UNISDR Technical Workshop
Launch of the Sendai Framework Monitoring Process
8th December 2017
UN Campus Bonn, Germany

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Measuring number of people affected and economic loss due to agricultural droughts – Examples from Ukraine and South Africa

Yvonne Walz, Karen Dall, Annika Min

Background and Motivation

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Agricultural drought

- 23% of loss and damage due to disasters attributed to agricultural sector (FAO, 2017)
- Drought: 84% of loss and damage due to drought hits agriculture (FAO, 2017)

→ Agriculture: highly vulnerable to disasters; but key economic factor and basis for livelihoods

Sendai Framework

- Shift from disaster management to disaster RISK management
- Monitoring progress in disaster risk reduction

→ Need for science-based information and knowledge

→ Need to overcome the lack of data readiness and calculate reference base (UNISDR, 2017)


https://si.wsj.net/public/resources/images/BN-KL046_0922AF_P_20150922222035.jpg

FAO (2017): The impact of disasters on agriculture. Addressing the information gap.
UNISDR (2017): Sendai Framework Data Readiness Review 2017. Global Summary Report.

EvIDENz project

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EvIDENz = Earth Observation based information products for drought risk reduction on the national level

Federal Ministry for Economic Affairs and Energy

EvIDENz

Key objectives of EvIDENz

1.) Assessment of selected targets of the Sendai Framework

2.) Understanding drought risk

Partners:

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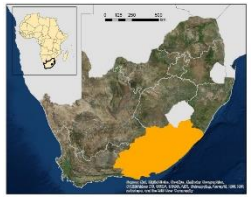
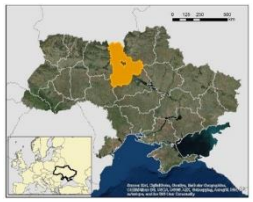
Case study examples

South Africa



Ukraine



Selected Sendai targets

Affected people/
global population
2020-2030 Average << 2005-2015 Average

Economic loss/
global GDP
2030 Ratio << 2015 Ratio

Affiliated partners:

UNITED NATIONS Office for Outer Space Affairs
UN-SPIDER

ІКД

UNIVERSITY OF THE FREE STATE UNIVERSITEIT VAN DIE VRYSTAAT YUNIVESITHI YA FREISTATA UFS UV

EvIDENz approach

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Objective I: Assessment of Sendai targets

HAZARD

Drought hazard classification

EXPOSED ELEMENTS

People, land, assets

Sendai indicators: B5, C2

Sendai Framework Targets

Affected people/ global population
2020-2030 Average << 2005-2015 Average

Economic loss/ global GDP
2030 Ratio << 2015 Ratio

Objective II: Understanding risk

VULNERABILITY

Characteristics of people, land, assets

Risk to agricultural assets and livelihoods

Relying on open, accessible data sets that are representative for the national level!

Assessment of Sendai Targets

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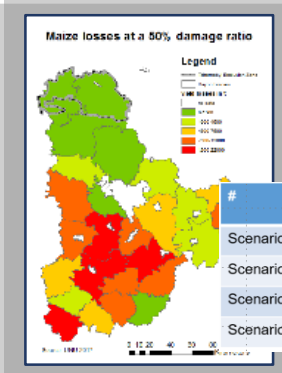
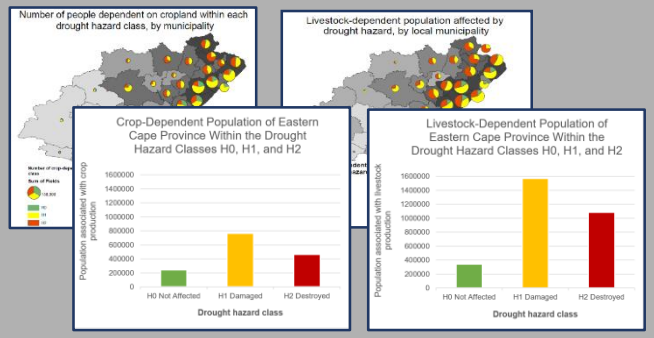
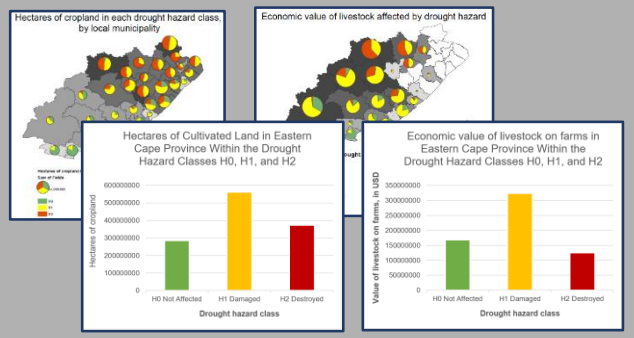
	Target B: People Affected ***B-5: Population with livelihoods were disrupted, destroyed due to drought***	Target C: Economic Loss ***C-2: Direct agricultural loss due to drought***
Ukraine Kiev Oblast		
South Africa Eastern Cape Province		

#	Damage in % yield loss	Loss in tons (∑ Rayons)	Loss in Million US-$ (∑ Rayons)
Scenario 1	20%	61,000	7.8
Scenario 2	25%	78,900	10
Scenario 3	50%	184,000	23.5
Scenario 4	80%	370,000	46.9

Computation of Sendai indicators

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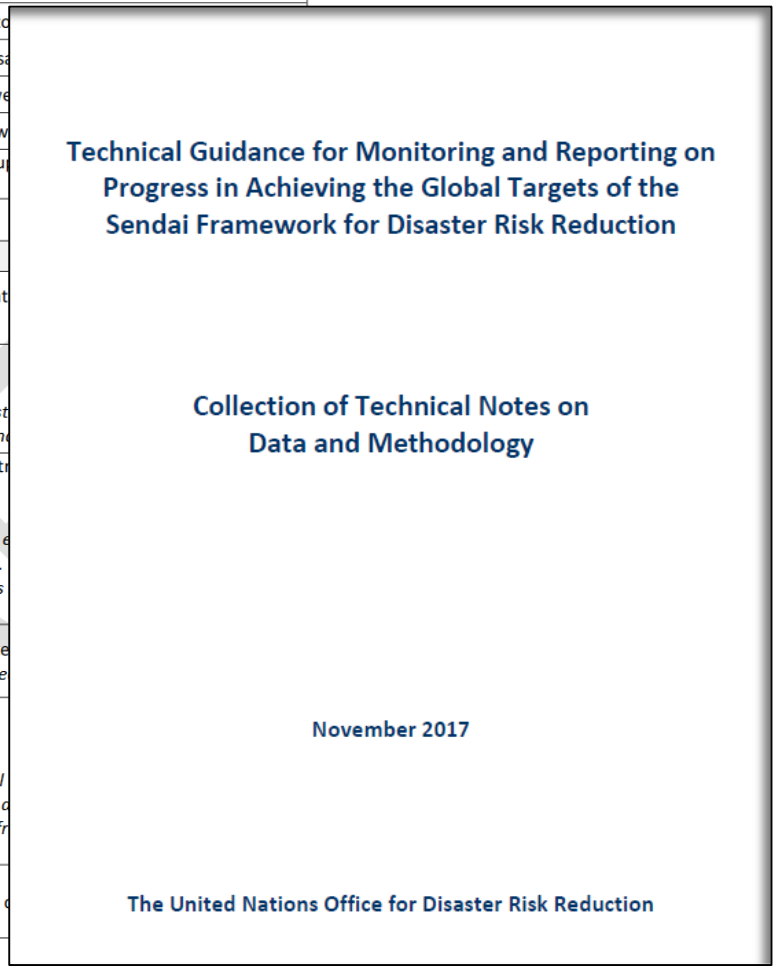
Affected people/
global population
2020-2030 Average << 2005-2015 Average

No.	Indicator
B-1	Number of directly affected people attributed to
B-2	Number of injured or ill people attributed to disa
B-3	Number of people whose damaged dwellings we
B-4	Number of people whose destroyed dwellings w
B-5	Number of people whose livelihoods were disru disasters.

Economic loss/
global GDP
2030 Ratio << 2015 Ratio

No.	Indicator
C-1	Direct economic loss attributed to disasters in relat (compound indicator)
C-2	Direct agricultural loss attributed to disasters *Agriculture is understood to include the crops, livest and forest sectors as well as associated facilities an*
C-3	Direct economic loss to all other damaged or destr disasters. *Productive assets would be disaggregated by e according to standard international classifications. economic sectors relevant to their economies. This metadata.*
C-4	Direct economic loss in the housing sector attribute *Data would be disaggregated according to damage*
C-5	Direct economic loss resulting from damaged attributed to disasters. *The decision regarding those elements of critical calculation will be left to the Member States a metadata. Protective infrastructure and green infr relevant*
C-6	Direct economic loss to cultural heritage damaged



Technical Guidance for Monitoring and Reporting on Progress in Achieving the Global Targets of the Sendai Framework for Disaster Risk Reduction

Collection of Technical Notes on Data and Methodology

November 2017

The United Nations Office for Disaster Risk Reduction

http://www.unisdr.org/files/54970_collectionoftechnicalnotesonindicat.pdf (30.11.2017).

Indicators measured for Target B

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Affected people/
global population
2020-2030 Average << 2005-2015 Average

B5 Number of people whose livelihoods were disrupted or destroyed, attributed to disasters°

B5a hectares of crops affected ($C2C_a$) * average workers per hectare

B5b livestock lost ($C2L_a$) * average workers per livestock

B5c sum of productive assets and infrastructure°°* facilities affected ($C3_b$ and $C5_b$) * average workers per facility and infrastructure

UNISDR 2017, p. 23, 27

° directly measured in situ, or using a nationally defined methodology
°°such as Industrial, Commercial, Services, etc.

Indicators measured for Target C

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Economic loss/
global GDP
2030 Ratio << 2015 Ratio

C2 Direct agricultural loss attributed to disasters

- **C2C** direct crop loss
- **C2L** direct livestock loss
- **C2FO** direct forestry loss
- **C2A** direct aquaculture loss
- **C2FI** direct fishery loss

UNISDR 2017, p. 23, 27

° directly measured in situ, or using a nationally defined methodology
°°such as Industrial, Commercial, Services, etc.

Processing chain: Economic loss due to affected maize in Kyiv oblast in Ukraine (I)

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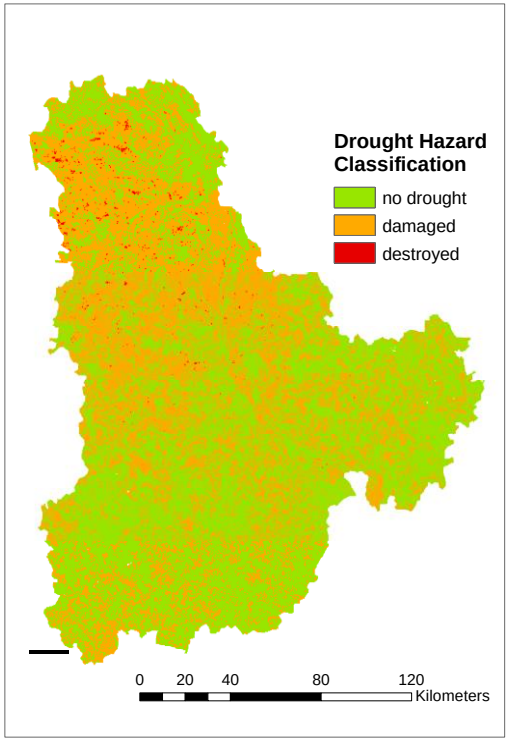
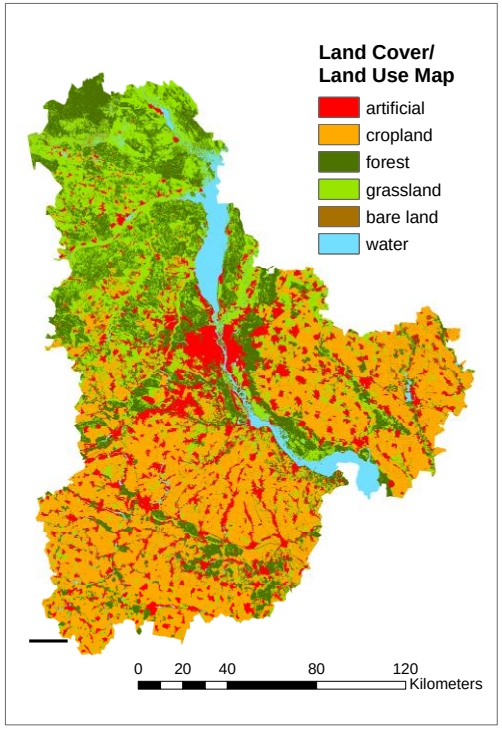
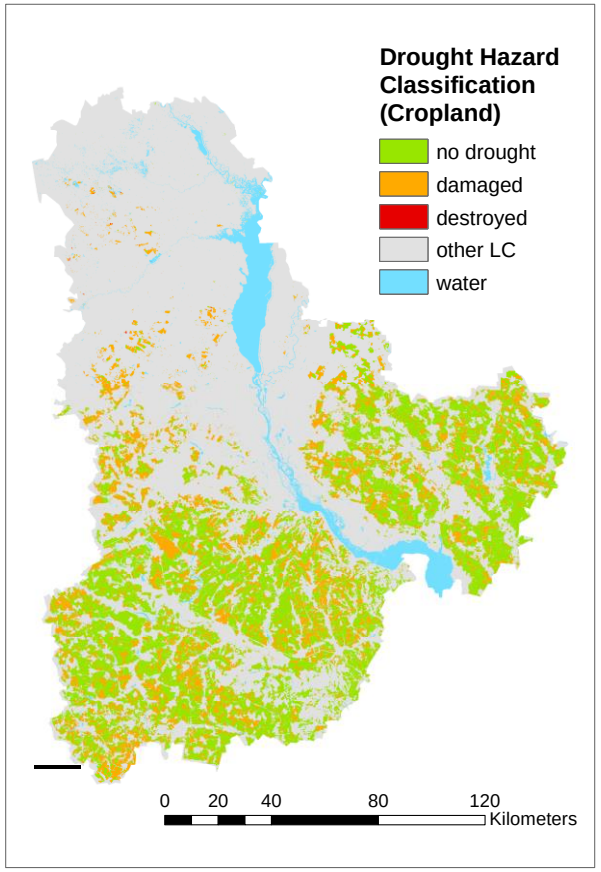


provided by ZFL



provided by N. Kussul, NASU-SSAU



Hazard Severity Map

Crop Specific Severity Map

Processing chain: Economic loss due to affected maize in Kyiv oblast in Ukraine (II)

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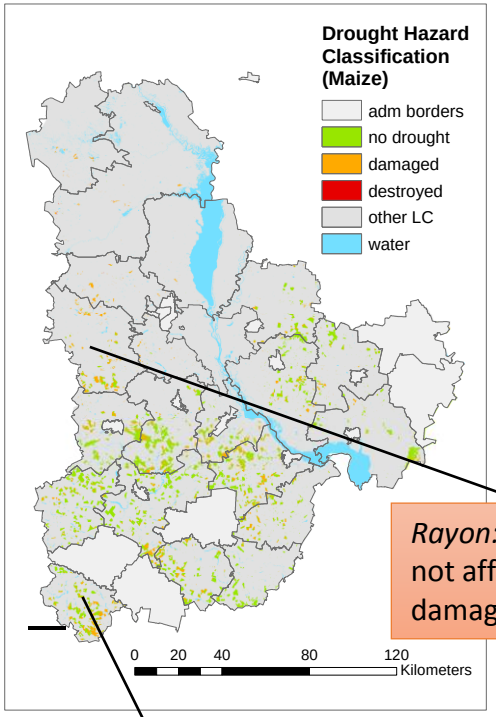
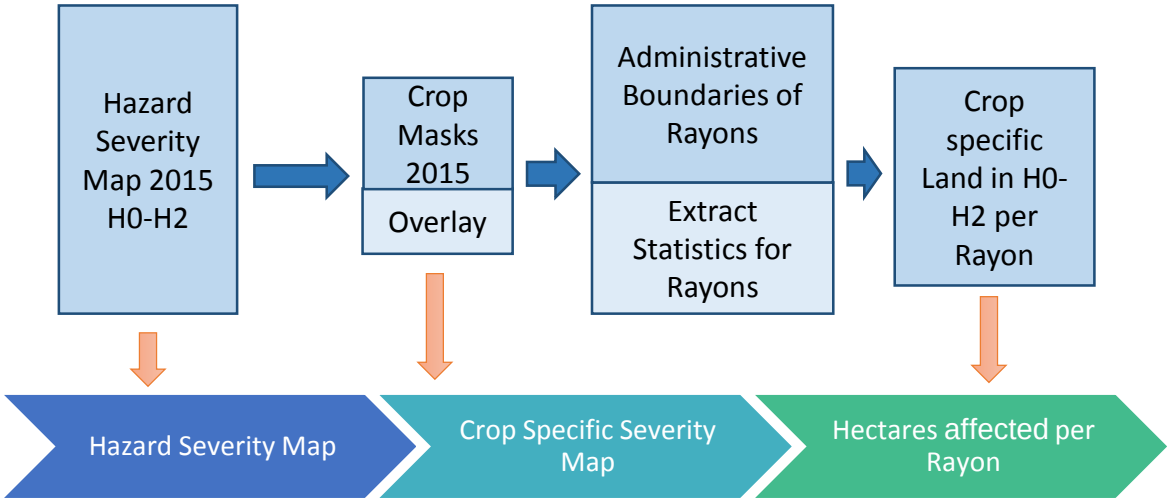


Rayon: Makarivskyi
not affected = 2,450 ha
damaged = 4,200 ha

Rayon: Teetivskyi
not affected = 6,800 ha
damaged = 5,100 ha



Processing chain: Economic loss due to affected maize in Kyiv oblast in Ukraine (III)

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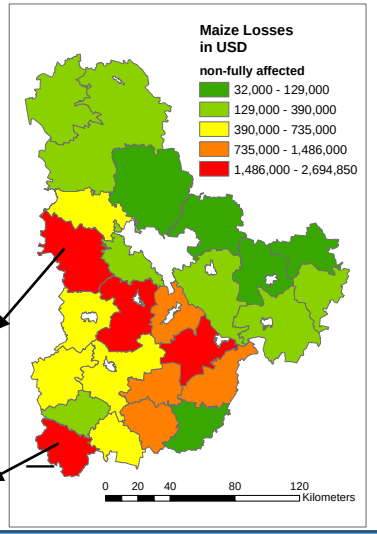
Difference between expected and actual value of crop production in non-fully affected harvested area

→ $p_{ij,t-1} \cdot \Delta y_{ij,t} \cdot ha_{ij,t} \cdot 1(\Delta y_{ij,t}>0)$

→ $Price_{pre\text{-}disaster}$* (expected yield ($Y_{max}$) – actual yield ($Y_{2015}$))*number of hectares

→ selling consumer price[1] * ($Y_{max2004\text{-}2015}$ – Y_{2015}) * ha_{H1}

[1] http://www.agricistrade.eu/statistics



Rayon: Makarivskyi
Economic loss due to maize = 1,7 Mio US$

Rayon: Teetivskyi
Economic loss due to maize = 2,4 Mio US$

Target C: Economic loss.
Focus on C-2: Direct agricultural loss due to hazardous events.

C2-1: Direct agricultural loss due to crops affected (damaged or destroyed)

Hazard Severity Map 2015 H0-H2

Crop Masks 2015 — Overlay

Administrative Boundaries of Rayons — Extract Statistics for Rayons

Crop specific Land in H0-H2 per Rayon

Yield in t/ha — Calculate losses (t)

Producer Selling Prices — Multiply losses and prices

Economic loss in USD per crop within each rayon (2015)

Hazard Severity Map → Crop Specific Severity Map → Hectares affected per Rayon → Yield Losses → Economic Loss in USD

Processing chain: People affected by crops damaged or destroyed in South Africa

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B5a = hectares of crops affected * average workers per hectare

Households involved in crop production **x** Number of people per household **=** Number of crop-dependent people

Number of crop-dependent people **÷** Hectares of cropland **=** Density of crop-dependent population per hectare of cropland

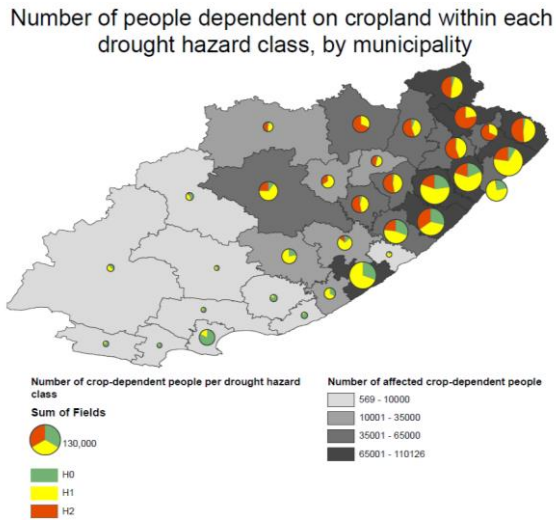
Density of crop-dependent population per hectare of cropland **x** Hectares of cropland in hazard classes (from C2-C) **=**

Data from Statistics South Africa — your leading partner in quality statistics

Data from EvIDENz

Data from environmental affairs, Department: Environmental Affairs, REPUBLIC OF SOUTH AFRICA; GEOTERRA IMAGE

People affected by crops damaged or destroyed



Experienced opportunities and challenges of processing Sendai indicators

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Opportunities

Processing chain based on remote sensing data in combination with socio-economic data:

- Supports the retrospective assessment of indicators (relevant for reference base).
- Provides a spatial explicit, disaggregated, objective information as cross-reference.
- Documentation and dissemination as „recommended practices“ via UN-SPIDER knowledge portal allows to reproduce procedure for any region.

Challenges

- Defining thresholds to determine not affected, not fully affected (damaged) and fully affected (destroyed).
- Reduce uncertainties in measuring indicators.

Why vulnerability matters?

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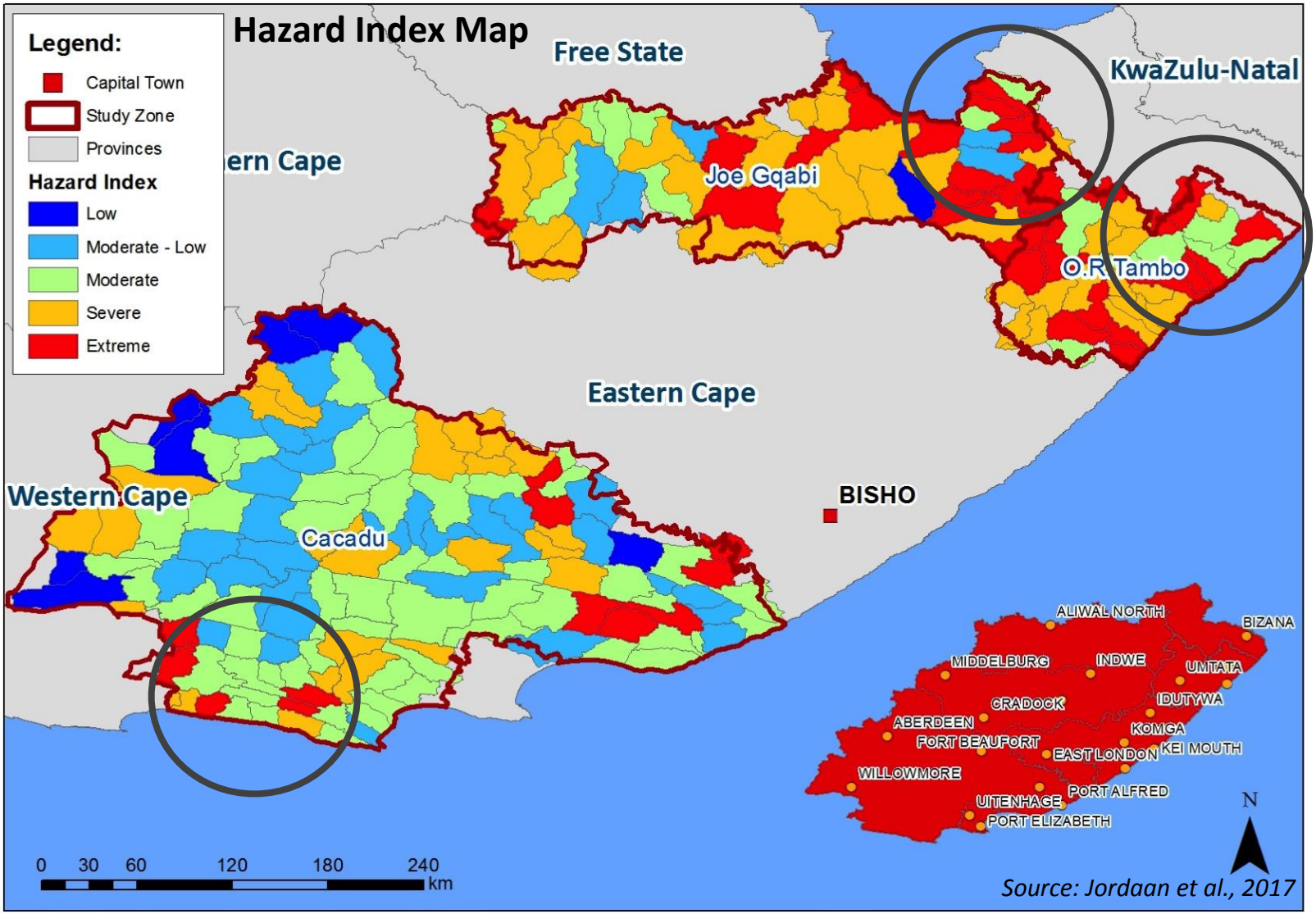

Source: Jordaan et al., 2017

Why vulnerability matters?

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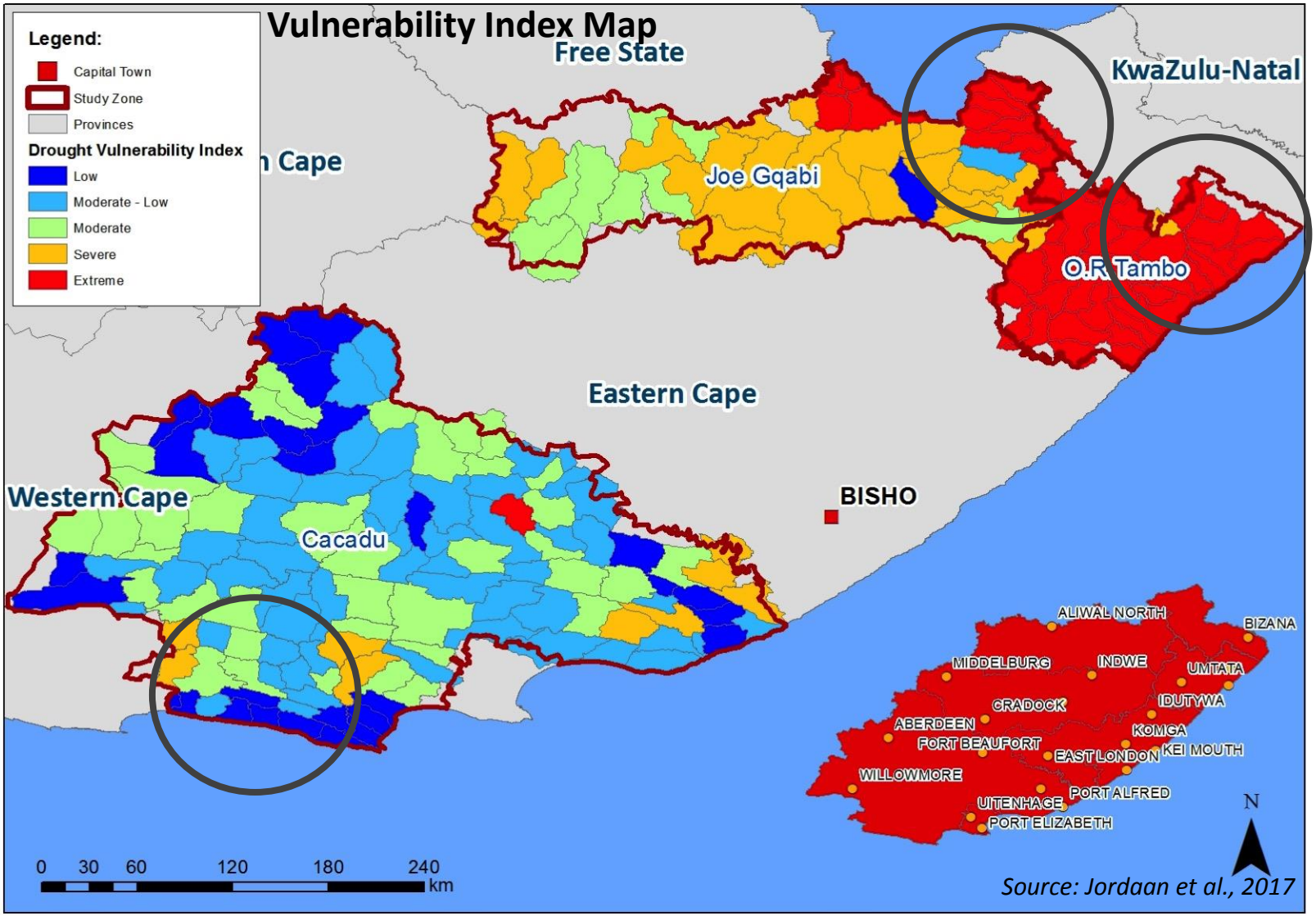

Source: Jordaan et al., 2017

Why vulnerability matters?

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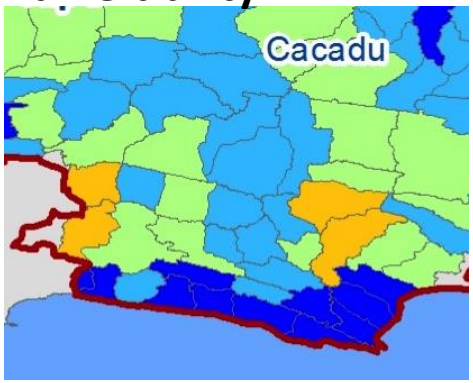
- Support decision making on the activation of safety nets
- Understanding risk through characteristics of vulnerability and identifying entry points for pro-active risk reduction strategies and adaptation.
- Identifying current and potential hotspots of vulnerability to drought hazards and in this relation identify hotspots of impacts.
- Tracking changes in vulnerability and monitoring and evaluation of prevention and adaptation efforts.

Hazard

Vulnerability



Source: Jordaan et al., 2017

Outlook: Does vulnerability impact Sendai indicator values?

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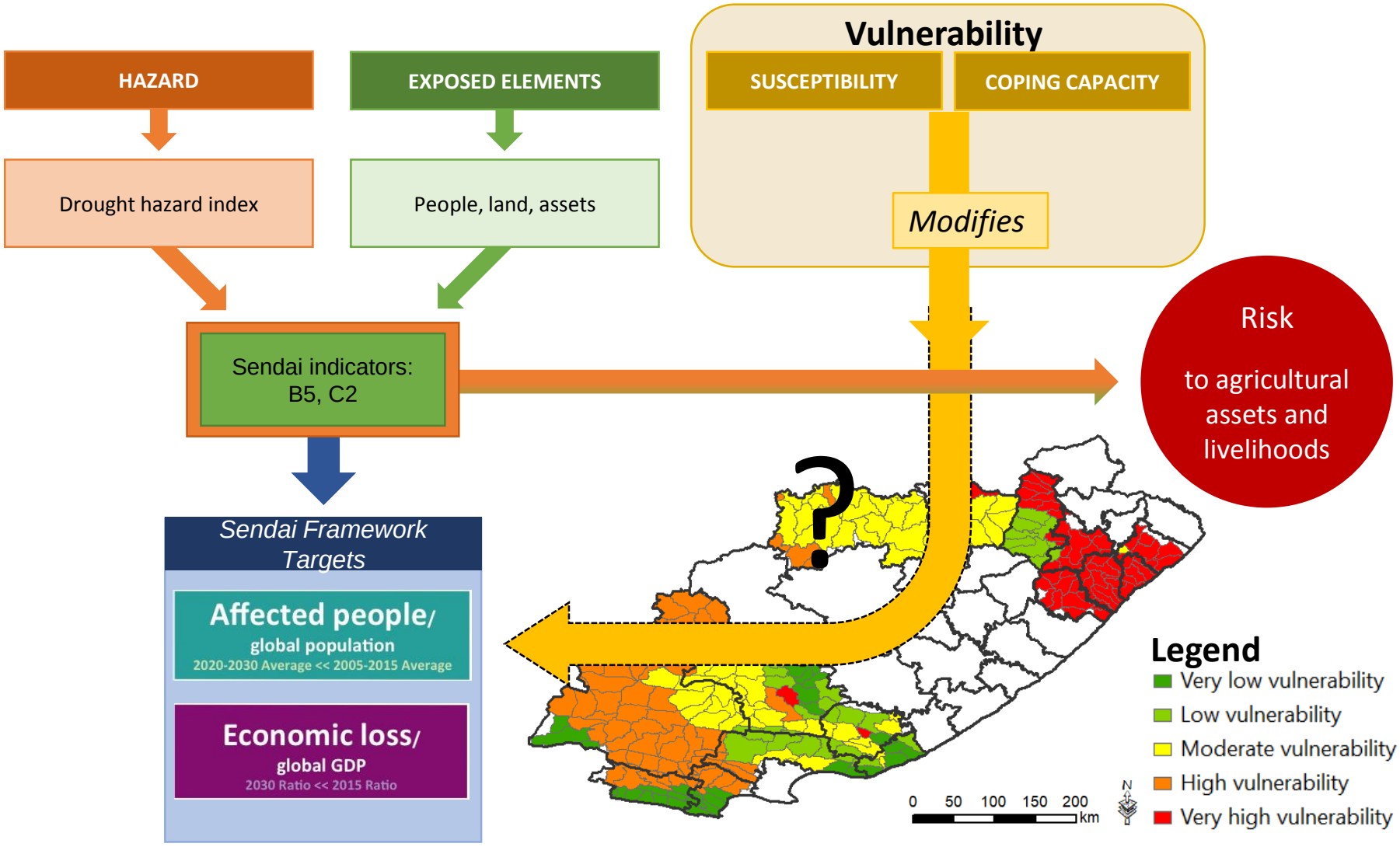

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Thank you very much for your attention

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Understanding risk – Measuring vulnerability to drought

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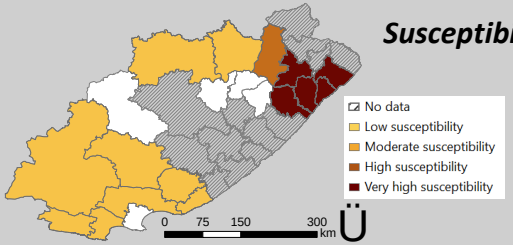
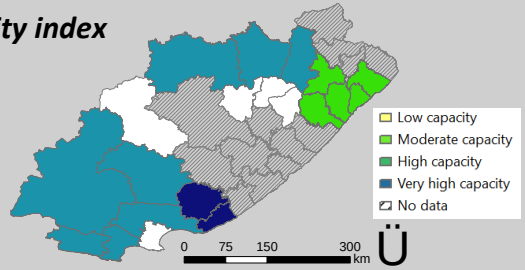
South Africa
Eastern Cape Province

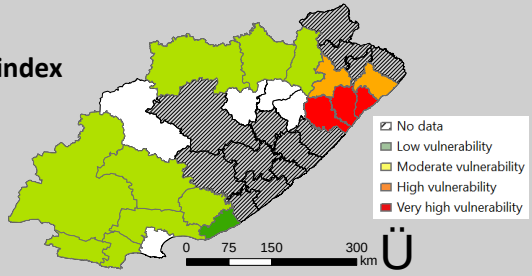
Susceptibility index



Capacity index

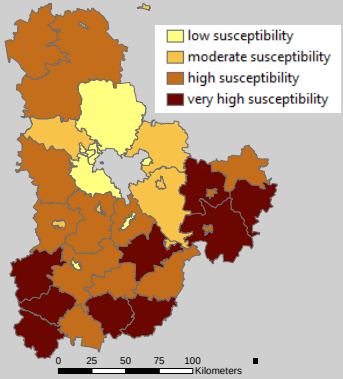


Vulnerability index



Ukraine
Kiev Oblast

Susceptibility index



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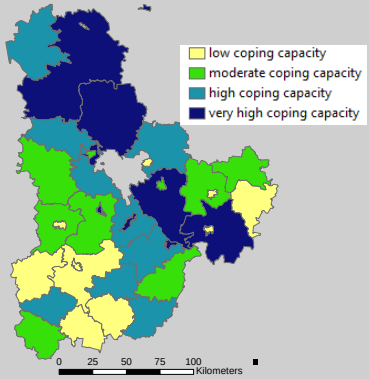
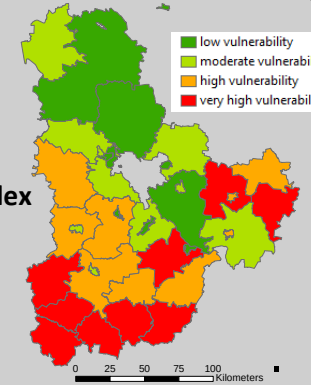


Vulnerability index



Indicators measured for Target C

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Economic loss/
global GDP
2030 Ratio << 2015 Ratio

C2 Direct agricultural loss attributed to disasters

C2C direct crop loss

Loss of annual crop stocks

Loss of perennial crop stocks

Annual crop production loss = difference between expected and actual value of crop production in non-fully affected harvested area in disaster year + pre-disaster value of destroyed crops in fully-affected areas + Short-run post-disaster maintenance costs (lump sum of expenses used to temporarily sustain production activities immediately post-disaster

Perennial crop production loss

Crop assets lost

UNISDR 2017, p. 23, 27