

Controlling the spread of invasive species with innovative methods in road construction and maintenance.



Aim of the project

1. Creation of a list of invasive alien plant (IAP) for European countries with relation to traffic
2. Test new methods for IAP management
3. A best practice-guide for the control of IAP during road construction and maintenance
4. Cost benefit analysis for the implementation of new methods during road construction and maintenance
5. Develop a best practice guide for road construction and maintenance

Transport and invasive alien plants

- IAP are introduced accidentally or deliberately into environments where they are not normally found and cause serious negative consequences in the new environment

- Traffic plays an important role in the spread of IAPs



Ragweed distribution among Lower Austria
(data NFB project LS12-016)



EU REGULATION (EU) No 1143/2014

Prevention and management of the introduction and spread of invasive alien species

Management measures should avoid any adverse impact on the environment as well as on human health

Cross-border cooperation needed

Early detection needed

Eradication measures should be effective in achieving the complete and permanent removal of the population of the invasive species concerned with due regards to human health and the environment, especially non-target species and their habitats



Minimize the spread of invasive alien plants on roads

IAPs related to roads and the spread among road

Alternative methods for IAP management

Current practice on road construction, operation and maintenance in regards to IAP

Publication/booklet based on literature search

Field test on alternative methods for the management of IAP

Questionnaire/ cost benefit analysis

Recommendation for best practice to prevent IAP spread



Invasive alien plants in Austria

Genus	Species	Family	Origin	according to BioFlor	according to EPPO Global database
<i>Acer</i>	<i>negundo</i>	Aceraceae	North America	Eschen-Ahorn	box elder
<i>Ailanthus</i>	<i>altissima</i>	Simaroubaceae	Asia	Drüsiger Götterbaum	Tree-of-heaven
<i>Ambrosia</i>	<i>artemisiifolia</i>	Asteraceae	North America	Beifuß-Ambrosie	Ragweed
<i>Asclepias</i>	<i>syriaca</i>	Apocynaceae	North America	Echte Seidenpflanze	common milkweed
<i>Buddleja</i>	<i>davidii</i>	Scrophulariaceae	Asia	Gewöhnlicher Sommerflieder	butterfly bush
<i>Fallopia</i>	<i>japonica</i>	Polygonaceae	Asia	Japanischer Flügelknöterich	Japanese knotweed
<i>Fallopia</i>	<i>x bohemica</i>	Polygonaceae	Hybrid	Bastard-Flügelknöterich	Bohemian knotweed
<i>Fallopia</i>	<i>sachalinensis</i>	Polygonaceae	Asia	Sachalin-Flügelknöterich	giant knotweed
<i>Helianthus</i>	<i>tuberosus</i>	Asteraceae	North America	Topinambur	Jerusalem artichoke
<i>Heracleum</i>	<i>mantegazzianum</i>	Apiaceae	Caucasus	Riesen-Bärenklau	giant hogweed
<i>Impatiens</i>	<i>glandulifera</i>	Balsaminaceae	India	Drüsiges Springkraut	Indian balsam
<i>Populus</i>	<i>x canadensis</i>	Salicaceae	Hybrid	Kanadische Pappel	Canadian poplar
<i>Robinia</i>	<i>pseudoacacia</i>	Fabaceae	North America	Gewöhnliche Robinie	black locust
<i>Rudbeckia</i>	<i>laciniata</i>	Asteraceae	North America	Schlitzblatt-Rudbeckie	cut-leaved coneflower
<i>Senecio</i>	<i>inaequidens</i>	Asteraceae	South Africa	Schmalblättriges Greiskraut	narrow-leaved ragwort
<i>Solidago</i>	<i>canadensis</i>	Asteraceae	North America	Kanadische Goldrute	Canadian goldenrod
<i>Solidago</i>	<i>gigantea</i>	Asteraceae	North America	Riesen-Goldrute	giant goldenrod
<i>Symphotrichum</i>	<i>lanceolatum</i>	Asteraceae	North America	Lanzett-Herbstaster	panicked aster

EU regulation

EU regulation

EU regulation

Green shaded:
species with
high impact

In frame of
the project
for every
country in
the call lists
are
elaborated
with IAP
specific to
the country
and related
to roads



Asclepias syriaca



Ambrosia artemisiifolia



Senecio inaequidens



Ailanthus altissima



Heracleum mantegazzianum



Fallopia japonica



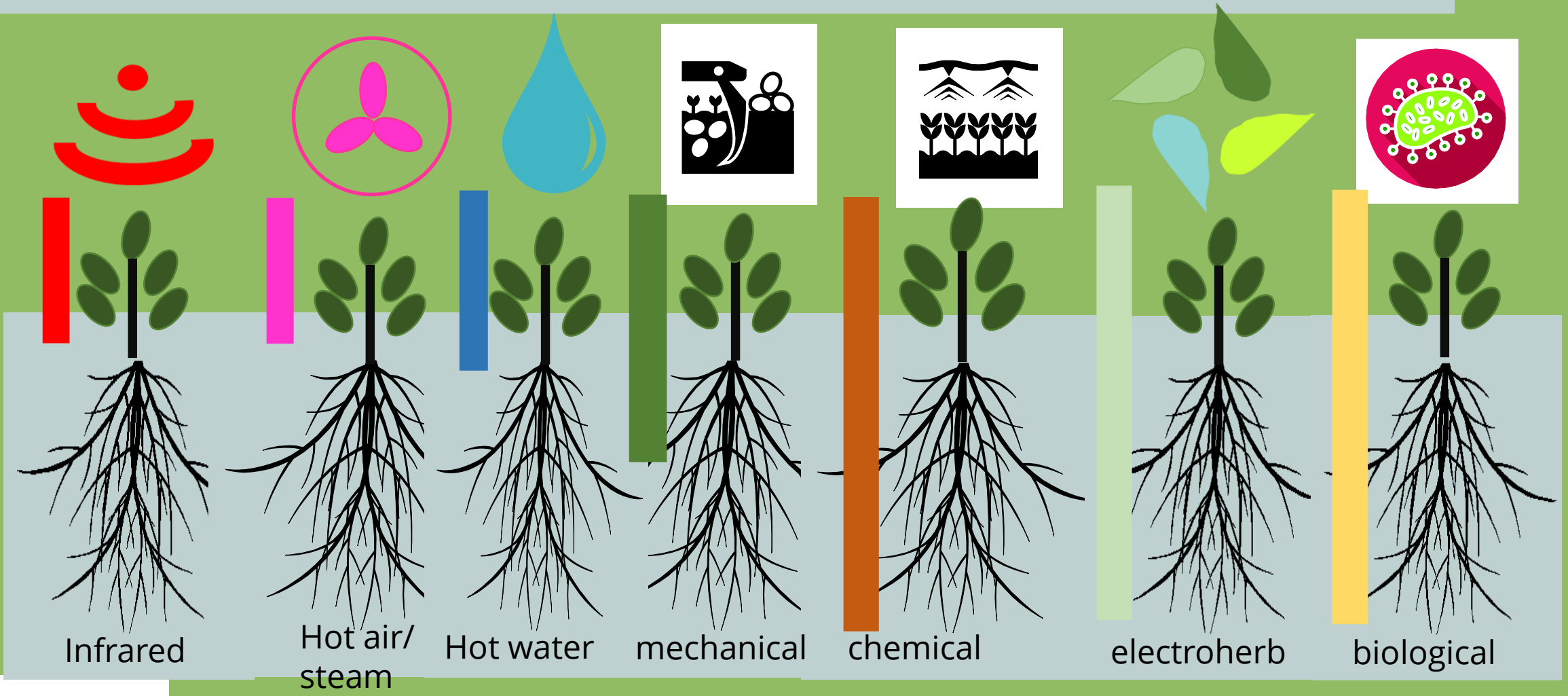
Robinia pseudoacacia

Requirements for alternative control methods

- No chemicals
- Energy efficient
- Effective in term of time and eradication
- Integration in current management praxis
- Safe for humans and the environment
- Ideally specific for each IAP



Which root zones are effected by different weed control methods?



Methods on the market

Pro and contra



Treatment	Equipment type	Number of treatments		Mean number of treatments year ⁻¹	Working width (cm)	Working speed km h ⁻¹	Mean dose kg gas ha ⁻¹	Mean dose year ⁻¹ kg gas ha ⁻¹
		2005	2006					
Flames	HOAF weemaster, hand pushed	6	6	5.0	50	0.64-0.70	150	750
Hot air/flames	Zacho Turbo Weedblaster	7	4	5.5	65	0.53-0.61	335	1.473
Steam	Dan-steam + handheld	6	5	5.5	50	0.50-0.60	163	897
Hot water	Waipuna hand held	4	2	3.0	20	1.00	312	936
Glyphosate	Hand held	2	3	2.5				

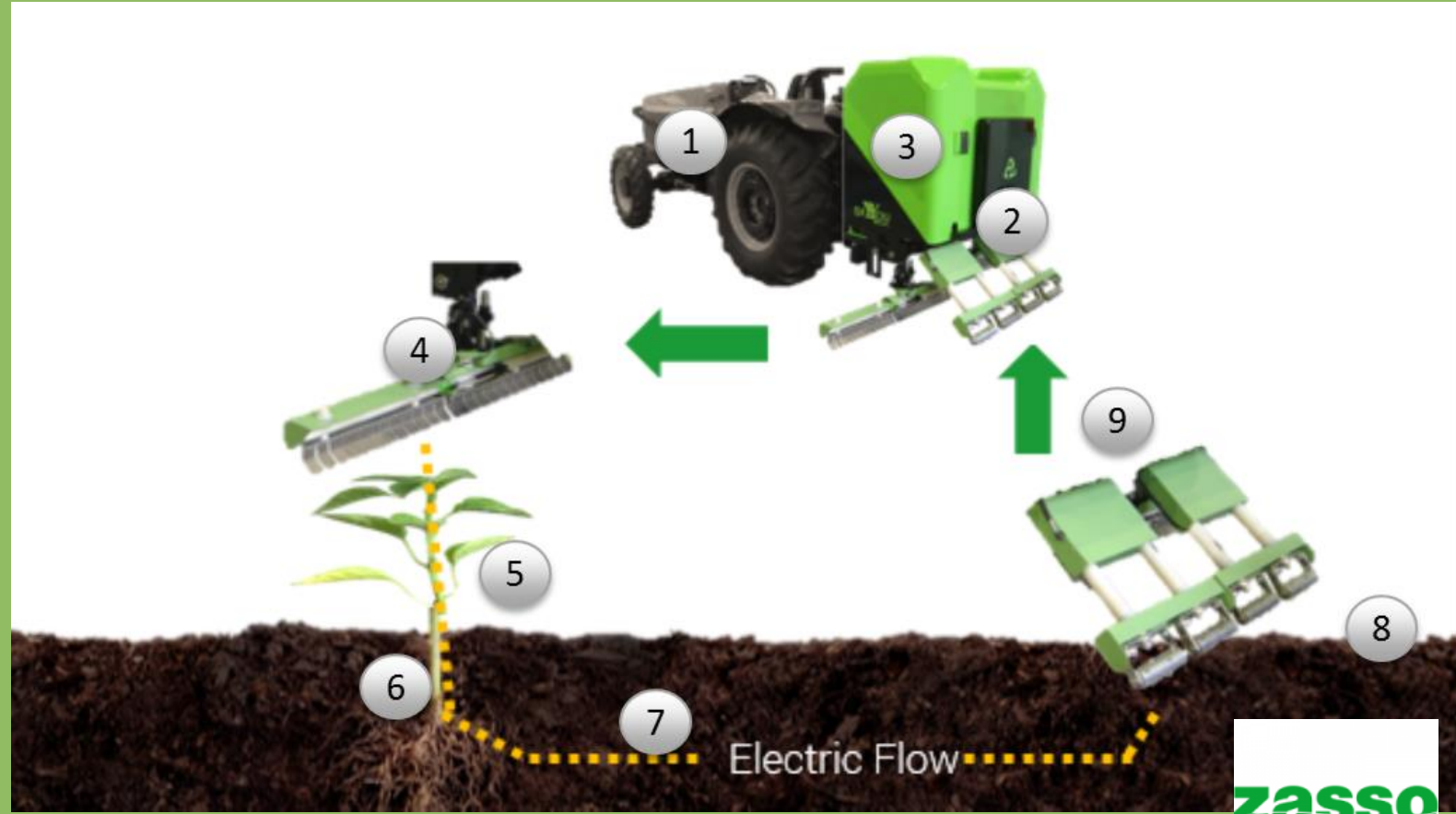
Literature review on the best non chemical method on the market for roads

- All alternative methods lack speed
- Infrared most effective, but no machinery for the use on roads exists
- Steaming in experiments showed good results
- Laser radiation and freezing destroy only the upper parts of the plants
- Microwaves high energy needed
- Biological substances (like perchlorate acetic acid, acetic acid, oils) too expensive and destroy only the upper part of the plants

Zasso method: electric circuit for weed control



1. Mechanical energy
2. Transformation into electrical power
3. Production of high frequency and high voltage
4. Electricity current flows through the stem
5. Electricity current flows through the root
6. Current flows through the soil
7. Electrical earthing applicator
8. Closing the electronic circuit



Soil organism not affected, only if the weather is very wet



Inundative biological control

Natural enemies are applied periodically in high concentration when the weed causes the problem

Examples (no products in Europe):

- BioChon (*Chondrostereum purpureum*) against *Prunus serotina*
- Camperico (*Xanthomonas campestris* pv. *poae*) for *Poa annua* in bent grass golf courses

Selective for specific weeds but registration costs too high for companies because of the small market

Support from the public is needed

Biological control of invasive plants on the example of *Prunus serotina*



Problem:

Listed invasive species in The Netherlands

Introduced in the 17th century as a ornamental tree form Northern America

Problem: Shows a powerful regeneration

Reduction of the tree cost intensive



Solution

Natural occurring fungi *Chondrostereum purpureum*; silver leaf disease

Saprophyte living on dead wood

Does not infect trees only through fresh open wounds

In experiments in the Nederland 90% of the stumps died in two years



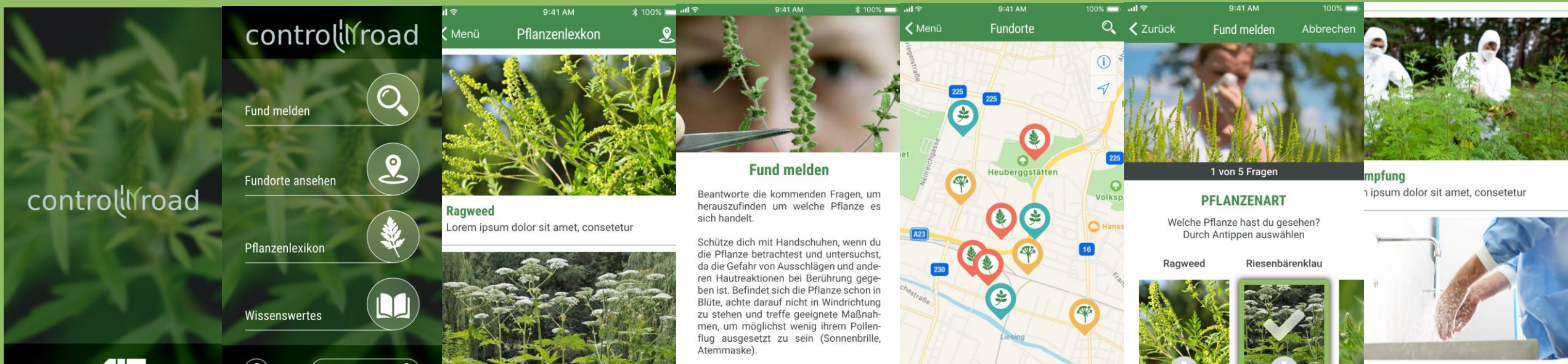
Important factors for effective control of IAPs

- Consistency of effort over time more important than quality
- Recognition of IAPs before road construction starts
- European wide action plan
- Re-cultivation of the native flora
- Early detection and control best strategy

Recognizing invasive alien plants and mapping their location



Application concept for mobile phones to help road construction and maintenance)



Recognition

Localization

Eradication

Output:

- Which methods are suitable to combat IAPs
- What is the cost-benefit of the implementation of new methods
- How the native flora can be preserved
- Concept tools for the recognition of IAPs and their localition

