system in the driver compartment	Cold stress	Thermal comfort
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution	Heat stress	Disease
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution	Heat stress	Comfort around resting
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution	Heat stress	Thirst
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution	Heat stress	Thermal comfort
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution	Cold stress/draught	Disease
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution	Cold stress/draught	Thermal comfort
MANAGEMENT			
PREPARATION TO THE TRANSPORT			
a.) Fasting			
Fasting duration	> maximum fasting duration	Desnutrition, loss of body weight	Hunger
Fasting duration	> maximum fasting duration	Aggression	Injuries
Fasting duration	> maximum fasting duration	Aggression	Social behaviour
b.) Feeding			
Feed quality	No adaption to feed stuff during transport	Desnutrition, loss of body weight	Hunger
Feed quality	No adaption to feed stuff during transport	Desnutrition, loss of body weight	Social behaviour
c.) Watering			
Water withdrawal	Lack of water up until loading	Dehydration	Thirst
Water withdrawal	Lack of water up until loading	Heatstress, overheating	Thermal comfort
d.) Management			
Lack of previous human contact	Inappropriate previous positive contacts with humans	Scape attempt	Human-animal relationship
Lack of previous human contact	Inappropriate previous positive contacts with humans	Scape attempt	Injuries
Lack of previous human contact	Inappropriate previous positive contacts with humans	Fear	Fear
Selection of animals to transport	Poor fitness, poor health status prior to transport	Incapacity of animals to travel	Injuries
Selection of animals to transport	Poor fitness, poor health status prior to transport	Incapacity of animals to travel	Disease
Selection of animals to transport	Late state of pregnancy	Incapacity of animals to travel	Disease
Cleanliness of vehicle	Uncleanliness of vehicle and insufficient disinfection	Disease spread, contamination, pathogens	Disease
Inadequate planning of the transport	Stationary vehicle due to delay in traffic operation/ferry times,	Heat stress, overheating	Thermal comfort
Inadequate planning of the transport	Stationary vehicle due to delay in traffic operation/ferry times,	Heat stress, overheating	Thirst
Inadequate planning of the transport	Stationary vehicle due to delay in traffic operation/ferry times,	Heat stress, overheating	Disease
Inadequate planning of the transport	Stationary vehicle due to delay in traffic operation/ferry times,	Lowering air quality (NH3)	Disease
Inadequate planning of the transport	Stationary vehicle due to delay in traffic operation/ferry times,	Disease spread, contamination, pathogens	Disease
Inadequate planning of the transport	Stationary vehicle due to delay in traffic operation/ferry times,	Desnutrition, loss of body weight, foraging, restless, vocalis	Hunger
Inadequate planning of the transport	No planning of loading/unloading schedule	Heat stress, overheating	Thermal comfort
Inadequate planning of the transport	Inappropriate plans for emergency (catering/killing)	Severe wounds, fractures	Injury
Inadequate planning of the transport	Inappropriate plans for emergency (catering/killing)	Severe wounds, fractures	Disease
Inadequate planning of the transport	Inadequate planning of the route (road conditions, traffic, stop	Problems maintaining balance, struggling, restless	Ease of movement
Inadequate planning of the transport	Inadequate planning of the route (road conditions, traffic, stop	Problems maintaining balance, struggling, restless	Disease

Table 2. Hazards related to transport of horses (cont.)

HAZARD	Hazard description	Adverse effect description	Adverse effect type
LOADING			
a.) Handling			
Handlers	Inappropriate handling (hitting, lack of motivation, shouting)	Bruising, wounds	Injuries
Handlers	Inappropriate handling (hitting, lack of motivation, shouting)	Escape attempts, balking	Human-animal relationship
Handlers	Inappropriate handling (hitting, lack of motivation, shouting)	Escape attempts, balking	Fear
Handlers	Too short loading time according to animals	Fatigue	Ease of movement
Handlers	Too short loading time according to animals	Stress	Fear
Handlers	Number of animals in the moving group too high	Balking	Human-animal relationship
Handlers	Incorrect tethering	Falling, bruising, wounds	Injuries
Composition of groups	Mixing unfamiliar animals	Agression, bruising, wounds	Injuries
Composition of groups	Mixing unfamiliar animals	Social stress	Fear
Composition of groups	Mixing unfamiliar animals	Spreading of diseases	Disease
Composition of groups	Separating familiar animals	Social stress	Fear
Composition of groups	Mixing of animals of different size/age (10% differences)	Agression, bruising, wounds	Injuries
Composition of groups	Mixing of animals of different size/age (10% differences)	Social stress	Fear
TRANSPORT			
Vehicle design			
a.) Bedding			
Inadequate quality of bedding material	Type of bedding according to climate	Heat stress, cold stress	Thermal comfort
Inadequate quality of bedding material	Type of bedding according to climate	Heat stress, cold stress	Disease
Inadequate quality of bedding material	Type of bedding, high level of wetness, high level of dirt/dust	Dyspnoeic, panting for air	Disease
Lack of bedding material	Absence of bedding material	Falling, bruising, wounds	Injuries
Quantity of bedding material	Availability	Restless, fatigue	Comfort around resting
Feeding and watering			
a.) Feeding			
Inadequate feed quality	Hazardous to health, less energie content, acceptability, nutrit	Desnutrition, loss of body weight, foraging, restless, vocalis	Hunger
Inadequate feed quantity	Less feed according to number of animal, inadequate energie	Desnutrition, loss of body weight, foraging, restless, vocalis	Hunger
Inadequate feed quantity	Less feed according to number of animal, inadequate energie	Fatigue	Ease of movement
Inadequate feed quantity	Less feed according to number of animal, inadequate energie	Aggression	Social behaviour
Inadequate feed quantity	Less feed according to number of animal, inadequate energie	Aggression	Injuries
Inadequate feeding intervall	intervall of feed application too long (according animal needs)	Desnutrition, loss of body weight, foraging, restless, vocalis	Hunger
Inadequate duration of feeding	Too short feeding duration	Desnutrition, loss of body weight, foraging, restless, vocalis	Hunger
Inadequate duration of feeding	Too short feeding duration	Aggression	Injuries
b.) Watering			
Water supply	too long period between water applications	Dehydration, vocalising, restless	Thirst
Lack of training to use the drinking facilities	Different drinking facilities as in husbandry system	Dehydration	Thirst
Lack of training to use the drinking facilities	Different drinking facilities as in husbandry system	Heatstress, overheating	Thermal comfort
Inadequate water quality	Unfamiliar taste/different tasting water	Dehydration	Thirst
Inadequate water quality	Unfamiliar taste/different tasting water	Heatstress, overheating	Thermal comfort
Floor allowance, resting periods and driving skills			
a.) Stocking density			
inadequate stocking density	Stocking density too high (according to category)	Aggression, bruising, wounds	Injuries
inadequate stocking density	Stocking density too high (according to category)	Heatstress, overheating	Thermal comfort
inadequate stocking density	Stocking density too high (according to category)	Lack of possibility to lie down/ to groom, lack of exercise	Comfort around resting
inadequate stocking density	Stocking density too high (according to category)	Lack of possibility to lie down / stand up, fatigue	Fear
inadequate stocking density	Stocking density too high (according to category)	Lack of possibility to feed	Hunger
inadequate stocking density	Stocking density too high (according to category)	Lack of possibility to drink	Thirst
b.) Resting periods			
Multiple loading during the same trip	Mixing animals, multiple loading procedure	Agression, bruising, wounds	Injuries
Multiple loading during the same trip	Mixing animals, multiple loading procedure	Fatigue, physical stress	Comfort around resting
Multiple loading during the same trip	Mixing animals, multiple loading procedure	Social stress	Fear
Multiple loading during the same trip	Mixing animals, multiple loading procedure	Spread disease	Disease
Inadequate resting time	<12 h	Inappropriate recovering from transport	Comfort around resting
Inadequate resting time	<12 h	Lack of possibility to feed	Hunger
Inadequate resting time	<12 h	Lack of possibility to drink	Thirst
Resting station	Stocking density too high	Aggression, bruising, wounds	Injuries
Resting station	Stocking density too high	Lack of possibility to lie down/ to groom, lack of exercise	Comfort around resting
Resting station	Inadequate feed quality	Desnutrition, loss of body weight, foraging, restless, vocalis	Hunger
Resting station	Inadequate feed quantity	Desnutrition, loss of body weight, foraging, restless, vocalis	Hunger
Resting station	Inadequate feed quantity	Fatigue	Ease of movement
Resting station	Mixing animals	Aggression	Social behaviour
Resting station	Mixing animals	Aggression	Injuries
c.) driving skills			
Driver	Rough driving, bad driving technique, swaying of vehicle	Problems maintaining balance, falling, bruising, wounds	Injuries
Driver	Rough driving, bad driving technique, swaying of vehicle	Physical stress	Ease of movement
Driver	Rough driving, bad driving technique, swaying of vehicle	Physical stress	Comfort around resting
Driver	Lack of monitoring during transport, lack of education/compet	No feeding during transport	Hunger
Driver	Lack of monitoring during transport, lack of education/compet	Dehydration, heatstress	Thirst
Driver	Lack of monitoring during transport, lack of education/compet	Dehydration, heatstress, coldstress, dyspnoeic	Thermal discomfort

Table 3. Hazards relate to transport of horses (cont.)

Scenarios	Species	Animal categories	Means of transport	Transport duration	Thermal environment
1	pigs	piglets	road	short	above
2	pigs	piglets	road	short	below
3	pigs	piglets	road	short	neutral
4	pigs	piglets	road	long	above
5	pigs	piglets	road	long	below
6	pigs	piglets	road	long	neutral
7	pigs	slaughter	road	short	above
8	pigs	slaughter	road	short	below
9	pigs	slaughter	road	short	neutral
10	pigs	slaughter	road	long	above
11	pigs	slaughter	road	long	below
12	pigs	slaughter	road	long	neutral
13	pigs	breeding	road	short	above
14	pigs	breeding	road	short	below
15	pigs	breeding	road	short	neutral
16	pigs	breeding	road	long	above
17	pigs	breeding	road	long	below
18	pigs	breeding	road	long	neutral

Figure 3. Different transport scenarios in pigs

HAZARD	Hazard description	Adverse effect description	Adverse effect type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
				Piglets						Slaughter pigs						Breeding pigs					
				RSA	RSB	RSN	RLA	RLB	RLN	RSA	RSB	RSN	RLA	RLB	RLN	RSA	RSB	RSN	RLA	RLB	RLN
FACILITIES and STRUCTURES																					
LOADING / UNLOADING																					
a.) Driveway																					
Inadequate driveway design	Too long (> max length according to different animal categories)	Fatigue	Ease of movement																		
Inadequate driveway design	Too narrow (< min width according to different animal categories)	Bruising, wounds	Injuries																		
Inadequate driveway design	Too narrow (< min width according to different animal categories)	Difficult movement, balking animals	Human-animal relationship																		
Inadequate driveway design	Continuity of race (dead ends)	Difficult movement	Ease of movement																		
Inadequate driveway design	Continuity of race (dead ends)	Difficult movement	Human-animal relationship																		
Inadequate structure of sides	Sharp protrusions, sharp angles, open sides, short sides	Bruising, wounds	Injuries																		
Inadequate floor surface	Slippery	Bruising, wounds	Injuries																		
Inadequate floor surface	Slippery	Difficult movement	Ease of movement																		
Inadequate floor surface	Slippery	Reluctant to move	Fear																		
Inadequate floor condition	Gaps, potholes, steps	Bruising, wounds, fractures	Injuries																		
Inadequate floor condition	Gaps, potholes, steps	Difficult movement	Ease of movement																		
Inadequate floor condition	Gaps, potholes, steps	Need of Difficult movement, balking animals	Human-animal relationship																		
b.) Ramp																					
Inadequate ramp design	Too steep up/down (> max slope according to different animal categories)	Bruising, wounds, fractures	Injuries																		
Inadequate ramp design	Too steep up/down (> max slope according to different animal categories)	Difficult movement	Ease of movement																		
Inadequate ramp design	Too steep up/down (> max slope according to different animal categories)	Reluctant to move	Fear																		
Inadequate ramp design	Too narrow (< min width according to different animal categories)	Bruising, wounds	Injuries																		
Inadequate ramp design	Too narrow (< min width according to different animal categories)	Need of Difficult movement, balking animals	Human-animal relationship																		
Inadequate structure of sides	Sharp protrusions, sharp angles, open sides, short sides	Bruising, wounds	Injuries																		
Inadequate floor surface	Slippery	Bruising, wounds, fractures	Injuries																		
Inadequate floor surface	Slippery	Difficult movement	Ease of movement																		
Inadequate floor surface	Slippery	Reluctant to move	Fear																		
Inadequate floor condition	Gaps, potholes, steps	Bruising, wounds, fractures	Injuries																		
Inadequate floor condition	Gaps, potholes, steps	Difficult movement	Ease of movement																		
Inadequate floor condition	Gaps, potholes, steps	Need of Difficult movement, balking animals	Human-animal relationship																		
Inadequate cleat ramps	Inter-cleat distance > max distance on centers according to different animal categories, missing cleat	Bruising, wounds, fractures	Injuries																		
Inadequate cleat ramps	Inter-cleat distance > max distance on centers according to different animal categories, missing cleat	Difficult movement	Ease of movement																		
Inadequate stairsteps	Stairsteps > max height and > max length according to different animal categories	Bruising, wounds, fractures	Injuries																		
Inadequate stairsteps	Stairsteps > max height and > max length according to different animal categories	Difficult movement	Ease of movement																		
c.) Lift																					
Inadequate floor surface	Slippery	Bruising, wounds, fractures	Injuries																		
Inadequate floor surface	Slippery	Reluctant to move	Fear																		
Inadequate floor condition	Gaps, potholes, steps	Bruising, wounds, fractures	Injuries																		
Inadequate floor condition	Gaps, potholes, steps	Reluctant to move	Fear																		
Inadequate structure of sides	Sharp protrusions, sharp angles, open sides, short sides (<75cm)	Bruising, wounds	Injuries																		
d.) Sensory input (Sound Smell Light)																					
Inadequate lighting	Blinding light, shadows, sudden change of light, glaring objects	Disorientation	Fear																		
Inadequate overall noise	High intensity sounds	Disorientation	Fear																		
Inadequate overall noise	High frequency sounds	Disorientation	Fear																		
Unfamiliar smell	Unfamiliar smell	Disorientation, aversion	Fear																		
Drafts blowing towards animals	Air blowing in their faces	Disorientation	Fear																		
e.) Gate																					
Inadequate gate design	< min width according to different animal categories	Bruising, wounds	Injuries	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.												
Inadequate gate design	< min width according to different animal categories	Need of Difficult movement, balking animals	Human-animal relationship	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.												
Inadequate gate design	< min height according to different animal categories	Bruising, wounds	Injuries	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.												
Inadequate gate design	< min height according to different animal categories	Need of Difficult movement, balking animals	Human-animal relationship	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.												
Inadequate structure of sides	Sharp protrusions	Bruising, wounds	Injuries	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.												

Table 4. Hazards related to transport of pigs

HAZARD	Hazard description	Adverse effect description	Adverse effect type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
				Piglets						Slaughter pigs						Breeding pigs					
				RSA	RSB	RSN	RLA	RLB	RLN	RSA	RSB	RSN	RLA	RLB	RLN	RSA	RSB	RSN	RLA	RLB	RLN
TRANSPORT																					
Vehicle / Container design																					
a.) Floors																					
Inadequate floor surface	Slippery	Bruising, wounds, fractures	Injuries																		
Inadequate floor surface	Slippery	Problems maintaining balance	Ease of movement																		
Inadequate floor surface	Slippery	Reluctant to move	Fear																		
Inadequate floor surface	Too rough (aluminium more skin problems than iron or polyester)	Bruising, wounds	Injuries																		
Inadequate floor surface	Too rough (aluminium more skin problems than iron or polyester)	Restless	Comfort around resting																		
Inadequate floor condition	Gaps, potholes, steps, sloping	Bruising, wounds, fractures	Injuries																		
Inadequate floor condition	Gaps, potholes, steps, sloping	Restless	Comfort around resting																		
b.) Partitions																					
Inadequate partitions design	Sharp protrusion, sharp edges	Bruising, wounds	Injuries																		
Inadequate partitions design	Partitions of not enough height (< min height according to different animal categories)	Aggression	Injuries																		
Inadequate partitions design	Partitions of not enough height (< min height according to different animal categories)	Aggression	Social behaviour																		
Inadequate partitions design	Too big apertures in the partitions (> max aperture according to different animal categories)	Bruising, wounds, fractures	Injuries																		
Inadequate partitions design	Too big apertures in the partitions (> max aperture according to different animal categories)	Aggression	Social behaviour																		
Inadequate partitions design	Partially open partitions: open at the bottom	Bruising, wounds, fractures	Injuries																		
Inadequate partitions design	Partially open partitions: open at the bottom	Aggression	Social behaviour																		
Absence of partitions	No partitions	Bruising, wounds	Injuries																		
Absence of partitions	No partitions	Aggression	Social behaviour																		
c.) Roof																					
Inadequate roof colour	Not reflecting bright colour	Heatstress	Thirst																		
Inadequate roof colour	Not reflecting bright colour	Heatstress	Thermal comfort																		
Inadequate roof condition	Gaps, holes	Heatstress	Thirst																		
Inadequate roof condition	Gaps, holes	Heatstress	Thermal comfort																		
Inadequate roof condition	Gaps, holes	Coldstress	Thermal comfort																		
Inadequate roof condition	Gaps, holes	Soaked animals	Comfort around resting																		
Inadequate roof condition	Gaps, holes	Soaked animals	Thermal comfort																		
Inadequate roof condition	Gaps, holes	Respiratory problems	Disease																		
Inadequate roof condition	Gaps, holes	Burning, skin lesions	Injuries																		
Inadequate roof condition	Protrusions, projections	Bruising, wounds	Injuries																		
Inadequate roof insulation	Solar gain heat	Heatstress	Thirst																		
Inadequate roof insulation	Solar gain heat	Heatstress	Thermal comfort																		
Inadequate roof insulation	Water condensation	Rising humidity	Thermal comfort																		
Inadequate roof insulation	Water condensation	Rising humidity	Disease																		
d.) Sensory input (Sound Smell Light)																					
Inadequate overall noise	High intensity sounds	Disorientation	Fear																		
Inadequate overall noise	High frequency sounds	Disorientation	Fear																		
Inadequate lighting	Sudden change of light (tunnels), poor lighting, glaring lights	Disorientation	Fear																		
Unfamiliar smell	Unfamiliar smell	Aversion	Fear																		
Drafts blowing towards animals	Air blowing in their faces	Disorientation	Comfort around resting																		
Drafts blowing towards animals	Change of pressure when passing other vehicles	Disorientation	Fear																		
e.) Space allowance																					
Inadequate deck height	Too low deck height (< min height according to different animal categories)	Heatstress	Thirst	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.												
Inadequate deck height	Too low deck height (< min height according to different animal categories)	Heatstress	Thermal comfort	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.												
Inadequate deck height	Too low deck height (< min height according to different animal categories)	Rising humidity	Thermal comfort	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.												
Inadequate deck height	Too low deck height (< min height according to different animal categories)	Respiratory problems	Disease	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.												
Inadequate deck height	Too low deck height (< min height according to different animal categories)	Bruising, wounds	Injuries	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.												
Inadequate deck height	Too low deck height (< min height according to different animal categories)	Inability to raise the head/inability to stand	Ease of movement	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.												
f.) Suspension																					
Poor suspension	Vibration, acceleration	Travel sickness	Disease																		

Table 4. Hazards related to transport of pigs (cont.)

HAZARD	Hazard description	Adverse effect description	Adverse effect type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
				Piglets						Slaughter pigs						Breeding pigs					
				RSA	RSB	RSN	RLA	RLB	RLN	RSA	RSB	RSN	RLA	RLB	RLN	RSA	RSB	RSN	RLA	RLB	RLN
Feeding and watering																					
a.) Watering																					
Lack of drinking facilities	No supply of water	Dehydration	Thirst	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
Lack of drinking facilities	No supply of water	Heatstress, overheating	Thermal comfort	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
Inadequate drinking facilities	Facilities not adjusted to animal species/category	Dehydration	Thirst	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
Inadequate drinking facilities	Facilities not adjusted to animal species/category	Heatstress, overheating	Thermal comfort	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
Inadequate number of drinking troughs/watering cups/nipples	< 1 drinking trough/10 animals	Dehydration	Thirst	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
Inadequate number of drinking troughs/watering cups/nipples	< 1 drinking trough/10 animals	Heatstress, overheating	Thermal comfort	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
Inadequate flow rate	< min flow rate according to different animal categories	Dehydration	Thirst	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
Inadequate flow rate	< min flow rate according to different animal categories	Heatstress, overheating	Thermal comfort	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
Inadequate refilling facilities (adapters)	Impossibility to refill tanks during the journey	Dehydration	Thirst	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
Inadequate refilling facilities (adapters)	Impossibility to refill tanks during the journey	Heatstress, overheating	Thermal comfort	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
Inadequate position of drinkers	Difficult access to the drinkers for some animals	Dehydration	Thirst	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
Inadequate position of drinkers	Difficult access to the drinkers for some animals	Heatstress, overheating	Thermal comfort	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
Microclimate throughout transportation																					
a.) Ventilation																					
Inadequate natural ventilation	< min air exchange/distribution	Heatstress	Thirst		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate natural ventilation	< min air exchange/distribution	Heatstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate natural ventilation	< min air exchange/distribution	Heatstress	Disease		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate natural ventilation	< min air exchange/distribution	Heatstress	Comfort around resting		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate natural ventilation	> max air exchange/distribution	Cold stress	Thermal comfort	n.a.			n.a.			n.a.			n.a.			n.a.			n.a.		
Inadequate forced ventilation	Lack of forced ventilation	Heatstress	Thirst		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Lack of forced ventilation	Heatstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Lack of forced ventilation	Heatstress	Disease		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Lack of forced ventilation	Heatstress	Comfort around resting		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Ventilation rate < min rate according to different animal categories	Heatstress	Thirst		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Ventilation rate < min rate according to different animal categories	Heatstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Ventilation rate < min rate according to different animal categories	Heatstress	Disease		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Ventilation rate < min rate according to different animal categories	Heatstress	Comfort around resting		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Lack of sensors of Ta and humidity in animal compartment	Heatstress	Thirst		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Lack of sensors of Ta and humidity in animal compartment	Heatstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Lack of sensors of Ta and humidity in animal compartment	Cold stress	Thermal comfort	n.a.			n.a.			n.a.			n.a.			n.a.			n.a.		
Inadequate forced ventilation	Lack of sensors of Ta and humidity in animal compartment	Heatstress	Disease		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Lack of sensors of Ta and humidity in animal compartment	Heatstress	Comfort around resting		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heatstress	Thirst		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heatstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Lack of alert system in the driver compartment	Cold stress	Thermal comfort	n.a.			n.a.			n.a.			n.a.			n.a.			n.a.		
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heatstress	Disease		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heatstress	Comfort around resting		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution in the vehicle)	Heatstress	Thirst		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution in the vehicle)	Heatstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution in the vehicle)	Heatstress	Disease		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distribution in the vehicle)	Heatstress	Comfort around resting		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Ventilation apertures design (protection plate on fan induces lower air flow rates)	Heatstress	Thirst		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Ventilation apertures design (protection plate on fan induces lower air flow rates)	Heatstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Ventilation apertures design (protection plate on fan induces lower air flow rates)	Heatstress	Disease		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate forced ventilation	Ventilation apertures design (protection plate on fan induces lower air flow rates)	Heatstress	Comfort around resting		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate air quality	Air contaminated with exhaust gases	Respiratory disorders	Disease																		
Inadequate air quality	Moderate or severe dust level	Respiratory disorders	Disease																		
Inadequate air quality	Not sufficient O2 (< min level according to different animal categories)	Respiratory disorders	Disease																		
b.) Cooling devices																					
Inadequate cooling devices (showering)	Lack of showers	Heatstress	Thermal comfort		n.a.																

Table 3. Hazards related to transport of pigs (cont.)

HAZARD	Hazard description	Adverse effect description	Adverse effect type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
				Piglets						Slaughter pigs						Breeding pigs					
				RSA	RSB	RSN	RLA	RLB	RLN	RSA	RSB	RSN	RLA	RLB	RLN	RSA	RSB	RSN	RLA	RLB	RLN
MANAGEMENT																					
PREPARATION TO THE TRANSPORT																					
a.) Fasting																					
No fasting	Fasting period < min according to different animal categories	Travel sickness	Disease	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.												
Too long fasting	Too long fasting > max according to different animal categories	Spread disease	Disease																		
Too long fasting	Too long fasting > max according to different animal categories	Desnutrition, loss of body weight	Hunger																		
Too long fasting	Too long fasting > max according to different animal categories	Fatigue	Ease of movement																		
Too long fasting	Too long fasting > max according to different animal categories	Aggression	Injuries																		
Too long fasting	Too long fasting > max according to different animal categories	Aggression	Social behaviour																		
b.) Watering																					
Water withdrawal	Lack of water up until loading	Dehydration	Thirst																		
Water withdrawal	Lack of water up until loading	Heatstress, overheating	Thermal comfort																		
c.) Management																					
Lack of previous human contact	Inappropriate previous positive contacts with humans	Scape attempt	Human-animal relationship																		
Lack of previous human contact	Inappropriate previous positive contacts with humans	Scape attempt	Injuries																		
Lack of previous human contact	Inappropriate previous positive contacts with humans	Fear	Fear																		
Inadequate selection of animals to transport	Transport of animals not fitted to travel	Incapacity of animals to travel	Injuries																		
Inadequate selection of animals to transport	Transport of animals not fitted to travel	Incapacity of animals to travel	Ease of movement																		
Inadequate selection of animals to transport	Transport of animals not fitted to travel	Incapacity of animals to travel	Human-animal relationship																		
Inadequate cleanliness of vehicle	Uncleanliness of vehicle and insufficient disinfection	Spread disease	Disease																		
Inadequate planing of the transport	Stationary vehicle due to delay in traffic operation	Heatstress	Thirst		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate planing of the transport	Stationary vehicle due to delay in traffic operation	Heatstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate planing of the transport	Stationary vehicle due to delay in traffic operation	Heatstress	Disease		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate planing of the transport	Stationary vehicle due to delay in traffic operation	Rising humidity	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate planing of the transport	Stationary vehicle due to delay in traffic operation	Rising humidity	Disease		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate planing of the transport	Stationary vehicle due to delay in traffic operation	Quality air (increase of NH3, dust)	Disease		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate planing of the transport	No planning of loading/unloading schedule	Heatstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate planing of the transport	No planning of loading/unloading schedule	Coldstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate planing of the transport	No plans for emergency	Heatstress	Injuries		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate planing of the transport	No plans for emergency	Heatstress	Disease		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate planing of the transport	Lack of preparation for the journey (road conditions)	Problems maintaining balance	Ease of movement																		
LOADING/UNLOADING																					
a.) Handling																					
Inadequate handlers	Inappropriate handling (hitting, lack of motivation, shouting)	Bruising, wounds	Injuries																		
Inadequate handlers	Inappropriate handling (hitting, lack of motivation, shouting)	Scape attempts	Human-animal relationship																		
Inadequate handlers	Inappropriate handling (hitting, lack of motivation, shouting)	Reluctant to move	Fear																		
Inadequate handlers	Use of unnecessary driving tools (prods, electric goads, sticks)	Bruising, wounds, fractures, crowding	Injuries																		
Inadequate handlers	Use of unnecessary driving tools (prods, electric goads, sticks)	Pain	Pain																		
Inadequate handlers	High speed of loading	Fatigue	Ease of movement																		
Inadequate composition of groups	Inadequate number of animals in the moving group (> max according to different animal categories)	Difficult movement	Ease of movement																		
Inadequate composition of groups	Mixing unfamiliar animals	Aggression	Injuries																		
Inadequate composition of groups	Mixing unfamiliar animals	Aggression	Social behaviours																		
Inadequate composition of groups	Mixing unfamiliar animals	Spread disease	Disease																		
Inadequate composition of groups	Moving animals individually	Social isolation	Social behaviours																		
TRANSPORT																					
Vehicle design																					
a.) Bedding																					
Inadequate quality of bedding material	Inappropriate type of bedding according to climate	Heatstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate quality of bedding material	Inappropriate type of bedding according to climate	Coldstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate quantity of bedding material	No availability	Abnormal resting/inferior resting comfort	Comfort around resting																		
Inadequate quantity of bedding material	No availability	Coldstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Absence of enrichment material for animals	Absence of sufficient amount of enrichment material	Aggression	Injuries																		
Absence of enrichment material for animals	Absence of sufficient amount of enrichment material	Abnormal behaviour (stereotype/redirected behaviour)	Social behaviour																		
Absence of enrichment material for animals	Absence of sufficient amount of enrichment material	Abnormal behaviour (stereotype/redirected behaviour)	Other behaviours																		
Feeding and watering																					
a.) Feeding																					
Inadequate food quality	Hazardous to health, less energie content, acceptability, nutrition not adjusted to demand of species and category	Desnutrition	Hunger		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate food quantity	Inadequate food quantity according to number of animal/category	Desnutrition, loss of body weight	Hunger		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate food quantity	Inadequate food quantity according to number of animal/category	Fatigue	Ease of movement		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate food quantity	Inadequate food quantity according to number of animal/category	Aggression	Injuries		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate food quantity	Inadequate food quantity according to number of animal/category	Aggression	Social behaviour		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
b.) Watering																					
Inadequate water quality	Unfamiliar taste/Different tasting water	Dehydration	Thirst		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate water quality	Unfamiliar taste/Different tasting water	Heatstress, overheating	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Floor and space allowance																					
a.) Stocking density																					
Inadequate stocking density	Overcrowding (> max stocking density according to different animal categories)	Aggression, crowding	Injuries																		
Inadequate stocking density	Overcrowding (> max stocking density according to different animal categories)	Aggression, crowding	Comfort around resting																		
Inadequate stocking density	Overcrowding (> max stocking density according to different animal categories)	Aggression, crowding	Thermal comfort					n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate stocking density	Overcrowding (> max stocking density according to different animal categories)	Aggression, crowding	Disease																		
Inadequate stocking density	Overcrowding (> max stocking density according to different animal categories)	Aggression, crowding	Social behaviour																		
Inadequate stocking density	Overcrowding (> max stocking density according to different animal categories)	Aggression, crowding	Ease of movement																		
Driving technique																					
a.) Driver																					
Inadequate driver	Rough driving, bad driving technique	Struggling, lose of balance, falling, fatigue, restless	Injuries																		
Inadequate driver	Rough driving, bad driving technique	Struggling, lose of balance, falling, fatigue, restless	Ease of movement																		
Inadequate driver	Rough driving, bad driving technique	Struggling, lose of balance, falling, fatigue, restless	Comfort around resting																		
Inadequate driver	Lack of monitoring during transport	Incapacity of animals to travel	Injuries																		
Inadequate driver	Lack of monitoring during transport	Incapacity of animals to travel	Disease																		
Inadequate driver	Disregarding adaptation of forced ventilation to changing climate conditions	Heatstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	
Inadequate driver	Disregarding temperature measurement	Heatstress	Thermal comfort		n.a.			n.a.			n.a.			n.a.			n.a.			n.a.	

Table 4. Hazards related to transport of pigs (cont.)

Scenarios	Species	Animal categories	Means of transport	Transport duration	Thermal environment
1	poultry	broiler	road	short	above
2	poultry	broiler	road	short	below
3	poultry	broiler	road	short	neutral
4	poultry	hens	road	short	above
5	poultry	hens	road	short	below
6	poultry	hens	road	short	neutral
7	poultry	spent hens	road	short	above
8	poultry	spent hens	road	short	below
9	poultry	spent hens	road	short	neutral
10	poultry	one day old chicks	road	short	above
11	poultry	one day old chicks	road	short	below
12	poultry	one day old chicks	road	short	neutral
13	poultry	one day old chicks	road	long	above
14	poultry	one day old chicks	road	long	below
15	poultry	one day old chicks	road	long	neutral
16	poultry	one day old chicks	air	long	neutral
17	poultry	ducks	road	short	above
18	poultry	ducks	road	short	below
19	poultry	ducks	road	short	neutral
20	poultry	quails	road	short	above
21	poultry	quails	road	short	below
22	poultry	quails	road	short	neutral
23	poultry	turkey	road	short	above
24	poultry	turkey	road	short	below
25	poultry	turkey	road	short	neutral

Figure 5. Different transport scenarios in poultry

HAZARD	Hazard description	Adverse effect description	Adverse effect type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
				Broilers			Hens			Spent Hens			One day old chicken						Ducks			Quails			Turkey			
				RSA	RSB	RSN	RSA	RSB	RSN	RSA	RSB	RSN	RSA	RSB	RSN	RLA	RLB	RLN	PLN	RSA	RSB	RSN	RSA	RSB	RSN	RSA	RSB	RSN
MANAGEMENT																												
PREPARATION TO THE TRANSPORT																												
a.) Fasting																												
Fasting	Too long fasting duration	Foraging, restless, vocalising	Hunger										n.a.	n.a.	n.a.	n.a.	n.a.	n.a.										
b.) Preparation																												
Inadequate cleaning and disinfection of transport vehicles	Uncleanliness, transport vehicles contaminated with faeces	Spread of disease	Disease																									
Inadequate selection of animals to transport	Animals unfit to travel	Bruising, wounds, fractures	Injuries																									
Inadequate selection of animals to transport	Animals unfit to travel	Immobile, illness	Disease																									
d.) Crating																												
Stocking density in crates	Too high (according to animal category)	Bruising, wounds, fractures, ,	Injuries																									
Stocking density in crates	Too high (according to animal category)	Lack of possibility to lie down, to groom	Ease of movement																									
Stocking density in crates	Too high (according to animal category)	Aggression	Injuries																									
Stocking density in crates	Too high (according to animal category)	Aggression	Fear																									
Stocking density in crates	Too high (according to animal category)	Heatstress	Thermal comfort																									
Filling crates	Rough handling	Bruising, wounds, fractures, trapped extremities	Injuries																									
Inappropriate crating in farm before transport	Separation from family unit	Social stress	Social behaviour																									
Inappropriate crating in farm before transport	Mixing of animals from different origin	Social stress	Social behaviour																									
Inappropriate crating in farm before transport	Unfamiliar environment	Aversion	Fear																									
e.) Handling																												
Lack of previous human contact	Inappropriate previous positive contacts with humans	Aversion, scape attempt	Fear																									
Lack of previous human contact	Inappropriate previous positive contacts with humans	Scape attempt	Injuries																									
Untrained personal	Rough handling	Bruising, wounds, fractures	Injuries																									
LOADING AND UNLOADING																												
a.) Loading																												
Inadequate management of loading	Excessive time in stacking crates at the farm waiting	Heatstress	Thermal comfort																									
Innapropriate stacking of crates	Poor ventilation	Heatstress	Thermal comfort																									
Container loading	Rough handling	Bruising, wounds, fractures	Injuries																									
Stocking density of crates/containers on the transport vehicle	Too high	Heatstress	Thermal comfort																									
Arrangement of crates/containers	Less air distribution	Heatstress	Thermal comfort																									
Waiting time between arrival and unloading	Too long duration	Heatstress	Thermal comfort																									
TRANSPORT																												
a.) Driver																												
Driver	Rough driving, bad driving technique	Struggling, lose of balance, falling	Injuries																									
Driver	Rough driving, bad driving technique	Struggling, lose of balance, falling	Ease of movement																									
Driver	Rough driving, bad driving technique	Struggling, lose of balance, falling	Comfort around resting																									

Table 5. Hazards related to transport of poultry (cont.)

Scenarios	Species	Animal categories	Means of transport	Transport duration	Thermal environment
1	rabbit	breeding	road	short	above
2	rabbit	breeding	road	short	below
3	rabbit	breeding	road	short	neutral
4	rabbit	breeding	road	long	above
5	rabbit	breeding	road	long	below
6	rabbit	breeding	road	long	neutral
7	rabbit	slaughter	road	short	above
8	rabbit	slaughter	road	short	below
9	rabbit	slaughter	road	short	neutral
10	rabbit	slaughter	road	long	above
11	rabbit	slaughter	road	long	below
12	rabbit	slaughter	road	long	neutral

Figure 1. Different transport scenarios in rabbits

HAZARD	Hazard description	Adverse effect description	Adverse effect type	Breeding											
				1	2	3	4	5	6	7	8	9	10	11	12
				Slaughter											
				RSA	RSB	RSN	RLA	RLB	RLN	RSA	RSB	RSN	RLA	RLB	RLN
FACILITIES and STRUCTURES															
PREPARATION TO THE TRANSPORT															
a.) Preloading installations															
Inadequate preloading installations	Inadequate protection from the wind	Cold stress	Thermal comfort	n.a.											
Inadequate preloading installations	Inadequate protection from the sun	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate preloading installations	Lack of adequate ventilation	Heat stress	Thermal comfort		n.a.			n.a.		n.a.	n.a.		n.a.	n.a.	
LOADING / UNLOADING															
a.) Stacking of crates															
Inadequate stacking of crates	Unfamiliar environment	Stressful situation	Social behaviour												
Inadequate stacking of crates	Unfamiliar environment	Stressful situation	Fear												
Inadequate stacking of crates	Poor ventilation	Heat stress	Thermal comfort		n.a.			n.a.		n.a.	n.a.		n.a.	n.a.	
b.) Loading tools															
Use of loading tools in bad condition	Lack of maintenance	Bruising, wounds, fractures	Injuries												
Use of loading tools in bad condition	Lack of maintenance	Stressful situation	Fear												
TRANSPORT															
a.) Crates design															
Inadequate size	Crates height too low	Inability to raise the head/inability to stand	Ease of movement												
Inadequate size	Crates height too low	Inability to raise the head/inability to stand	Other behaviours												
Inadequate crate material	Iron	Foot pad injuries	Injuries												
Inadequate type of floor	Solid floor	Cold stress	Thermal comfort	n.a.			n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate type of floor	Not solid floor	Heat stress	Thermal comfort		n.a.			n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate type of floor	Not solid floor	Urine and faeces contamination	Disease												
Inadequate floor surface	Smooth surface	Aggression	Social behaviour												
Inadequate floor surface	Smooth surface	Aggression	Social behaviour												
Inadequate floor surface	Smooth surface	Bruising, wounds, fractures	Injuries												
Inadequate floor condition	Floor condition (gaps, potholes)	Panic	Fear												
Inadequate mesh size	Too wide	Bruising, wounds, fractures	Injuries												
Inadequate mesh size	Too small	Bruising, wounds, fractures	Injuries												
Inadequate structure of sides	Sharp protrusions	Bruising, wounds	Injuries												
Inadequate gate design	Gate too small	Bruising, wounds	Injuries												
Use of clean transport crates	Strange environment	Stressful situation	Fear												
b.) Vehicle design															
Absence of side protection in the vehicle	Lack of side curtain in the vehicle	Cold stress	Thermal comfort	n.a.			n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Absence of roof in the vehicle	Solar gain heat	Heat stress	Thermal comfort		n.a.	n.a.		n.a.		n.a.	n.a.		n.a.	n.a.	
Absence of roof in the vehicle	Drop of temperature	Cold stress	Thermal comfort		n.a.	n.a.		n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate roof condition	Gaps, holes	Heat stress	Thirst												
Inadequate roof condition	Gaps, holes	Heat stress	Thermal comfort												
Inadequate roof condition	Gaps, holes	Heat stress	Thermal comfort												
Inadequate roof condition	Gaps, holes	Cold stress	Thermal comfort	n.a.			n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate roof condition	Gaps, holes	Soaked animals	Comfort around resting												
Inadequate roof condition	Gaps, holes	Soaked animals	Thermal comfort												
Inadequate roof condition	Gaps, holes	Respiratory problems	Disease												
Inadequate roof condition	Gaps, holes	Burning, skin lesions	Injuries												
Inadequate roof insulation	Solar gain heat	Heat stress	Thirst		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate roof insulation	Solar gain heat	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate roof insulation	Water condensation	Rising humidity	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate crate subjection	Falling of crates	Bruising, wounds, fractures	Injuries												
c.) Feeding and watering															
Absence of feeding facilities	No availability of food for animals	Denutrition	Hunger	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
Absence of drinking facilities	No availability of water for animals	Dehydration	Thirst	n.a.	n.a.	n.a.				n.a.	n.a.	n.a.			
d.) Sensory input (Sound Smell Light)															
Inadequate overall noise	High intensity and frequency sounds	Disorientation	Fear												
Inadequate lighting	Sudden change of light (tunnels)	Disorientation	Fear												
Unfamiliar smell	Unfamiliar smell	Aversion	Fear												
Drafts blowing towards animals	Change of pressure when passing other vehicles	Disorientation	Fear												
e.) Microclimate throughout transportation															
Inadequate ventilation	Rising of temperature	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate ventilation	Rising of temperature	Hypertermia	Disease												
Inadequate ventilation	Location of ventilation apertures	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate ventilation	Ventilation apertures design	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate ventilation	Ventilation apertures distribution	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate air quality	Inadequate ventilation	Respiratory disorders	Disease												
Inadequate air quality	Lack of mechanical ventilation in cold climate	Respiratory disorders	Disease												
Inadequate air quality	Increase of noxious gases (NH3, CO2)	Respiratory disorders	Disease												
Inadequate air quality	Not sufficient O2	Respiratory disorders	Disease												
Inadequate air quality	Noxious gases from the lorry	Respiratory disorders	Disease												
Inadequate air quality	Moderate or severe dust level	Respiratory disorders	Disease												
MANAGEMENT															
PREPARATION TO THE TRANSPORT															
a.) Fasting															
Too long fasting	Too long fasting (>24h)	Denutrition, loss of body weight	Hunger												
Too long fasting	Too long fasting (>24h)	Fatigue	Ease of movement												
b.) Management															
Lack of previous human contact	Inappropriate previous positive contacts with humans	Scape attempt	Human-animal relationship												
Lack of previous human contact	Inappropriate previous positive contacts with humans	Scape attempt	Injuries												
Lack of previous human contact	Inappropriate previous positive contacts with humans	Fear	Fear												
Inadequate selection of animals to transport	Transport of animals not fitted to travel	Incapacity of animals to travel	Injuries												
Inadequate selection of animals to transport	Transport of animals not fitted to travel	Incapacity of animals to travel	Ease of movement												
Inadequate selection of animals to transport	Transport of animals not fitted to travel	Incapacity of animals to travel	Human-animal relationship												
Inadequate cleanliness of vehicle	Uncleanliness of vehicle and insufficient disinfection	Spread disease	Disease												
Inadequate planing of the transport	Stationary vehicle due to delay in traffic operation	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate planing of the transport	Stationary vehicle due to delay in traffic operation	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate planing of the transport	No planning of loading/unloading schedule	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate planing of the transport	No planning of loading/unloading schedule	Cold stress	Thermal comfort	n.a.			n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate planing of the transport	No plans for emergency	Heat stress	Injuries												
Inadequate planing of the transport	No plans for emergency	Heat stress	Disease		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate planing of the transport	Lack of preparation for the journey (road conditions)	Problems maintaining balance	Ease of movement												
LOADING / UNLOADING															
a.) Handling															
Inadequate handlers	Inappropriate handling (hitting, lack of motivation, shouting)	Bruising, wounds	Injuries												
Inadequate handlers	Inappropriate handling (hitting, lack of motivation, shouting)	Scape attempts	Human-animal relationship												
Inadequate handlers	Inappropriate handling (hitting, lack of motivation, shouting)	Reluctant to move	Fear												
Inappropriate crating into farm before transport	Separation from family unit	Social stress	Social behaviour												
Inappropriate crating into farm before transport	Mixing of animals from different origin	Social stress	Social behaviour												
Inappropriate crating into farm before transport	Unfamiliar environment	Stressful situation	Fear												
Inadequate stocking density in crates	Overcrowding (Standard 10 rabbits/crate)	Aggression	Social behaviour												
Inadequate stocking density in crates	Overcrowding (Standard 10 rabbits/crate)	Aggression	Injuries												
Inadequate stocking density in crates	Overcrowding (Standard 10 rabbits/crate)	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate stocking density in crates	Overcrowding (Standard 10 rabbits/crate)	Heat stress	Comfort around resting												
Stocking density of crates on the vehicle	Too high	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
TRANSPORT															
a.) Bedding															
Inadequate quality of bedding material	Inappropriate type of bedding (e.g. straw in summer)	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate quality of bedding material	Inappropriate type of bedding (e.g. straw in summer)	Heat stress	Comfort around resting		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate quantity of bedding material	No availability	Abnormal resting or not enough resting period	Comfort around resting												
Absence of enrichment material for animals	Absence of sufficient amount of enrichment material	Abnormal behaviour (stereotype/redirected behaviour)	Other behaviours												
b.) Driver															
Inadequate driver	Rough driving, bad driving technique	Struggling, loss of balance, falling, fatigue, restless	Injuries												
Inadequate driver	Rough driving, bad driving technique	Struggling, loss of balance, falling, fatigue, restless	Ease of movement												
Inadequate driver	Rough driving, bad driving technique	Struggling, loss of balance, falling, fatigue, restless	Comfort around resting												
Inadequate driver	Lack of monitoring during transport	Incapacity of animals to travel	Injuries												
Inadequate driver	Lack of monitoring during transport	Incapacity of animals to travel	Disease												
Inadequate driver	Disregarding adaptation of forced ventilation to changing climate conditions	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
Inadequate driver	Disregarding temperature measurement	Heat stress	Thermal comfort		n.a.		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	

Table 6. Hazards related to transport of rabbits

Scenarios	Species	Animal categories	Means of transport	Transport duration	Thermal environment
1	sheep and goats	adults	road	short	above
2	sheep and goats	adults	road	short	below
3	sheep and goats	adults	road	short	neutral
4	sheep and goats	adults	road	long	above
5	sheep and goats	adults	road	long	below
6	sheep and goats	adults	road	long	neutral
7	sheep and goats	adults	sea	long	above
8	sheep and goats	adults	sea	long	below
9	sheep and goats	adults	sea	long	neutral
10	sheep and goats	young	road	short	above
11	sheep and goats	young	road	short	below
12	sheep and goats	young	road	short	neutral
13	sheep and goats	young	road	long	above
14	sheep and goats	young	road	long	below
15	sheep and goats	young	road	long	neutral
16	sheep and goats	young	sea	long	above
17	sheep and goats	young	sea	long	below
18	sheep and goats	young	sea	long	neutral

Figure 7. Different transport scenarios in sheep and goats

HAZARD	Hazard description	Adverse effect description	Adverse effect type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
				Adult									Young								
				RSA	RSB	RSN	RLA	RLB	RLN	SLA	SLB	SLN	RSA	RSB	RSN	RLA	RLB	RLN	SLA	SLB	SLN
LOADING																					
a.) Handling																					
Handlers	Inappropriate handling (hitting, lack of motivation, shouting)	Bruising, wounds	Injuries																		
Handlers	Inappropriate handling (hitting, lack of motivation, shouting)	Escape attempts, balking	Human-animal relationship																		
Handlers	Inappropriate handling (hitting, lack of motivation, shouting)	Escape attempts, balking	Fear																		
Handlers	Too short loading time according to animals	Fatigue	Ease of movement																		
Handlers	Too short loading time according to animals	Stress	Fear																		
Handlers	Number of animals in the moving group too high	Balking	Human-animal relationship																		
Handlers	Incorrect tethering	Falling, bruising, wounds	Injuries																		
Composition of groups	Mixing unfamiliar animals	Aggression, bruising, wounds	Injuries																		
Composition of groups	Mixing unfamiliar animals	Social stress	Fear																		
Composition of groups	Mixing unfamiliar animals	Spreading of diseases	Disease																		
Composition of groups	Separating familiar animals	Social stress	Fear																		
Composition of groups	Mixing of animals of different size/age (10% differences)	Aggression, bruising, wounds	Injuries																		
Composition of groups	Mixing of animals of different size/age (10% differences)	Social stress	Fear																		
Composition of groups	Mixing horned/ unhorned animals	Bruising, wounds	Injuries										n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Composition of groups	Mixing horned/ unhorned animals	Aggression	Social behaviour										n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
TRANSPORT																					
Vehicle design																					
a.) Bedding																					
Inadequate quality of bedding material	Type of bedding according to climate	Heat stress, cold stress	Thermal comfort																		
Inadequate quality of bedding material	Type of bedding according to climate	Heat stress, cold stress	Disease			n.a.				n.a.											
Inadequate quality of bedding material	Type of bedding, high level of wetness, high level of dirt/dust	Dyspnoeic, panting for air	Disease			n.a.				n.a.											
Quantity of bedding material	Availability	Restless, fatigue	Comfort around resting																		
Feeding and watering																					
a.) Feeding																					
Inadequate feed quality	Hazardous to health, less energetic content, acceptability, nutrient density	Desnutrition, loss of body weight, foraging, restless, vomiting	Hunger																		
Inadequate feed quantity	Less feed according to number of animal, inadequate energy density	Desnutrition, loss of body weight, foraging, restless, vomiting	Hunger																		
Inadequate feed quantity	Less feed according to number of animal, inadequate energy density	Fatigue	Ease of movement																		
Inadequate feed quantity	Less feed according to number of animal, inadequate energy density	Aggression	Social behaviour																		
Inadequate feed quantity	Less feed according to number of animal, inadequate energy density	Aggression	Injuries																		
Inadequate feeding interval	Interval of feed application too long (according to animal needs)	Desnutrition, loss of body weight, foraging, restless, vomiting	Hunger																		
Inadequate duration of feeding	Too short feeding duration	Desnutrition, loss of body weight, foraging, restless, vomiting	Hunger																		
Inadequate duration of feeding	Too short feeding duration	Aggression	Injuries																		
b.) Watering																					
Water supply	too long period between water applications	Dehydration, vocalising, restless	Thirst																		
Lack of training to use the drinking facilities	Different drinking facilities as in husbandry system	Dehydration	Thirst																		
Lack of training to use the drinking facilities	Different drinking facilities as in husbandry system	Heatstress, overheating	Thermal comfort			n.a.	n.a.			n.a.	n.a.										
Inadequate water quality	Unfamiliar taste/different tasting water	Dehydration	Thirst																		
Inadequate water quality	Unfamiliar taste/different tasting water	Heatstress, overheating	Thermal comfort			n.a.	n.a.			n.a.	n.a.										
Floor allowance, resting periods and driving skills																					
a.) Stocking density																					
Inadequate stocking density	Stocking density too high (according to category)	Aggression, bruising, wounds	Injuries																		
Inadequate stocking density	Stocking density too high (according to category and length)	Heatstress, overheating	Thermal comfort			n.a.															
Inadequate stocking density	Stocking density too high (according to category)	Lack of possibility to lie down/ to groom, lack of exercise	Comfort around resting																		
Inadequate stocking density	Stocking density too high (according to category)	Lack of possibility to lie down / stand up, fatigue	Fear																		
Inadequate stocking density	Stocking density too high (according to category)	Lack of possibility to feed	Hunger																		
Inadequate stocking density	Stocking density too high (according to category)	Lack of possibility to drink	Thirst																		
b.) Resting periods																					
Multiple loading during the same trip	Mixing animals, multiple loading procedure	Aggression, bruising, wounds	Injuries																		
Multiple loading during the same trip	Mixing animals, multiple loading procedure	Fatigue, physical stress	Comfort around resting																		
Multiple loading during the same trip	Mixing animals, multiple loading procedure	Social stress	Fear																		
Multiple loading during the same trip	Mixing animals, multiple loading procedure	Spread disease	Disease																		
Inadequate resting time	<12 h	Inappropriate recovering from transport	Comfort around resting																		
Inadequate resting time	<12 h	Lack of possibility to feed	Hunger																		
Inadequate resting time	<12 h	Lack of possibility to drink	Thirst																		
Resting station	Stocking density too high	Aggression, bruising, wounds	Injuries																		
Resting station	Stocking density too high	Lack of possibility to lie down/ to groom, lack of exercise	Comfort around resting																		
Resting station	Inadequate feed quality	Desnutrition, loss of body weight, foraging, restless, vomiting	Hunger																		
Resting station	Inadequate feed quantity	Desnutrition, loss of body weight, foraging, restless, vomiting	Hunger																		
Resting station	Inadequate feed quantity	Fatigue	Ease of movement																		
Resting station	Mixing animals	Aggression	Social behaviour																		
Resting station	Mixing animals	Aggression	Injuries																		
c.) driving skills																					
Driver	Rough driving, bad driving technique, swaying of vehicle	Problems maintaining balance, falling, bruising, wounds	Injuries																		
Driver	Rough driving, bad driving technique, swaying of vehicle	Physical stress	Ease of movement																		
Driver	Rough driving, bad driving technique, swaying of vehicle	Physical stress	Comfort around resting																		
Driver	Lack of monitoring during transport, lack of education/competence	No feeding during transport	Hunger																		
Driver	Lack of monitoring during transport, lack of education/competence	Dehydration, heatstress	Thirst																		
Driver	Lack of monitoring during transport, lack of education/competence	Dehydration, heatstress, coldstress, dyspnoeic	Thermal discomfort																		

Table 7. Hazards related to transport of sheep and goats (cont.)

HAZARD	HAZARD identification			Hazard characterization					Exposure Assessment				Risk Characterization														
	Hazard description	Adverse effect description	Adverse effect type	Severity 0-4	Duration category	Quantitative assessment of			Qualitative assessment of the uncertainty	Quantitative assessment of P. of			Qualitative assessment of the uncertainty	Risk estimate (CI95%)	Qualitative uncertainty of the risk estimate	Dist. P. Exposure	Dist Likelihood	Probability of Occurrence	Median P. Of occurrence	P95 of P of occurrence	P05 of P of occurrence	Magnitude	Risk	Median risk	P95 Risk	P05 Risk	
						min (%)	ml (%)	max (%)		min (%)	ml (%)	max (%)															
FACILITIES and STRUCTURES																											
LOADING/UNLOADING																											
a.) Installations																											
Inadequate pumping system	Aspiration pressure above	Skin, head, eyes and fin lesions	Injuries	5	1	20	40	60	Medium	5	10	15	High	97.697 (59.717 - 147.578)	High	10	40	400	390.789737	590.313307	238.866849	0.25	100	97.6974344	147.578327	59.7167122	
Inadequate pumping system	Aspiration pressure below	Bruising, wounds, trapped animal	Injuries	4	1	10	28	32	Medium	5	10	15	High	50.804 (31.857 - 72.539)	High	10	25	256.666667	254.020963	362.695061	159.282732	0.2	51.3333333	50.8041926	72.5390122	31.8565464	
Inadequate pumping system	Pipe section below the average size	Skin lesion, wounds	Injuries	5	1	20	40	60	Medium	5	10	15	High	98.214 (58.804 - 147.521)	High	10	40	400	392.857932	590.082366	235.216651	0.25	100	98.2144829	147.520591	58.8041627	
Inadequate water flow speed		Skin, head, eyes and fin lesions	Injuries	5	1	20	40	60	High	15	32	40	High	301.428 (190.033 - 433.750)	High	30.5	40	1220	1205.71287	1735.00087	760.132406	0.25	305	301.428218	433.750218	190.033101	
b.) Access hole																											
Inadequate hole design	Sharp edges	Bruising skin and fin lesions, wounds	Injuries	5	1	10	25	40	Medium	5	10	15	High	60.779 (34.858 - 96.504)	High	10	25	250	243.114734	386.017481	138.633629	0.25	62.5	60.7786834	96.5043703	34.8584073	
Insufficient width	Pipe section below the average size	Trapped animal, skin lesions	Injuries	4	1	20	40	60	Medium	5	10	15	High	78.441 (47.618 - 118.152)	High	10	40	400	392.204087	590.761357	238.088827	0.2	80	78.4408174	118.152271	47.6177655	
TRANSPORT																											
Vehicle design																											
a.) Container design																											
Inappropriate container design	Sharp protrusion, sharp edges	Skin lesions, wounds	Injuries	5	5	50	70	90	medium/high	10	12	15	High	1.059.089 (840.902 - 1.303.772)	High	12	1666667	70	851.666667	847.271481	1043.01747	672.721604	1.25	1064.58333	1059.08935	1303.77183	840.902005
Inappropriate container design	Inadequate inspection facilities	Rising T°, hypoxia, toxicity	Injuries	5	5	25	55	70	medium/high	15	22	30	High	1.445.005 (977.392 - 1.963.536)	High	22	1666667	52.5	1163.75	1156.00392	1570.82859	781.913692	1.25	1454.8675	1445.0049	1963.53573	977.392115
b.) Vehicle maintenance																											
Poor suspension	Excess of vibrations	Balance stress (lateral line)	Ease of movement	4	5	92	98	100	High	1	15	23	High	1.385.267 (669.953 - 1.980.724)	High	14	97.3333333	1362.66667	1385.26662	1980.72379	669.952953	1	1362.66667	1385.26662	1980.72379	669.952953	
Excessive pressure in tyres of the vehicle	Excess of vibrations	Balance stress (lateral line)	Ease of movement	4	5	92	98	100	High	1	15	23	High	1.384.821 (671.328 - 1.976.680)	High	14	97.3333333	1362.66667	1384.82067	1976.67979	671.32784	1	1362.66667	1384.82067	1976.67979	671.32784	
Vehicle in bad condition	Excess of vibrations	Balance stress (lateral line)	Ease of movement	4	5	92	98	100	High	1	15	23	High	1.387.385 (670.460 - 1.976.701)	High	14	97.3333333	1362.66667	1387.38544	1976.70087	670.459968	1	1362.66667	1387.38544	1976.70087	670.459968	
Microclimate during transport																											
a.) Water temperature																											
Inadequate water temperature (12-17° C) (EFGA trout)	Lack of a T monitoring system	Rising T°	Thermal comfort	4	5	50	75	90	Medium	60	75	88	High	5.478.311 (4.342.023 - 6.594.515)	High	74	6666667	73.3333333	5475.55556	5478.31098	6594.51521	4342.02272	1	5475.55556	5478.31098	6594.51521	4342.02272
Inadequate water temperature (12-17° C) (EFGA trout)	Failure of cooling system	Rising T°	Thermal comfort	4	5	50	75	90	Medium	60	75	88	High	5.469.096 (4.349.299 - 6.596.302)	High	74	6666667	73.3333333	5475.55556	5469.09598	6595.30219	4349.29937	1	5475.55556	5469.09598	6595.30219	4349.29937
Inadequate water temperature (12-17° C) (EFGA trout)	T above 24° C	Rising T°	Thermal comfort	5	5	50	75	90	Medium	60	75	88	High	6.845.442 (5.425.169 - 8.236.523)	High	74	6666667	73.3333333	5475.55556	5476.35332	6589.21846	4340.13491	1.25	6844.44444	6845.44165	8236.52307	5425.16863
Inadequate water temperature (12-17° C) (EFGA trout)	T above 22°C and below 24 °C	Rising T°	Thermal comfort	4	5	50	75	90	Medium	60	75	88	High	5.475.279 (4.342.496 - 6.596.199)	High	74	6666667	73.3333333	5475.55556	5475.27901	6596.19988	4342.49591	1	5475.55556	5475.27901	6596.19988	4342.49591
Inadequate water temperature (12-17° C) (EFGA trout)	Sudden change of T°	Rising T°	Thermal comfort	4	5	50	75	90	Medium	60	75	88	High	5.466.828 (4.368.445 - 6.589.497)	High	74	6666667	73.3333333	5475.55556	5466.82828	6589.49659	4368.44544	1	5475.55556	5466.82828	6589.49659	4368.44544
b.) Water quality																											
Oxygen level of water too high (>5.0 mg/l)	Failure in the oxygen delivery system	Hypoxia, unconsciousness, death	Disease	5	5	50	75	90	Medium	10	15	22	High	1.387.725 (1.018.229 - 1.851.233)	High	15	3333333	73.3333333	1124.44444	1110.18015	1480.9862	814.583515	1.25	1405.55556	1387.72519	1851.23275	1018.22939
Oxygen level of water too high (>5.0 mg/l)	Lack of an oxygen level monitoring system	Hypoxia, unconsciousness, death	Disease	4	5	50	75	90	Medium	10	15	22	High	1.112.299 (814.484 - 1.476.942)	High	15	3333333	73.3333333	1124.44444	1112.29934	1476.94169	814.484133	1	1124.44444	1112.29934	1476.94169	814.484133
Oxygen level of water too high (>5.0 mg/l)	Super saturation	Gas bubble disease	Disease	5	5	50	75	90	Low	60	75	88	High	6.845.772 (5.443.913 - 8.247.538)	High	74	6666667	73.3333333	5475.55556	5476.61759	6586.03026	4355.13072	1.25	6844.44444	6845.77199	8247.53782	5443.91334
CO2 level of water too high (>10mg/l)	Decrease in gas exchange	Hypoxia, foam from fish mucos	Disease	4	5	15	30	45	Medium	15	18	20	High	533.011 (364.537 - 708.847)	High	17	8333333	30	535	533.010888	708.846924	364.537499	1	535	533.010888	708.846924	364.537499
Saturation	Super saturation	Gas bubble disease	Disease	4	5	50	75	90	Low	20	28	35	High	2.032.580 (1.561.197 - 2.532.816)	High	27	8333333	73.3333333	2041.11111	2032.58039	2532.81579	1561.19681	1	2041.11111	2032.58039	2532.81579	1561.19681
NH3 level of water too high (>0.01 mg/l)	NH3 higher than 0.012 mg/l	Acute toxicity	Disease	4	5	45	73	85	Low	60	75	88	High	5.258.423 (4.153.171 - 6.323.804)	High	74	6666667	70.3333333	5251.55556	5258.4329	6323.80373	4161.00344	1	5251.55556	5258.4329	6323.80373	4161.00344
Nitrite (<0.1mg/l)	Nitrite higher than 0.1 mg/l	Acute toxicity	Disease	4	5	45	73	85	Low	60	75	88	High	5.258.423 (4.153.171 - 6.323.804)	High	74	6666667	70.3333333	5251.55556	5258.4329	6323.80373	4161.00344	1	5251.55556	5258.4329	6323.80373	4161.00344
Aluminium contamination of water	pH reduction	Acute toxicity	Disease	4	4	45	73	85	Low	60	75	88	High	4.203.290 (3.311.385 - 5.066.979)	High	74	6666667	70.3333333	5251.55556	5254.11206	6333.72424	4139.23127	0.8	4201.24444	4203.28965	5066.97939	3311.38501
Inadequate water exchange	Raccomanded 1 l/min/kg biomass	Acute toxicity	Disease	4	5	50	75	90	High	85	90	99	High	6.671.159 (5.451.326 - 7.757.692)	High	90	6666667	73.3333333	6648.88889	6671.15853	7757.69181	5451.32572	1	6648.88889	6671.15853	7757.69181	5451.32572
Inadequate aeration system	Not sufficient	Acute toxicity	Disease	4	5	50	75	90	High	40	52	65	High	3.809.463 (2.986.775 - 4.718.515)	High	52	1666667	73.3333333	3825.55556	3809.46332	4718.51516	2986.77503	1	3825.55556	3809.46332	4718.51516	2986.77503
MANAGEMENT																											
HANDLING																											
Lack of previous interaction with humans	Animals inappropriate reactions to hand	Aversion	Fear	5	2	50	75	90	High	3	5	10	High	195.964 (127.303 - 293.880)	High	5.5	73.3333333	403.333333	391.927964	587.760667	254.606975	0.5	201.666667	195.96382	293.880433	127.303488	
Untrained personnel	Rough handling	Bruising skin and fin lesions, wounds	Injuries	5	5	15	22	30	High	3	5	10	High	147.862 (94.483 - 226.544)	High	5.5	22.1666667	121.916667	118.12967	181.235331	75.5867965	1.25	152.336833	147.862027	226.544163	94.4834956	
Untrained personnel	Crowding	Intra specific aggression, fin lesion	Injuries	5	5	20	40	60	Medium	35	42	50	High	2.098.616 (1.432.398 - 2.821.806)	High	42	1666667	40.1686667	1678.89294	2257.44507	1145.91827	1.25	2108.33333	2098.61618	2821.80634	1432.39784	
PREPARATION FOR TRANSPORT																											
a.) Preparation																											
Inadequate cleaning and disinfection of transport vehicles	Transport vehicles contaminated with pathogens	Spread of disease	Disease	5	5	50	75	90	Low	10	13	18	High	1.212.116 (935.055 - 1.546.219)	High	13	3333333	73.3333333	977.777778	969.692524	1236.97507	748.043872	1.25	1222.22222	1212.11566	1546.21883	935.05484
Inappropriate selection of animals to transport	Poor fitness, poor health status prior to transport	Spread of disease	Disease	5	5	50	75	90	Low	10	13	18	High	1.212.546 (935.429 - 1.547.673)	High	13	3333333	73.3333333	977.777778	970.037023	1238.13833	748.343053	1.25	1222.22222	1212.54628	1547.67291	935.428816
b.) Inappropriate fasting																											
Inappropriate fasting	Fasting too short (according to category)	Rising toxic metabolites	Disease	4	5	50	75	90	Medium	0.5	10	15	High	683.301 (327.143 - 1.020.903)	High	9.25	73.3333333	678.333333	683.300566	1020.9026	327.142904	1	678.333333	683.300566	1020.9026	327.142904	
Inappropriate fasting	Fasting period too long (according to category)	Hunger, intra specific aggression	Hunger	5	5	15	30	45	Medium	0.5	10	15	High	341.168 (157.141 - 558.901)	High	9.25	30	277.5	272.934534	447.120623	125.712817	1.25	346.875	341.168167	558.900779	157.141021	
c.) Inappropriate planning of the transport																											
Inappropriate planning of the transport	Selection of an inadequate vehicle for the transport	Thermal comfort, lack of an oxygen level monitoring system	Disease	5	5	50	75	90	High	10	25	40	High	2.268.578 (1.382.242 - 3.283.469)	High	25	73.3333333	1833.333333	1814.86213	2626.77527	1105.79337	1.25	2291.66667	2268.57766	3283.46908	1382.24171	
Inappropriate planning of the transport	Stationary vehicle due to delay in traffic	Thermal comfort, lack of an oxygen level monitoring system	Disease	5	5	50	75	90	High	1	3	5	High	272.300 (156.347 - 402.091)	High	3	73.3333333	220	217.839601	321.672676	125.077627	1.25	275	272.299502	402.090845		

Hazard identification				Hazard Characterization				Exposure assessment			Risk Characterization																	
HAZARD	Hazard description	Adverse effect description	Adverse effect type	Magnitude		Quantitative assessment of P. of likelihood			Quantitative assessment of P. of Exposure			Risk estimate [CI95%]	Qualitative uncertainty of the risk estimate	Dist. P. Exposure	Dist. Likelihood	Probability of Occurrence	Median P. of occurrence	P95 of P. of occurrence	P05 of P. of occurrence	Magnitude	Risk	Median risk	P95 Risk	P05Risk				
				Severity (1-4)	Duration category	min	ml	max	Qualitative assessment of the uncertainty	min	ml														max	Qualitative assessment of the uncertainty		
FACILITIES AND STRUCTURES																												
LOADING / UNLOADING																												
a) Driveway																												
Inadequate Driveway design	< 200 cm width	Bruising, wounds	Injuries	3	5	20	50	70	high	3	5	10	high	191.818 [112.388 - 308.308]	high	5.39451717	51.5255074	277.95234	255.757051	412.410972	149.850904	0.75	208.466425	191.817788	309.308229	112.388178		
Inadequate Driveway design	< 200 cm width	Balking	Human-animal relationship	1	1	10	20	30	high	3	5	10	high	5.311 [3.153 - 8.591]	high	6.89775753	16.421153	113.269131	106.210009	171.819752	63.905866	0.05	5.66345657	5.16500043	8.90908782	3.1524433		
Inadequate Driveway design	Angles, >75°	Difficult movement, balking	Human-animal relationship	2	1	10	20	50	high	10	30	50	high	65.538 [31.934 - 122.409]	high	29.6049279	18.193038	538.603577	655.384671	1224.08668	319.33615	0.1	53.8603577	65.5384671	1224.08668	31.933615		
Inadequate Structure of driveway sides	Sharp protrusions, sharp angles, open sides, short sides	Bruising, wounds	Injuries	3	5	10	20	40	high	10	3	5	high	46.415 [23.965 - 81.379]	high	3.35186627	13.1862067	46.5799623	61.886187	108.505636	31.9526786	0.75	34.942367	46.4148402	81.379229	23.964509		
Inadequate Floor surface of driveways	Slippery	Bruising, wounds, fractures, ruptures	Injuries	4	5	10	30	40	high	10	15	20	high	10.7338336	high	42.3397 [63.943 - 590.403]	high	10.7338336	25.7850887	277.842349	423.396921	590.401739	263.64295	0.1	277.842349	423.396921	590.401739	263.64295
Inadequate Floor surface of driveways	Slippery	Ease of movement	Injuries	4	5	80	90	100	high	10	15	20	high	17.0112327	high	93.6651187	1593.35913	1347.59521	1649.45969	1058.23620	319.24429	0.05	79.679566	62.4729847	92.941910	31.954079		
Inadequate floor surface	Slippery	Reluctant to move	Fear	1	1	80	90	100	high	10	15	20	high	202.326 [159.063 - 247.718]	high	14.8887061	88.3983047	1316.13637	1348.84281	1651.45075	1060.42332	0.15	197.420456	202.326241	247.717613	159.063348		
Inadequate Floor condition of driveways	Gaps, potholes, steps	Bruising, wounds, fractures	Injuries	2	5	2	5	10	high	5	7	10	high	5.48582406	high	6.43148073	35.2819717	24.7599422	41.8258803	12.8083694	4.041847	0.5	17.409889	12.3919711	20.9129402	6.4041847		
Inadequate Floor condition of driveways	Gaps, potholes, steps	Ease of movement	Injuries	1	1	10	30	50	high	10	15	20	high	22.174 [12.488 - 33.780]	high	14.7979512	21.6814769	320.832982	443.471937	675.606847	249.757617	0.05	16.0416491	22.1735959	33.7803424	12.4878909		
Steps	>10cm rise height and/or <50cm tread length	Bruising, wounds, fractures	Injuries	2	5	2	5	10	high	1	2	5	high	3.262 [1.676 - 6.119]	high	1.187174	1.6786712	4.6840353	12.2311775	3.13268381	0.15	0.9785903	3.2624076	6.11858875	1.37634239			
Steps	>10cm rise height and/or <50cm tread length	Difficult movement	Injuries	1	1	30	50	high	10	15	20	high	13.6455352	high	35.5542902	485.157318	445.284241	673.202419	251.356267	0.05	24.2578659	22.284212	33.6601209	12.5698134				
b) Gates																												
Inadequate Gate design	Sharp edges, sharp protrusion, sharp projections	Bruising, wounds	Injuries	2	5	10	15	30	high	3	5	10	high	43.683 [26.010 - 72.671]	high	4.35490207	23.1783234	100.939328	87.3657171	145.34279	62.0203558	0.5	50.4996542	43.6829585	72.671395	26.0101679		
Inadequate Gate design	< 200 cm width (except calves)	Balking	Injuries	3	5	20	50	high	3	5	10	high	125.500 [76.948 - 201.457]	high	4.75269873	25.0011703	118.829781	167.332756	269.638615	102.463899	0.75	69.123356	125.499567	201.457211	76.947515			
Inadequate Gate design	< 200 cm width (except calves)	Need of human intervention to move animals	Human-animal relationship	2	1	20	50	high	2	5	10	high	24.5006199	high	42.5731803	104.306931	154.11949	239.898213	909.463427	0.1	104.306931	154.11949	239.898213	90.9463427				
Inadequate Gate design	< 150 cm height (except calves)	Bruising, wounds	Injuries	3	5	5	10	20	high	1	3	5	high	23.135 [11.755 - 40.843]	high	2.7895816	9.6883134	27.0291746	30.8472998	54.4573253	15.6739853	0.75	20.2718909	23.1354748	40.8429939	11.755489		
c) Ramp																												
Inadequate Ramp design																												
Inadequate Ramp design	>20° steepness up/down	Bruising, wounds, fractures	Injuries	3	5	10	15	30	high	2	5	10	high	63.487 [33.575 - 110.896]	high	3.43672922	10.8373577	37.1419512	84.6487016	147.82132	44.7670441	0.75	27.886434	63.4865052	110.89599	33.5752631		
Inadequate Ramp design	>20° steepness up/down	Balking	Fear	3	5	20	50	high	2	5	10	high	74.014 [44.460 - 109.564]	high	17.2467984	40.1772202	693.362414	740.139195	1085.63377	444.559528	0.1	68.3362414	74.0139195	1085.63377	44.559528			
Inadequate Ramp design	>20° steepness up/down	Need of human intervention to move animals	Human-animal relationship	1	1	5	10	25	high	10	15	20	high	8.389 [4.674 - 14.147]	high	15.402146	7.60356517	117.110906	167.780214	282.932525	93.4769583	0.05	5.8554531	8.3890701	14.1466262	4.6734477		
Inadequate Ramp design	< 200cm width	Bruising, wounds	Injuries	3	5	30	50	high	1	3	5	high	69.189 [38.415 - 111.411]	high	3.87661179	36.4001591	141.072866	92.251599	148.547671	61.2194153	0.75	105.804664	69.1898692	111.410753	38.4145615			
Inadequate Ramp design	< 200cm width	Need of human intervention to move animals	Human-animal relationship	2	1	20	30	50	high	2	5	10	high	16.186 [8.816 - 27.201]	high	7.65640775	28.9519664	221.66806	161.88228	222.005059	88.1810653	0.1	22.166806	16.1862228	27.201059	8.8110653		
Inadequate Structure of sides	Sharp protrusion, sharp projections, sharp angles, open sides	Bruising, wounds, fractures	Injuries	3	5	20	30	50	high	2	5	10	high	122.230 [66.815 - 203.356]	high	5.3157781	28.0284852	148.336883	162.973415	271.14466	88.9194881	0.75	111.627663	122.230026	203.356099	66.8149611		
Inadequate Structure of sides	< 200 cm height	Balking	Injuries	3	5	20	30	50	high	2	5	10	high	38.272 [22.412 - 65.059]	high	4.7995934	7.5102968	38.020193	51.4231074	86.745458	27.2152695	0.75	27.0985144	38.272143	65.059053	20.41187		
Inadequate Floor surface of ramps	Slippery	Bruising, wounds	Injuries	3	5	10	30	40	high	1	3	5	high	62.107 [32.739 - 100.780]	high	2.49686761	20.3800474	50.8862801	82.809205	134.372988	43.6526043	0.75	38.1647101	62.1069038	100.779471	32.7393453		
Inadequate Floor surface of ramps	Slippery	Difficult movement	Injuries	3	5	80	90	100	high	10	15	20	high	18.4472747	high	90.5891424	1671.1228	1347.92483	1646.69638	1056.24708	0.15	250.66842	182.126758	247.304457	158.47062			
Inadequate Floor surface of ramps	Slippery	Difficult movement	Injuries	3	5	20	50	high	10	15	20	high	14.5793041	high	31.7495288	462.886036	739.600616	1092.63716	148.53404	0.1	4.8286036	14.5793041	24.7306126	44.853404				
Inadequate Floor condition of ramps	Gaps, potholes, steps	Bruising, wounds, fractures	Injuries	2	5	2	5	10	high	2	5	10	high	7.847 [3.654 - 13.600]	high	2.27123488	7.0222825	16.108248	15.2930541	27.2009104	7.39834475	0.5	8.05412401	7.8472062	13.6004552	3.6547227		
Inadequate Floor condition of ramps	Gaps, potholes, steps	Balking	Injuries	3	5	20	40	high	10	20	30	high	31.547 [18.298 - 49.159]	high	13.1833747	52.4412949	691.457728	630.945411	983.181305	379.921477	0.05	54.5728884	31.5472371	49.1592633	18.2972789			
Inadequate Clear ramps	> 20-30cm inter-clear distance, missing clear, inadequate	Bruising, wounds, fractures	Injuries	2	5	10	30	40	high	2	5	10	high	72.480 [37.831 - 123.260]	high	5.38868652	35.0246372	188.740588	144.959088	248.519857	75.6628811	0.1	94.3670291	72.479544	123.269929	37.8312505		
Inadequate Clear ramps	> 20-30cm inter-clear distance, missing clear, inadequate	Difficult movement	Injuries	1	1	80	90	100	high	5	10	15	high	10.2271938	high	84.3504536	862.668843	898.675829	1188.10713	616.424816	0.05	43.1334421	10.2271938	59.403565	30.8214281			
Inadequate Clear ramps	> 20-30cm inter-clear distance, missing clear, inadequate	Difficult movement	Injuries	1	1	80	90	100	high	5	10	15	high	44.925 [30.739 - 59.503]	high	7.86694523	85.4345278	672.108751	898.48972	1190.09923	614.783388	0.05	33.6054375	44.924369	59.5034617	30.731692		
Steps between ground and ramp and loading decks	> 15cm height	Bruising, wounds	Injuries	2	5	2	5	10	high	2	3	5	high	8.119 [4.119 - 13.631]	high	3.36990717	7.67059139	30.1960429	16.2374874	27.26292	8.3832286	0.5	15.099215	8.1197487	13.63146	4.1191633		
Steps between ground and ramp and loading decks	> 15cm height	Balking	Fear	1	1	20	40	high	40	50	60	high	99.729 [67.853 - 133.966]	high	56.889771	44.7934916	2548.29175	1694.37963	2679.32754	1393.05093	0.05	127.414587	99.729916	133.966377	67.853475			
d) Sensory Input (Sound Light)																												
Light	Poor lighting, shadows, sudden change of light, glaring light	Balking/Disorientation	Fear	1	1	80	90	100	high	20	30	50	high	281.323 [207.683 - 375.715]	high	25.83148	83.9908076	2170.16691	2813.23078	3757.14883	2076.6263	0.1	217.016691	281.323078	375.714883	207.6263		
Noise	Hissing noise	Balking/Disorientation	Fear	1	1	80	90	100	high	10	20	30	high	22.0538804	high	88.3059228	1951.00216	1795.00241	2376.84841	1231.59044	0.05	97.501078	88.3059228	1795.00241	18.83242			
Unfamiliar smells	Unfamiliar smell	Balking/Disorientation	Fear	1	1	20	50	70	high	10	20	30	high	47.560 [28.272 - 71.464]	high	4.7995934	7.5102968	38.020193	51.4231074	1429.28266	565.434478	0.05	42.389459	47.5604206	71.4642631	28.2717289		
Drafts	Air blowing to animal	Balking/Disorientation	Fear	2	1	20	50	70	high	20	30	high	94.636 [67.830 - 143.064]	high	15.8299772	61.3317798	969.854062	948.38192	1430.33621	570.29854	0.1	96.854342	94.636192	143.063621	67.8532854			
TRANSPORT																												
Vehicle design																												
a) Floors																												
Floor surface	Slippery	Bruising, wounds, fractures	Injuries	3	5	2	3	5	high	3	5	7	high	11.610 [7.810 - 16.898]	high	5.44810372	2.59833023	14.1613445	15.47									

Hazard Identification				Hazard Characterization			Exposure assessment			Risk Characterization																
HAZARD	Hazard description	Adverse effect description	Adverse effect type	Quantitative assessment of P. of likelihood			Quantitative assessment of P. of Exposure			Risk estimate [C95%]	Qualitative uncertainty of the risk estimate	Probability of Occurrence														
				Severity (1-4)	Duration category		min	ml	max			min	ml	max	Diagn. P. Exposure	Diagn. Likelihood	Median P. Of occurrence	P95 of P of occurrence	P05 of P of occurrence	P95 of P of occurrence	P05 of P of occurrence					
Microclimate throughout transportation																										
Ventilation																										
Natural Ventilation total surface area opened	< min air exchange/distribution (rising T° rising humidity)	Heat stress	Thermal comfort	2	3	10	20	30	high	3	5	10	high	5.8951914	18.4656373	108.858476	105.87501	169.973676	63.3182601	0.3	32.6575429	31.7625029	50.9921027	18.995478		
Natural Ventilation total surface area opened	< min air exchange/distribution (rising T° rising humidity)	Heat stress	Thermal comfort	1	3	10	20	30	high	3	5	10	high	3.3330494	21.5679388	83.2760712	105.894033	170.069698	62.7448328	0.15	12.4912607	15.8841025	25.5103694	9.41165743		
Natural/forced Ventilation total surface area opened	> max air exchange/distribution (draught, decreasing T°)	Cold stress	Thermal comfort	4	2	20	30	40	high	5	10	15	high	9.2541627	28.2200778	281.153191	295.590888	418.890288	183.702958	0.8	208.322563	236.929084	335.111222	154.962364		
Natural/forced Ventilation total surface area opened	> max air exchange/distribution (draught, decreasing T°)	Cold stress	Thermal comfort	3	3	20	30	40	high	5	10	15	high	8.82417328	23.161014	204.86213	295.660172	420.758935	183.82137	0.45	92.1878586	133.047778	189.341521	87.2486615		
Natural/forced Ventilation total surface area opened	> max air exchange/distribution (draught, decreasing T°)	Cold stress	Thermal comfort	2	3	20	30	40	high	5	10	15	high	8.71358072	22.5251571	199.62622	199.62622	420.758935	183.573961	0.3	58.8878681	88.713093	125.516648	58.0721883		
Inadequate forced ventilation	Air contaminants with exhaust gases	Heat stress	Thermal comfort	3	3	20	30	40	high	5	10	15	high	1.73844288	25.7399344	44.8562256	59.3012438	84.2748859	50.5676939	0.2	25.9140039	36.5807463	50.5676939	25.2851988		
Inadequate forced ventilation	Lack of forced ventilation	Heat stress	Thermal comfort	2	4	80	90	100	high	5	10	15	high	11.4775542	88.4570008	992.31491	898.492279	1189.05244	617.027740	0.4	396.925964	399.39712	475.620974	246.811080		
Inadequate forced ventilation	Lack of forced ventilation	Heat stress	Thermal comfort	2	4	80	90	100	high	5	10	15	high	7.99389097	90.9272145	726.843144	900.681219	1190.52548	613.744512	0.4	290.727258	300.772488	478.261657	245.497905		
Inadequate forced ventilation	Max. Ventilation rate lowering about protection plates on	Heat stress	Thermal comfort	2	4	80	90	100	high	60	75	80	high	2.697307	2.3255339	3.087.696	67.132677	7719.2389	5813.94464	0.4	2722.1439	2697.3078	3087.6956	2325.5389		
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Heat stress	Thermal comfort	3	7	10	15	25	high	3	7	10	high	7.20231236	13.2911651	95.6988149	105.648974	169.219677	65.3022078	0.6	47.419169	63.3781848	95.317401	39.210197		
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Heat stress	Thermal comfort	3	7	10	15	25	high	3	7	10	high	5.91943484	98.9023557	867.87921	615.907900	809.965207	412.230981	0.4	227.071884	246.362830	323.986033	164.892392		
Inadequate forced ventilation	Lack of sensors of T. and humidity in animal compartment	Heat stress	Thermal comfort	3	7	10	15	25	high	3	7	10	high	6.0537505	88.0173009	796.868682	616.56661	811.021245	412.553075	0.2	159.377336	123.313322	162.204249	82.5106149		
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Thermal comfort	3	7	10	15	25	high	3	7	10	high	7.17833501	94.3836309	677.517332	641.279377	797.7654	505.323819	0.1	677.517332	641.279377	797.7654	505.323819		
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Thermal comfort	3	7	10	15	25	high	3	7	10	high	6.12793524	79.759156	707.759156	616.666667	809.965207	412.230981	0.4	227.071884	246.362830	323.986033	164.892392		
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Thermal comfort	3	7	10	15	25	high	3	7	10	high	6.0537505	88.0173009	796.868682	616.56661	811.021245	412.553075	0.2	159.377336	123.313322	162.204249	82.5106149		
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Thermal comfort	3	7	10	15	25	high	3	7	10	high	6.12793524	79.759156	707.759156	616.666667	809.965207	412.230981	0.4	227.071884	246.362830	323.986033	164.892392		
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Thermal comfort	3	7	10	15	25	high	3	7	10	high	6.0537505	88.0173009	796.868682	616.56661	811.021245	412.553075	0.2	159.377336	123.313322	162.204249	82.5106149		
Inadequate forced ventilation	Lack of alert system in the driver compartment	Heat stress	Thermal comfort	3	7	10	15	25	high	3	7	10	high	6.12793524	79.759156	707.759156	616.666667	809.965207	412.230981	0.4	227.071884	246.362830	323.986033	164.892392		
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
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Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
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Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4	80	90	100	high	3	7	10	high	123.540	182.086	181.695	181.695	181.695	181.695	181.695	181.695	0.2	156.93896	161.694773	410.428372	82.086743
Inadequate forced ventilation	Ventilation apertures distribution (inappropriate air distrib	Cold stress	Thermal comfort	2	4																					

Hazard identification				Hazard characterization					Exposure Assessment				Risk Characterization														
HAZARD IDENTIFIED	Hazard description	Adverse effect description	Adverse effect type	Magnitude		Quantitative assessment of			Qualitative assessment of the uncertainty	Quantitative assessment of P. of			Qualitative assessment of the uncertainty	Risk estimate [C195%]	Qualitative uncertainty of the risk estimate	Dist. P. Exposure	Dist Likelihood	Probability of Occurrence	Median P. Of occurrence	P95 of P of occurrence	P05 of P of occurrence	Magnitude	Risk	Median risk	P95 Risk	P05 Risk	
				Severity 1-4	Duration categorie	min (%)	ml (%)	max (%)		min (%)	ml (%)	max (%)															
FACILITIES and STRUCTURES																											
LOADING/UNLOADING																											
a.) Driveway																											
Inadequate driveway design	Too long (> 60m)	Fatigue	Ease of movement	1	1	5	20	40	high	5	15	25	high	14.848 [6,543 - 27,632]	high	15	20.8333333	312.5	296.960785	552.635783	130.855093	0.05	15.625	14.8480393	27.6317892	6.54275466	
Inadequate driveway design	Too narrow (<90cm)	Bruising_wounds	Injuries	3	5	2	10	15	high	5	15	30	high	108.344 [48.560 - 195.098]	high	15.8333333	9.5	150.416667	144.458074	260.130838	64.7460705	0.75	112.8125	108.344356	195.098128	48.5595629	
Inadequate driveway design	Too narrow (<90cm)	Human intervention to move animal	Human-animal relationship	2	2	25	45	65	high	5	15	30	high	137.691 [70.987 - 229.576]	high	15.8333333	45	712.5	688.454942	1147.87918	354.936733	0.2	142.5	137.690988	229.575837	70.9873465	
Inadequate driveway design	Continuity of race (dead ends)	Difficult movement	Ease of movement	2	1	5	15	35	high	2	5	15	high	9.207 [3.690 - 20.597]	high	6.16666667	16.6666667	102.777778	92.0672565	205.968036	36.8953629	0.1	10.2777778	9.2072565	20.5986036	3.68953629	
Inadequate structure of sides	Sharp protrusions, sharp angles, open sides, sl	Bruising_wounds	Injuries	3	5	5	15	30	high	5	15	30	high	176.677 [78.239 - 339.195]	high	15.8333333	15.8333333	250.694444	235.569095	452.260139	104.318333	0.75	188.020833	176.678222	339.195104	78.2387499	
Inadequate floor surface	Slippery	Bruising_wounds	Injuries	3	5	1	3	5	high	10	20	30	high	43.876 [23.620 - 70.769]	high	20	3	60	58.5009937	94.358521	31.493491	0.75	45	43.875453	70.7688907	23.6201183	
Inadequate floor surface	Slippery	Difficult movement	Ease of movement	2	1	15	20	35	high	10	20	30	high	42.294 [27.146 - 63.298]	high	20	21.6666667	433.333333	422.939957	632.922277	271.464716	0.1	43.3333333	42.299957	63.2982277	27.1464716	
Inadequate floor surface	Slippery	Reluctant to move	Fear	2	1	20	40	50	high	10	20	30	high	75.598 [48.654 - 108.364]	high	20	38.3333333	766.666667	755.979561	1083.64042	486.53941	0.1	76.6666667	75.5979561	108.364042	48.653941	
Inadequate floor condition	Gaps, potholes, steps	Bruising_wounds, fractures	Injuries	3	5	5	15	25	high	5	15	30	high	168.903 [78.253 - 307.346]	high	15.8333333	15	237.5	225.203965	409.794281	104.337196	0.75	178.125	168.902973	307.345711	78.2528967	
Inadequate floor condition	Gaps, potholes, steps	Difficult movement	Ease of movement	2	1	20	40	55	high	5	15	30	high	59.751 [30.552 - 100.074]	high	15.8333333	39.1666667	620.138889	1000.74082	305.521182	0.1	62.0138889	59.7508863	100.074082	30.5521182		
Inadequate floor condition	Gaps, potholes, steps	Need of human intervention to mov	Human-animal relationship	2	1	10	30	50	high	5	15	30	high	45.071 [20.982 - 82.544]	high	15.8333333	30	475	450.705525	825.442516	209.817627	0.1	47.5	45.0705525	82.5442516	20.9817627	
b.) Ramp																											
Inadequate ramp design	Too steep up/down (> 20°)	Bruising_wounds, fractures	Injuries	3	5	5	10	15	high	5	15	30	high	113.942 [57.219 - 195.743]	high	15.8333333	10	158.333333	151.922676	260.991035	76.2924378	0.75	118.75	113.942007	195.743276	57.2193284	
Inadequate ramp design	Too steep up/down (> 20°)	Difficult movement	Ease of movement	2	1	30	50	80	high	5	15	30	high	78.770 [40.804 - 134.277]	high	15.8333333	51.6666667	818.055556	787.699151	1342.7737	408.040733	0.1	81.8055556	78.7699151	134.27737	40.8040733	
Inadequate ramp design	Too steep up/down (> 20°)	Reluctant to move	Fear	2	1	20	35	55	high	5	15	30	high	54.746 [27.640 - 93.065]	high	15.8333333	35.8333333	567.361111	547.464645	930.646016	276.401734	0.1	56.7361111	54.7464645	93.0646016	27.6401734	
Inadequate ramp design	Too narrow (<90cm)	Bruising_wounds	Injuries	3	5	5	10	25	high	1	5	15	high	67.297 [16.642 - 108.910]	high	6	11.6666667	70	63.0627517	145.21375	22.1891872	0.75	52.5	47.2970638	108.910313	16.6418904	
Inadequate ramp design	Too narrow (<90cm)	Need of human intervention to mov	Human-animal relationship	2	1	20	40	65	high	1	5	15	high	22.784 [8.415 - 46.508]	high	6	40.8333333	245	227.635184	465.07881	84.1470833	0.1	24.5	22.7635184	46.507881	8.41470833	
Inadequate structure of sides	Sharp protrusions, sharp angles, open sides, sl	Bruising_wounds	Injuries	3	5	5	15	30	high	3	10	15	high	110.085 [51.680 - 195.262]	high	9.66666667	15.8333333	153.055556	146.77947	260.349891	68.9065599	0.75	114.791667	110.084603	195.262486	51.6799199	
Inadequate floor surface	Slippery	Bruising_wounds, fractures	Injuries	3	5	5	15	30	high	5	25	45	high	278.254 [119.351 - 535.874]	high	25	15.8333333	395.833333	371.004712	714.498903	159.134721	0.75	296.875	278.253534	535.874177	119.351041	
Inadequate floor surface	Slippery	Difficult movement	Ease of movement	2	1	35	55	80	high	5	25	45	high	136.661 [66.071 - 223.663]	high	25	55.8333333	1395.833333	1366.61099	2236.63039	660.71497	0.1	139.583333	136.661099	223.663039	66.071497	
Inadequate floor surface	Slippery	Reluctant to move	Fear	2	1	15	30	50	high	5	25	45	high	74.214 [34.664 - 129.488]	high	25	30.8333333	770.833333	742.138585	1294.87948	346.641325	0.1	77.0833333	74.2138585	129.487948	34.6641325	
Inadequate floor condition	Gaps, potholes, steps	Bruising_wounds, fractures	Injuries	3	5	5	10	30	high	5	15	25	high	130.306 [59.775 - 258.384]	high	15	12.5	187.5	173.741249	344.511626	79.7006678	0.75	140.625	130.306936	258.383719	59.7754258	
Inadequate floor condition	Gaps, potholes, steps	Difficult movement	Ease of movement	2	1	20	35	60	high	5	15	25	high	53.104 [28.634 - 87.743]	high	15	36.6666667	550	531.040417	877.431628	286.339171	0.1	55	53.1040417	87.7431628	28.6339171	
Inadequate floor condition	Gaps, potholes, steps	Need of human intervention to mov	Human-animal relationship	2	1	10	25	50	high	5	15	25	high	37.975 [18.493 - 68.417]	high	15	26.6666667	400	379.751403	684.171788	184.930474	0.1	40	37.9751403	68.4171788	18.4930474	
Inadequate clear ramps	Inter-clear distance >20 cm on centers, missing	Bruising_wounds, fractures	Injuries	3	5	2	10	20	high	10	15	30	high	122.586 [55.400 - 224.598]	high	16.6666667	10.3333333	172.222222	163.448197	299.46384	73.8672247	0.75	129.166667	122.586148	224.59788	55.4004185	
Inadequate clear ramps	Inter-clear distance >20 cm on centers, missing	Difficult movement	Ease of movement	2	1	10	15	40	high	10	15	30	high	28.667 [16.421 - 51.123]	high	16.6666667	18.3333333	305.555556	286.665461	511.230588	164.212737	0.1	30.5555556	28.6665461	51.1230588	16.4212737	
Inadequate stairsteps	Stairsteps higher than 6.5cm and longer than 2	Bruising_wounds, fractures	Injuries	3	5	5	10	20	high	3	10	15	high	75.210 [39.432 - 128.126]	high	9.66666667	10.8333333	104.722222	100.280521	170.834452	52.5754475	0.75	78.5416667	75.2103904	128.125399	39.4315856	
Inadequate stairsteps	Stairsteps higher than 6.5cm and longer than 2	Difficult movement	Ease of movement	2	1	10	35	60	high	3	10	15	high	32.758 [15.938 - 55.957]	high	9.66666667	35	338.333333	327.578967	559.565434	159.383238	0.1	33.8333333	32.7578967	55.9565434	15.9383238	
c.) Lift																											
Inadequate floor surface	Slippery	Bruising_wounds, fractures	Injuries	3	5	5	10	15	high	5	15	30	high	113.659 [57.644 - 195.599]	high	15.8333333	10	158.333333	151.544783	260.799118	76.8582041	0.75	118.75	113.658587	195.599338	57.6436351	
Inadequate floor surface	Slippery	Reluctant to move	Fear	2	1	8	18	30	high	5	15	30	high	27.697 [13.586 - 49.281]	high	15.8333333	18.3333333	290.277778	276.969512	492.807798	135.860532	0.1	29.0277778	27.6969512	49.2807798	13.5860533	
Inadequate floor condition	Gaps, potholes, steps	Bruising_wounds, fractures	Injuries	3	5	5	10	20	high	1	5	10	high	39.532 [17.348 - 75.578]	high	5.16666667	10.8333333	55.9722222	52.7087959	100.770707	23.130729	0.75	41.9791667	39.5319589	75.5780304	17.3480467	
Inadequate floor condition	Gaps, potholes, steps	Reluctant to move	Fear	2	1	5	15	25	high	1	5	10	high	7.288 [3.128 - 13.901]	high	5.16666667	15	77.5	72.8824679	139.012692	31.2834835	0.1	7.75	7.28824679	13.9012692	3.12834835	
Inadequate structure of sides	Sharp protrusions, sharp angles, open sides, sl	Bruising_wounds	Injuries	3	5	5	10	20	high	3	10	20	high	80.406 [37.308 - 150.106]	high	10.5	10.8333333	113.75	107.207544	200.141332	49.7444373	0.75	85.3125	80.4056682	150.105999	37.308328	
d.) Sensory input (Sound Smell Light)																											
Inadequate lighting	Blinding light, shadows, sudden change of light	Disorientation	Fear	2	1	10	25	40	high	25	35	55	high	89.696 [53.616 - 136.542]	high	36.6666667	25	916.666667	896.85906	1365.4246	536.162837	0.1	91.6666667	89.6966667	136.54246	53.6162837	
Inadequate overall noise	High intensity sounds (>85dBA)	Disorientation	Fear	2	1	10	30	55	high	20	30	45	high	92.577 [49.995 - 149.802]	high	30.8333333	30.8333333	950.694444	925.767189	1498.02393	499.946455	0.1	95.0694444	92.5767189	149.802393	49.946455	
Inadequate overall noise	High frequency sounds (>7000Hz)	Disorientation	Fear	2	1	10	30	55	high	10	20	30	high	59.701 [31.348 - 99.043]	high	20	30.8333333	616.666667	597.007694	990.431928	313.482828	0.1	61.6666667	59.707694	99.0431928	31.3482828	
Unfamiliar smell	Unfamiliar smell	Disorientation	Fear	2	1	5	15	35	high	25	40	65	high	66.192 [32.045 - 118.343]	high	41.6666667	16.6666667	694.444444	661.916564	1183.42771	320.448327	0.1	69.4444444	66.1916564	118.342771	32.0448327	
Drafts blowing towards animals	Air blowing in their faces	Disorientation	Fear	2	1	20	35	50	high	20	30	45	high	106.155 [71.919 - 149.955]	high	30.8333333	35	1079.166667	1061.55092	1499.94764	719.190013	0.1	107.916667	106.155092	149.94764	71.9190013	
e.) Gate																											
Inadequate gate design	Insufficient width (<90																										

Scenarios	Species	Animal categories	Means of transport	Transport duration	Thermal environment
1	equine	broken	road	short	above
2	equine	broken	road	short	below
3	equine	broken	road	short	neutral
4	equine	broken	road	long	above
5	equine	broken	road	long	below
6	equine	broken	road	long	neutral
7	equine	broken	sea	long	above
8	equine	broken	sea	long	below
9	equine	broken	sea	long	neutral
10	equine	unbroken	road	short	above
11	equine	unbroken	road	short	below
12	equine	unbroken	road	short	neutral
13	equine	unbroken	road	long	above
14	equine	unbroken	road	long	below
15	equine	unbroken	road	long	neutral
16	equine	unbroken	sea	long	above
17	equine	unbroken	sea	long	below
18	equine	unbroken	sea	long	neutral
19	equine	mares with foals	road	short	above
20	equine	mares with foals	road	short	below
21	equine	mares with foals	road	short	neutral
22	equine	stallions	road	short	above
23	equine	stallions	road	short	below
24	equine	stallions	road	short	neutral
25	equine	stallions	road	long	above
26	equine	stallions	road	long	below
27	equine	stallions	road	long	neutral
28	equine	stallions	sea	long	above
29	equine	stallions	sea	long	below
30	equine	stallions	sea	long	neutral

Figure 4. Different transport scenarios in horses

Hazard identification				Hazard characterization					Exposure Assessment				Risk Characterization														
HAZARD IDENTIFIED	Hazard description	Adverse effect description	Adverse effect type	Magnitude		Quantitative assessment of			Qualitative assessment of the uncertainty	Quantitative assessment of P. of			Qualitative assessment of the uncertainty	Risk estimate [CI95%]	Qualitative uncertainty of the risk estimate	Dist. P. Exposure	Dist Likelihood	Probability of Occurrence	Median P. Of occurrence	P95 of P of occurrence	P05 of P of occurrence	Magnitude	Risk	Median risk	P95 Risk	P05/risk	
				Severity 1-4	Duration categorie	min (%)	ml (%)	max (%)		min (%)	ml (%)	max (%)															
LOADING/UNLOADING																											
a.) Handling																											
Inadequate handlers	Inappropriate handling (hitting, lack of motivation)	Bruising, wounds	Injuries	3	5	20	35	50	high	15	30	45	high	773.309 [488.866 - 1.129.748]	high	30	35	1050	1031.07805	1506.33042	651.821863	0.75	787.5	773.308537	1129.74782	488.866397	
Inadequate handlers	Inappropriate handling (hitting, lack of motivation)	Scrape attempts	Human-animal relationship	2	3	30	45	70	high	15	30	45	high	409.957 [263.039 - 606.190]	high	30	46.6666667	1400	1366.52308	2020.63439	876.797502	0.3	420	409.956919	606.190318	263.03251	
Inadequate handlers	Inappropriate handling (hitting, lack of motivation)	Reluctant to move	Fear	2	3	30	45	70	high	15	30	45	high	411.165 [264.352 - 608.043]	high	30	46.6666667	1400	1370.54939	2028.80974	881.172635	0.3	420	411.164818	608.042923	264.35179	
Inadequate handlers	Use of unnecessary driving tools (prods. electr)	Bruising, wounds, fractures, crowding	Injuries	3	5	20	35	50	high	10	15	30	high	421.846 [268.375 - 655.957]	high	16.6666667	35	583.333333	562.461187	874.609563	357.832877	0.75	437.5	421.84589	655.957173	268.374658	
Inadequate handlers	Use of unnecessary driving tools (prods. electr)	Pain	Injuries	3	1	20	35	50	high	10	15	30	high	84.644 [53.608 - 130.847]	high	16.6666667	35	583.333333	584.292085	870.980525	357.389898	0.15	87.5	84.6438127	130.847079	53.6084847	
Inadequate handlers	High speed of loading	Fatigue	Ease of movement	1	2	10	20	35	high	10	15	35	high	34.598 [19.377 - 60.248]	high	17.5	20.8333333	364.583333	345.976283	602.476809	193.768952	0.1	36.4583333	34.5976283	60.2476809	19.3768952	
Inadequate composition of groups	Inadequate number of animals in the moving gr	Difficult movement	Ease of movement	2	1	20	35	60	high	15	30	45	high	107.170 [64.705 - 166.027]	high	30	36.6666667	1100	1071.70256	1660.27236	647.05439	0.1	110	107.170256	166.027236	64.705439	
Inadequate composition of groups	Mixing unfamiliar animals	Aggression	Injuries	3	5	15	35	60	high	25	35	60	high	979.171 [578.861 - 1.536.765]	high	37.5	35.8333333	1343.75	1305.56086	2049.01949	771.815013	0.75	1007.8125	979.170642	1536.76462	578.86126	
Inadequate composition of groups	Mixing unfamiliar animals	Aggression	Social behaviours	2	2	15	40	65	high	25	35	60	high	292.629 [169.528 - 459.879]	high	37.5	40	1500	1463.14254	2299.39617	847.639731	0.2	300	292.628509	459.879235	169.527946	
Inadequate composition of groups	Mixing unfamiliar animals	Spread disease	Disease	3	5	5	10	15	high	25	35	60	high	273.681 [175.700 - 412.472]	high	37.5	10	375	364.907531	549.962266	234.266567	0.75	281.25	273.680648	412.471699	175.69925	
Inadequate composition of groups	Moving animals individually	Social isolation	Social behaviours	2	2	25	45	65	high	1.5	5	10	high	45.687 [23.181 - 76.961]	high	5.25	45	236.25	228.436529	384.8026	115.905212	0.2	47.25	45.6873058	76.9605201	23.1810424	
TRANSPORT																											
Vehicle design																											
a.) Bedding																											
Inadequate quality of bedding material	Inappropriate type of bedding (e.g. straw in summer)	Rising Ta	Thermal comfort	3	3	10	30	50	high	3	5	10	high	71.427 [37.862 - 121.393]	high	5.5	30	165	158.726222	269.763303	84.1377208	0.45	74.25	71.427025	121.393487	37.8619744	
Inadequate quality of bedding material	Inappropriate type of bedding (e.g. straw in summer)	Normal	Comfort around resting	2	2	10	25	45	high	3	5	10	high	27.103 [14.530 - 46.671]	high	5.5	25.8333333	142.083333	135.514629	233.356184	72.6476911	0.2	28.4166667	27.1029258	46.6712368	14.5295382	
Inadequate quantity of bedding material	No availability	Abnormal resting/Inferior resting co	Comfort around resting	2	2	5	25	50	high	15	30	55	high	155.322 [68.157 - 287.374]	high	31.6666667	25.8333333	818.055556	776.60987	1436.87235	340.78598	0.2	163.611111	155.321974	287.37447	68.1571961	
Absence of enrichment material for animals	Absence of sufficient amount of enrichment ma	Aggression	Injuries	3	5	3	10	15	high	25	45	80	high	333.306 [181.907 - 544.114]	high	47.5	9.6666667	459.166667	444.407741	725.48566	242.542534	0.75	344.375	333.306806	544.114245	181.9069	
Absence of enrichment material for animals	Absence of sufficient amount of enrichment material	Social behaviour	Social behaviour	2	2	5	10	15	high	25	45	80	high	92.243 [55.136 - 145.509]	high	47.5	10	475	461.213188	727.544698	275.680073	0.2	95	92.2426375	145.50894	55.1360147	
Absence of enrichment material for animals	Absence of sufficient amount of enrichment ma	Abnormal behaviour (stereotype/re	Other behaviours	2	2	3	10	15	high	25	45	80	high	88.962 [48.513 - 144.769]	high	47.5	9.6666667	459.166667	444.811071	723.8442	242.563857	0.2	91.8333333	88.9622143	144.76884	48.5127714	
Feeding and watering																											
a.) Feeding																											
Inadequate food quality	Hazardous to health, less energie content, acco	Desnutrition	Hunger	3	3	5	15	30	high	40	50	60	high	349.941 [187.726 - 546.684]	high	50	15.8333333	791.666667	777.645568	1214.85391	417.168371	0.45	356.25	349.940505	546.684262	187.725767	
Inadequate food quantity	Inadequate food quantity according to number	Desnutrition, loss of body weight	Hunger	3	3	5	20	30	high	40	45	60	high	404.620 [229.923 - 571.030]	high	46.6666667	19.1666667	894.444444	899.155788	1268.95543	510.939405	0.45	402.5	404.620105	571.029943	229.922732	
Inadequate food quantity	Inadequate food quantity according to number	Fatigue	Ease of movement	2	2	2	10	15	high	40	45	60	high	89.210 [48.902 - 127.072]	high	46.6666667	9.5	443.333333	446.051813	635.361836	244.51095	0.2	88.6666667	89.2103627	127.072367	48.9021899	
Inadequate food quantity	Inadequate food quantity according to number	Aggression	Injuries	3	5	5	10	20	high	40	45	60	high	370.223 [229.230 - 558.032]	high	46.6666667	10.8333333	505.555556	493.630315	744.043278	305.639643	0.75	379.166667	370.222737	558.032458	229.229733	
Inadequate food quantity	Inadequate food quantity according to number of animal/category	Social behaviour	Social behaviour	2	2	5	15	25	high	40	45	60	high	139.572 [80.809 - 202.142]	high	46.6666667	15	700	697.860145	1010.71117	404.045067	0.2	140	139.572029	202.14234	80.8090134	
b.) Watering																											
Inadequate water quality	Unfamiliar taste/Different tasting water	Dehydration	Thirst	3	2	10	25	50	high	5	30	45	high	216.380 [99.422 - 390.231]	high	28.3333333	26.6666667	755.555556	721.268043	1300.77108	331.406255	0.3	226.66667	216.380413	390.231235	99.4218765	
Inadequate water quality	Unfamiliar taste/Different tasting water	Heatstress, overheating	Thermal comfort	2	3	10	15	20	high	5	30	45	high	126.795 [66.759 - 189.357]	high	28.3333333	15	425	422.650586	631.18875	222.531356	0.3	127.5	126.795176	189.356625	66.7594067	
Floor and space allowance																											
a.) Stocking density																											
Inadequate stocking density	Overcrowding (<0.42 m2/100kg)	Aggression, crowding	Injuries	3	5	10	20	40	high	1	5	15	high	89.298 [32.406 - 191.182]	high	6	21.6666667	130	119.064256	254.908823	43.2082236	0.75	97.5	89.298192	191.182367	32.4061677	
Inadequate stocking density	Overcrowding (<0.42 m2/100kg)	Aggression, crowding	Comfort around resting	2	2	30	50	75	high	1	5	15	high	57.401 [21.585 - 111.845]	high	6	50.8333333	305	287.004182	559.225286	107.92511	0.2	61	57.4008363	111.845057	21.5850221	
Inadequate stocking density	Overcrowding (<0.42 m2/100kg)	Aggression, crowding	Thermal comfort	2	3	15	35	55	high	1	5	15	high	58.329 [21.489 - 119.453]	high	6	35	210	194.430604	398.175561	71.6315669	0.3	63	58.3291812	119.452668	21.4894701	
Inadequate stocking density	Overcrowding (<0.42 m2/100kg)	Aggression, crowding	Disease	3	5	2	5	10	high	1	5	15	high	21.671 [7.845 - 47.545]	high	6	5.33333333	32	28.8951125	63.393614	10.4597322	0.75	24	21.6713344	47.5450211	7.84479915	
Inadequate stocking density	Overcrowding (<0.42 m2/100kg)	Aggression, crowding	Social behaviour	2	2	20	40	60	high	1	5	15	high	44.901 [16.923 - 89.101]	high	6	40	240	224.502656	445.507036	84.6161981	0.2	48	44.9005311	89.1014071	16.9232396	
Inadequate stocking density	Overcrowding (<0.42 m2/100kg)	Aggression, crowding	Ease of movement	2	2	20	40	65	high	1	5	15	high	45.787 [17.256 - 91.950]	high	6	40.8333333	245	228.932698	459.750879	86.2784334	0.2	49	45.7865395	91.9501759	17.2556867	
Driving technique																											
a.) Driver																											
Driver	Rough driving, bad driving technique	Problems maintaining balance	Injuries	3	5	5	15	30	high	3	10	20	high	116.637 [50.622 - 224.271]	high	10.5	15.8333333	166.25	155.515447	299.027781	67.4953933	0.75	124.6875	116.636585	224.270835	50.621545	
Driver	Rough driving, bad driving technique	Ease of movement	Ease of movement	2	1	15	30	55	high	3	10	20	high	31.888 [15.039 - 57.100]	high	10.5	31.6666667	332.5	316.879633	571.000169	150.393006	0.1	33.25	31.6879633	57.1000169	15.0393006	
Driver	Rough driving, bad driving technique	Comfort around resting	Comfort around resting	2	1	20	35	60	high	3	10	20	high	36.931 [17.882 - 64.917]	high	10.5	36.6666667	385	369.312649	649.174305	178.824147	0.1	38.5	36.9312649	64.9174305	17.8824147	
Driver	Lack of monitoring during transport	Incapacity of animals to travel	Injuries	3	5	2	15	30	high	10	15	30	high	182.572 [77.672 - 334.313]	high	16.6666667	15.3333333	255.555556	243.429058	445.750717	103.562137	0.75	191.666667	182.571793	334.313038	77.616026	
Driver	Lack of monitoring during transport	Disease	Disease	3	5	2	15	25	high	10	15	30	high	174.882 [81.804 - 303.864]	high	16.6666667	14.5	241.666667	233.176262	404.884921	109.071947	0.75	181.25	174.882196	303.863691	81.8039604	
Driver	Disregarding adaptation of forced ventilation to	Rising Ta	Thermal comfort	2	3	5	10	25	high	10	20	30	high	66.122 [35.091 - 117.037]	high	20	11.6666667	233.333333	220.40556	390.122542	116.969853	0.3	70	66.1216681	117.036762	35.090956	
Driver	Disregarding temperature measurement	Rising Ta	Thermal comfort	2	3	5	15	25	high	5	15	30	high	67.678 [31.407 - 123.997]	high	15.8333333	15	237.5	225.593605	413.323955	104.691469	0.3	71.25	67.6780815	123.997187	31.4074408	

Table 9.Risk Assessment on the welfare aspect of the transport of pigs for slaughter: short transport by road in warm conditions (cont.)