Agri PV in het landschap

Nationaal Consortium Zon in Landschap
4 December

Welkom & Agenda

Doel

Identificeren perspectieven en (onderzoeks)vragen vanuit het consortium over agri-PV, draagvlak en landschapverbetering.

Programma

16.30	Welkom
16.35	Agri PV in het landschap en hernieuwbare energie – inleiding
16.45	Aan de slag: perspectieven verzamelen & clusteren
17.05	Gesprek/ toelichten
17.25	Vervolgstappen
17.30	Eind & the power of the sticker

Agri PV in het landschap en hernieuwbare energie – inleiding

We werken naar een tekst voor een call voor projectvoorstellen

*Hoe kunnen we het initiële **publieke draagvlak** voor agri-pv in Nederland waarborgen en welke technisch, en sociaal maatschappelijke innovaties hiervoor nodig op **middellange en lange termijn.***

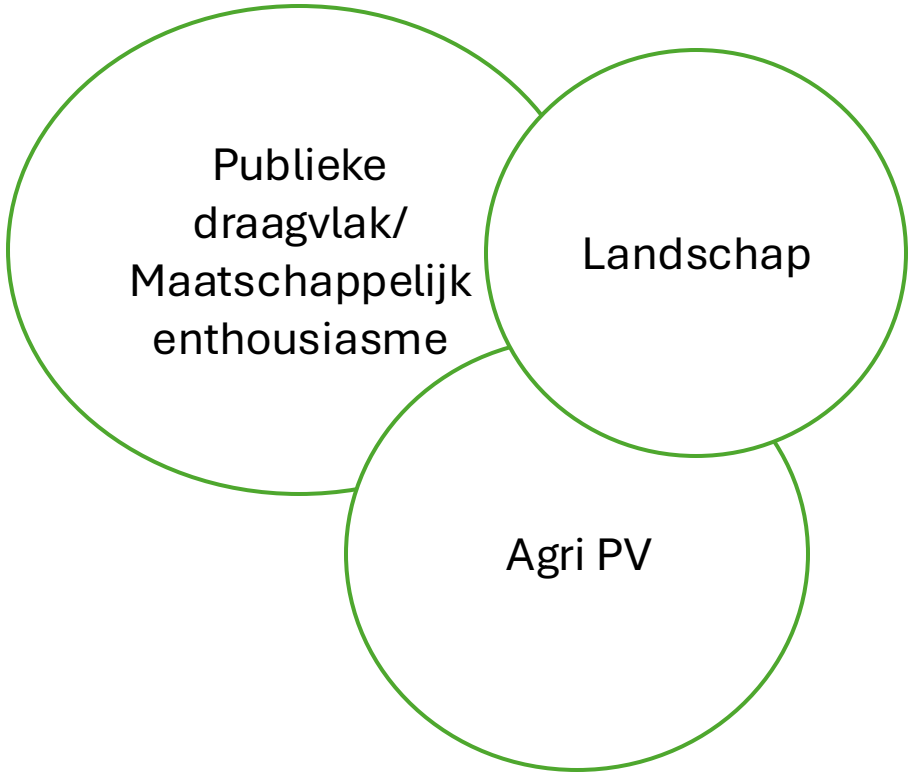
In ons achterhoofd: synergie tussen gebruikswaarde, toekomstwaarde en belevingswaarde.

Perspectieven verzamelen

Publieke draagvlak voor agri-pv waarborgen; welke technische, en sociaal maatschappelijke innovaties zijn middenlange en lange termijn nodig?

- ***Publiek draagvlak – Agri PV***
  - *Dit wil ik weten/ deze kennis heb ik nodig als we maatschappelijk enthousiasme (draagvlak) willen versterken.*

- ***Benodigde innovaties***
  - *Deze technische/ sociale oplossingen heb ik nodig om maatschappelijk enthousiasme voor Agri PV te vergroten.*



Agrivoltaics_NL - Advancing Multifunctional Solutions for Social Acceptance and Landscape Experience

Toetsing themabeschrijving

04-12-2024

Zon in Landschap Summit

In december organiseren wij wederom de PV-dagen onder de nieuwe naam Zon in Landschap Summit.

Het doel van deze dagen is kennis delen, van elkaar leren en elkaar ontmoeten. De summit biedt een informele setting waarin relevante onderwerpen worden besproken met deelnemers van het Nationaal Consortium Zon in Landschap. Daarnaast is ook dit jaar het Nationaal Consortium Zon op Infra betrokken.

Locatie en datum
Wageningen university & research

Droevendaalsesteeg 4, 6708 PB Wageningen

- 3 december
  projectmeetings voor SolarEcoPlus en Ecocertified
- 4 december 9.30-11 uur
  projectmeetings Gazo en SolarMilk
- 4 december 11.00- 18.00 uur
  Zon in Landschap Summit met sessies over actuele onderwerpen gratis toegankelijk voor alle leden inclusief voldoende ruimte voor netwerken en afsluitend een diner

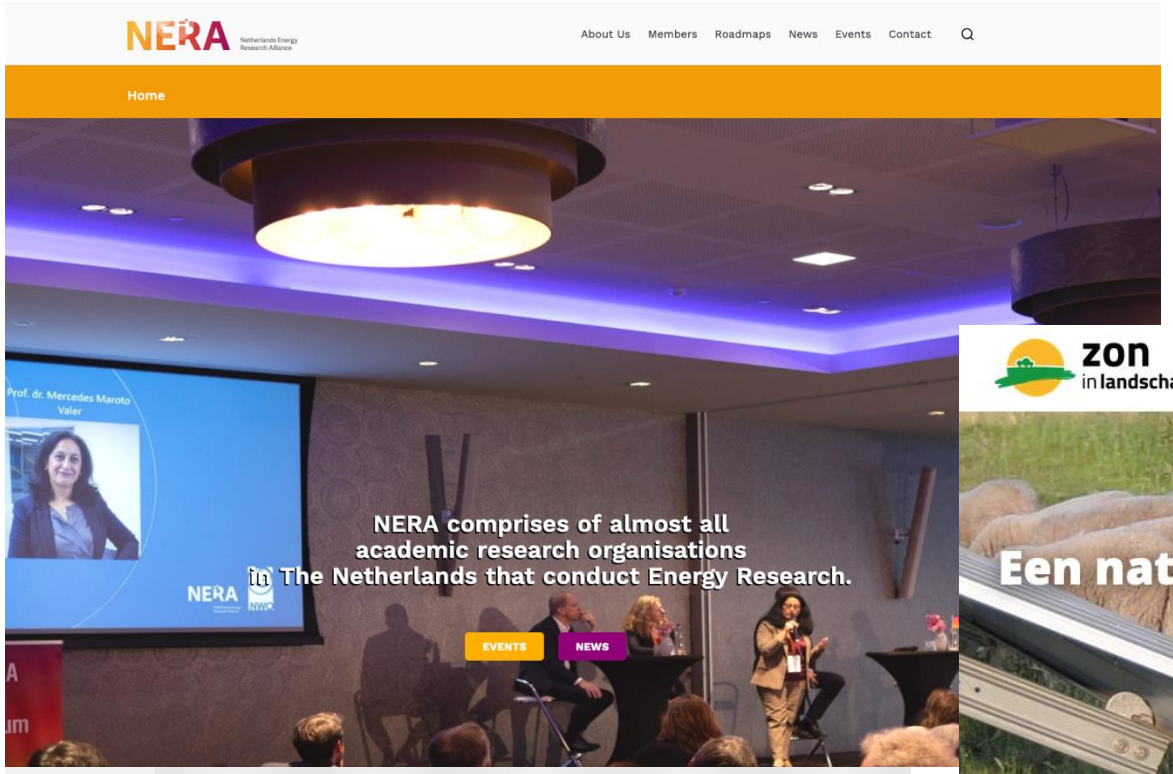
Programma in vogelvlucht

Moderator *Kay Cesar, TNO*

- Welkom | *Prof. Carolien Kroese, rector, WUR*
- Update Zon in Landschap | *Kay Cesar, TNO*
- WuR Solar Research program | *Sven Stremke en Jeroen Sluijsmans, WUR*
- Update TKI Urban Energy | *Robin Quax, TKI Urban Energy*
- update Agri-PV in Nederland | *TNO, WUR | ZLTO*

zon in landschap

Agrivoltaics_NL, een coproductie NERA leden + deelnemers NCZiL



Agrivoltaics_NL: Leden schrijfgroep (August-November 2024)

Opstellers van het thema (leden van de schrijfgroep)		
Naam	Organisatie	Expertise/discipline
Sven Stremke, Professor	WUR/Solar Research Program; Scientific Board NERA	Energy transition, solar energy, energy landscapes, agrivoltaics
Kay Cesar, PhD	Nationaal Consortium Zon in Landschap (43 societal and knowledge partners); TNO	Voorzitter Nationaal Consortium Zon in Landschap; Program coordinator advanced solar parks and horticulture
Dirk Oudes, Assistant Prof.	WUR/Landscape Architecture; WUR/Solar Research Program	Landscape architect, solar power plants, multifunctional solutions
Laura Webb, Assistant Prof.	WUR/Animal Production systems	Applied ethology, positive animal welfare, sensor technology
Rebecca Saive, Professor	University of Twente/MESA+ Institute for Nanotechnology	Applied physics, photovoltaics, optical modelling
Bas van Aken, PhD	TNO/Agrivoltaics	Optical & pv-yield modelling, techno-economic evaluations of pv systems
Wilfried van Sark, Professor	Utrecht University/ Copernicus Institute	Integration of solar energy and photovoltaics
Sara Golroodbari, Assistant Prof.	Utrecht University/ Copernicus Institute	Integration of solar energy and photovoltaics
Olindo Isabella, Professor	TUD/Photovoltaic materials and devices group	Solar cells, PV efficiency, PV applications
Hesan Ziar, Assistant Prof.	TUD/Photovoltaic materials and devices group	PV applications

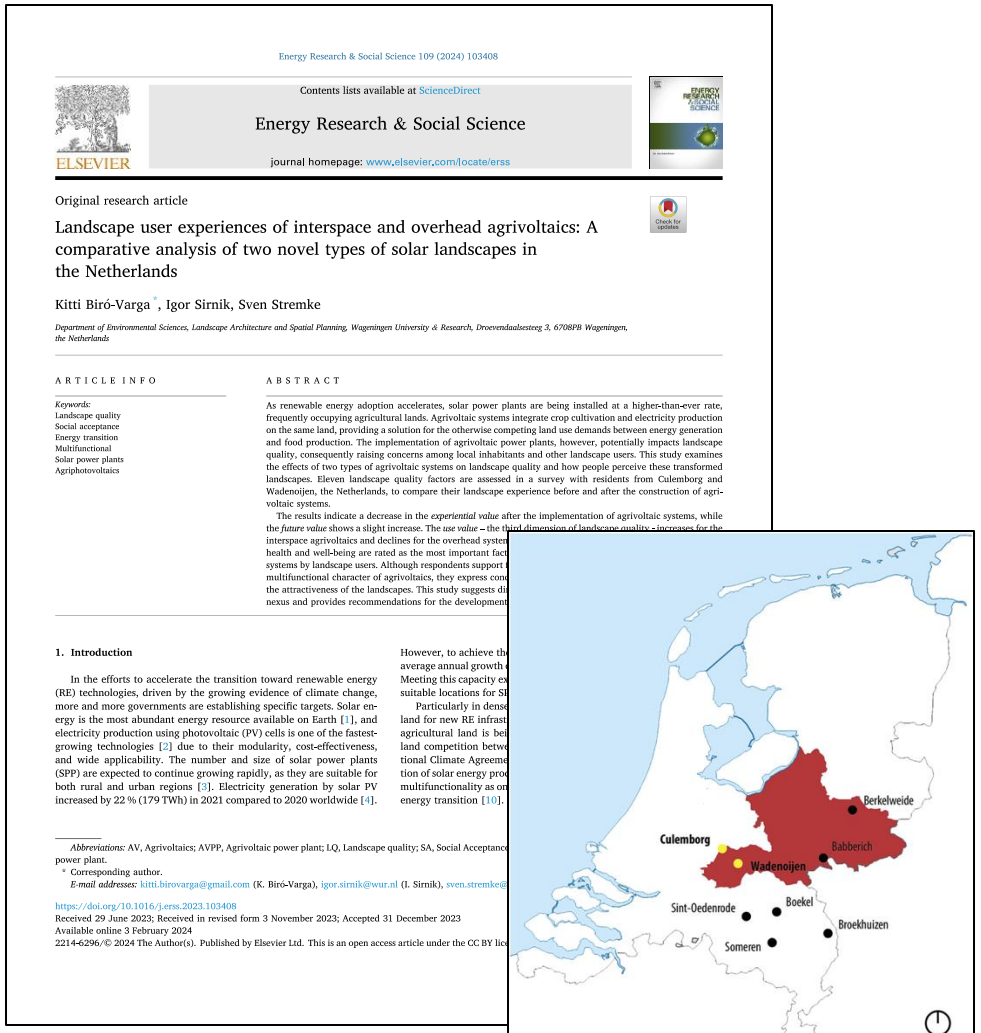
+ Marieke Rietbergen (Design Innovation Group)

+ Erwin Haveman LTO/Themaspecialist Klimaat & Energie (maatschappelijke stakeholder)

+ AVANS University of Applied Sciences + Den Hague University of Applied Sciences (to be confimed)

+ PBL Planbureau voor de Leefomgeving (to be confirmed)

Agrivoltaics_NL: Voorbeeld uitdaging, AV effecten op 'ruimtelijke kwaliteit'



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Original research article

Landscape user experiences of interspace and overhead agrivoltaics: A comparative analysis of two novel types of solar landscapes in the Netherlands

Kitti Biró-Varga *, Igor Sirnik, Sven Stremke

Department of Environmental Sciences, Landscape Architecture and Spatial Planning, Wageningen University & Research, Droevendaalsesteeg 3, 6708PB Wageningen, the Netherlands

ARTICLE INFO

Keywords:
Landscape quality
Social acceptance
Energy transition
Multifunctional
Solar power plants
Agriphotovoltaics

ABSTRACT

As renewable energy adoption accelerates, solar power plants are being installed at a higher-than-ever rate, frequently occupying agricultural lands. Agrivoltaic systems integrate crop cultivation and electricity production on the same land, providing a solution for the otherwise competing land use demands between energy generation and food production. The implementation of agrivoltaic power plants, however, potentially impacts landscape quality, consequently raising concerns among local inhabitants and other landscape users. This study examines the effects of two types of agrivoltaic systems on landscape quality and how people perceive these transformed landscapes. Eleven landscape quality factors are assessed in a survey with residents from Culemborg and Wadenoijen, the Netherlands, to compare their landscape experience before and after the construction of agrivoltaic systems.

The results indicate a decrease in the *experiential value* after the implementation of agrivoltaic systems, while the *future value* shows a slight increase. The *use value* – the third dimension of landscape quality - increases for the interspace agrivoltaics and declines for the overhead syste
health and well-being are rated as the most important fact
systems by landscape users. Although respondents support
multifunctional character of agrivoltaics, they express con
the attractiveness of the landscapes. This study suggests di
nexus and provides recommendations for the development

1. Introduction

In the efforts to accelerate the transition toward renewable energy (RE) technologies, driven by the growing evidence of climate change, more and more governments are establishing specific targets. Solar energy is the most abundant energy resource available on Earth [1], and electricity production using photovoltaic (PV) cells is one of the fastest-growing technologies [2] due to their modularity, cost-effectiveness, and wide applicability. The number and size of solar power plants (SPP) are expected to continue growing rapidly, as they are suitable for both rural and urban regions [3]. Electricity generation by solar PV increased by 22 % (179 TWh) in 2021 compared to 2020 worldwide [4].

However, to achieve th
average annual growth
Meeting this capacity e
suitable locations for S
Particularly in dense
land for new RE infrast
agricultural land is bei
land competition betwe
tional Climate Agreeme
tion of solar energy pro
multifunctionality as on
energy transition [10].

Abbreviations: AV, Agrivoltaics; AVPP, Agrivoltaic power plant; LQ, Landscape quality; SA, Social Acceptanc
power plant.
* Corresponding author.
E-mail addresses: kitti.birovarga@gmail.com (K. Biró-Varga), igor.sirnik@wur.nl (I. Sirnik), sven.stremke@

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Available online 3 February 2024

Culemborg (vertikaal AV met gras)

Gebruikswaarde +12%

Toekomstwaarde +2%

Belevingswaarde -11%

Culemborg
Fixed, vertical interspace agrivoltaic system with pasture

Wadenoijen (AV dak boven fruit)

Gebruikswaarde -11%

Toekomstwaarde +2%

Belevingswaarde -16%

Wadenoijen
Fixed, overhead agrivoltaic system with berry cultivation

!!! Ja, AVs zijn multifunctioneel maar de beleving van AV vraagt aandacht, om maatschappelijke draagvlak op peil te houden !!!

Reference: Biro-Varga, Oudes & Stremke (2024) *Energy Research & Social Science*

Agrivoltaics_NL: Advancing Multifunctional Solutions for Social Acceptance and Landscape Experience

Kritische inter- en transdisciplinaire kennisleemtes (middellange & lange termijn)

- **Inventory of Requirements and Expectations**
  What requirements and expectations are of relevance for the acceptance of agrivoltaics according to the stakeholders in the Netherlands?

- **Technological Innovations for Landscape Experience and Biodiversity**
  What technological innovations can give rise to new agrivoltaic models that mitigate the negative impacts of current systems on landscape experience and biodiversity, especially regarding their height?

- **Replacement of Plant Support Systems**
  What technological advancements are required to replace existing plant support systems (such as plastic coverings in soft fruit farming) and ensuring effective rainwater management?

- **Animal Welfare Improvements**
  What agrivoltaic innovations can enhance animal welfare in sectors such as dairy, sheep, and poultry farming?

- **Agricultural Robotics**:
  What types of agricultural robotics could enable new system designs, addressing current shortcomings and improving their integration with existing infrastructure?

NWO: Omschrijf welke inter- en transdisciplinaire kennisleemtes er onderliggend aan de genoemde/gekozen oorzaken zijn (wat is de 'knowledge gap'?).

Agrivoltaics_NL: Advancing Multifunctional Solutions for Social Acceptance and Landscape Experience

Kritische inter- en transdisciplinaire kennisleemtes *(*middellange & lange termijn)

- **Light Management and Market Optimization**
  What innovations are needed to optimize light distribution for crops under changing microclimatic conditions and fluctuating electricity market values? This includes innovations in smart tracking algorithms, dynamic panel transparency, even-lighting solutions and moveability at the panel and system scale.

- **Planning Policies and Guidelines**
  What planning policies and design guidelines can facilitate the deployment of different models of agrivoltaics systems in regions where their landscape impact will be minimal and the societal acceptance the greatest?

- **Greenhouse Gas Emission Reduction**
  What contributions can the various agrivoltaic models make to reduce greenhouse gas emissions in the Dutch agricultural sector, by solar energy generation and changing land-use/land-management practices such as precision agriculture?

- **Policy and Financial Instruments**
  What types of policy and financial instruments are needed to ensure that the development of agrivoltaics aligns with the diverse set of expectations, including those of residents and other landscape users?

NWO: Omschrijf welke inter- en transdisciplinaire kennisleemtes er onderliggend aan de genoemde/gekozen oorzaken zijn (wat is de 'knowledge gap'?).

NWA_ORC initiatief 'Agrivoltaics_NL'

Kernvraag: Hoe kunnen we het initiële publiek draagvlak voor agrivoltaics in Nederland waarborgen, welke technische en sociaal-maatschappelijke innovaties zijn hiervoor op de middellange & lange termijn nodig?

Frequency of appearance	Factors mentioned in the acceptance field (n: 70/86)
Very often (> 60 %)	
often (40–60 %)	*Economic benefits*; *environmental impact*; *visual impact*;
Sometimes (20–40 %)	*Aesthetics & scenic quality*; nuisance; *community involvement &participation*; *community values*; *decision making*; *landscape values*; *procedural justice*; *economic impact*; *perception of landscape change*; *place attachment*; *communication*; *environmental concerns*; *jobs*;
Seldom (< 20 %)	Health & well-being; process; site selection; temporal dimension; transparency; moral & ethical values; design; landscape characteristics; trust; visibility; *Attitudes (towards RE)*; *landscape quality*; *wildlife habitats & -creation*; *CO2 emissions*; *knowledge & understanding of RET*; *price*; *perception of risk*; *project size*; *recreation & community activities*; Cultural heritage; demographic characteristics; fairness; information; regional added value; technology; trust in developer; impact on agricultural land use; (cost) efficient; geographical locations; property values; social values; safety of plant; tourism; air pollution; construction; end-of-life; landscape modification; noise pollution; physical characteristics of energy alternatives; project details; trust in politics & institutions; alternative options; business model; cumulative impacts; flooding; functional efficiency; legacy; light pollution; mitigation measures; NIMBY; quality of energy provision; stable energy provision; traffic; visual preference.

Afbeelding: Factoren voor publiek draagvlaak HE projecten (Enserink et al. 2022)

Final note: Please leave your card on your way out if you would like to be listed as party interested in further process of this call, and later during consortium forming and proposal phase.

Perspectieven verzamelen – tijdslijn 5-10 jaar

Publieke draagvlak voor agri-pv waarborgen; welke technische, en sociaal maatschappelijke innovaties zijn middenlange en lange termijn nodig?

- ***Publiek draagvlak – Agri PV***
  - *Dit wil ik weten/ deze kennis heb ik nodig als we maatschappelijk enthousiasme (draagvlak) willen versterken.*
  - ***Schrijf je kennisvraag in hele zin***

- ***Benodigde innovaties***
  - *Deze technische/ sociale oplossingen heb ik nodig om maatschappelijk enthousiasme voor Agri PV te vergroten.*
  - ***Beschrijf je innovatie, een ander moet het begrijpen***

kennisinstelling

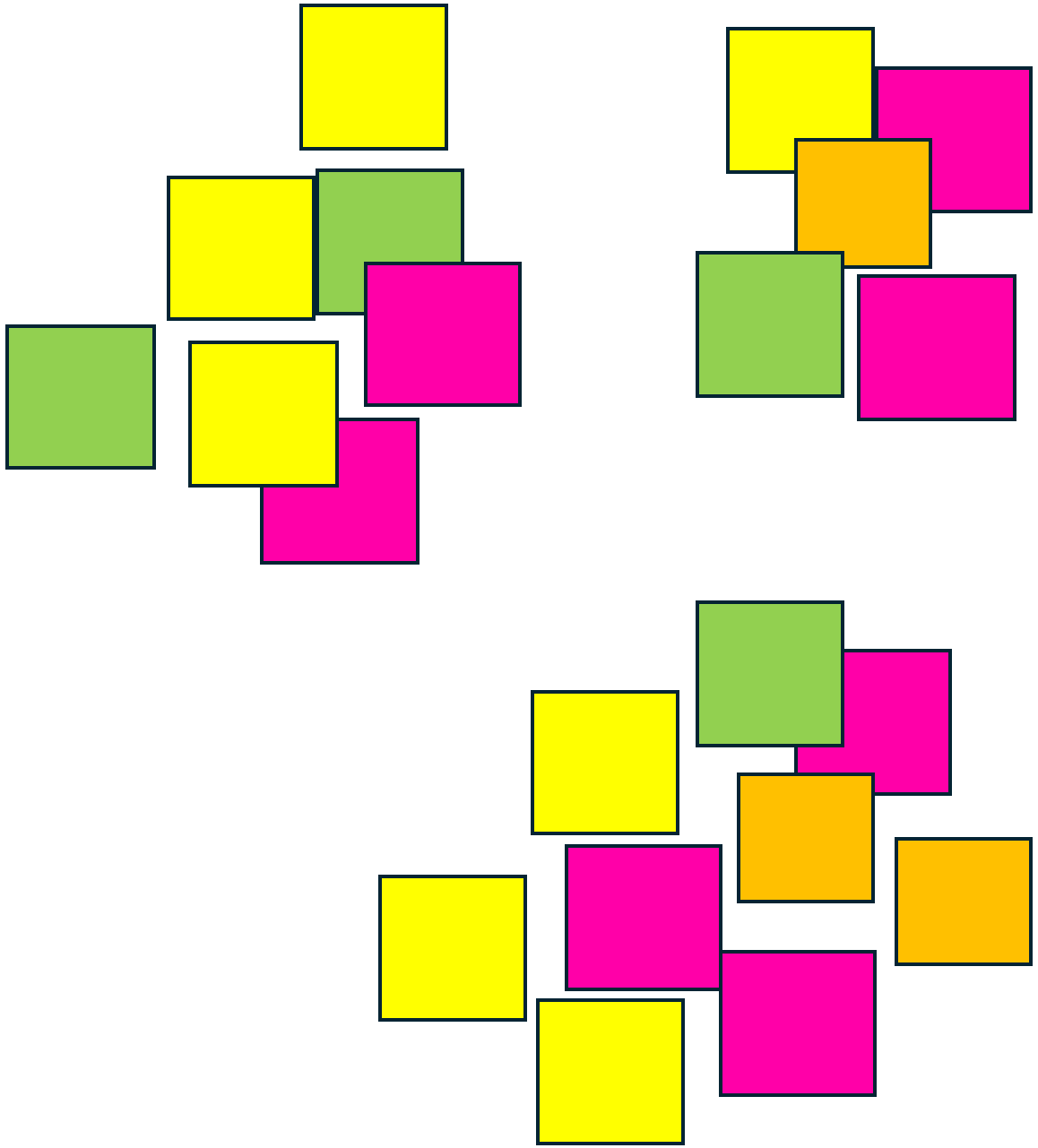
bedrijf

overheid

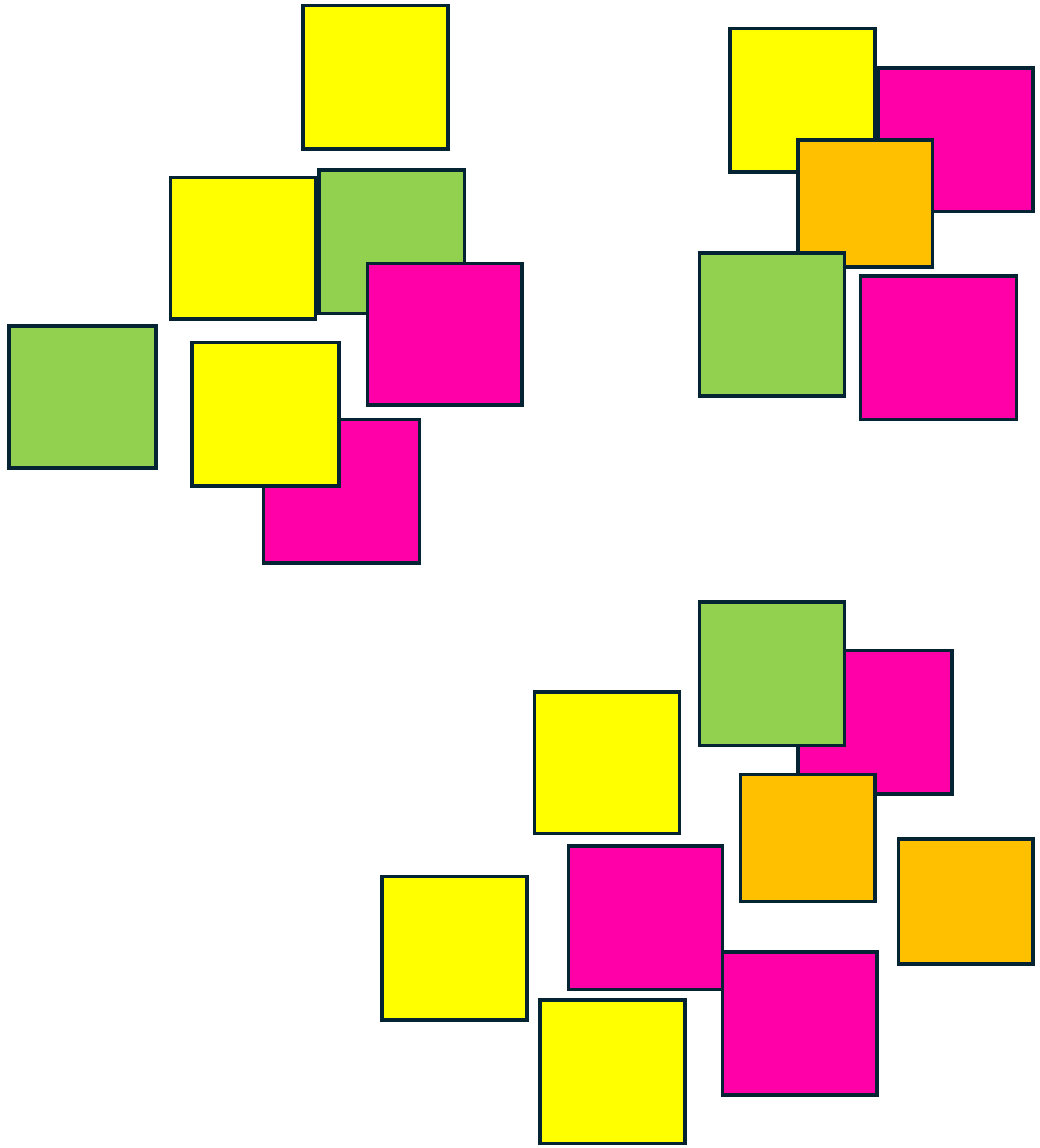
Anders … zoals NGOs

Ophangen bij de onderwerpen

- Inventory of Requirements and Expectations
- Technological Innovations for Landscape Experience and Biodiversity
- Replacement of Plant Support Systems
- Animal Welfare Improvements
- Agricultural Robotics
- Light Management and Market Optimization
- Planning Policies and Guidelines
- Greenhouse Gas Emission Reduction
- Policy and Financial Instruments



Gesprek/ toelichten



Vervolgstappen

The power of the sticker en de ‘business card’

Wat zijn, voor jou, de twee belangrijkste vragen/onderwerpen?

Laat je NAW gegevens/ business card achter als je deze call ondersteund (nemen we op in het voorstel).