



# Zurich Flood Resilience Alliance Risk Assessment in the resilience space

Swiss Development Corporation – Brownbag Lunch and Learn – September 2019  
Michael Szönyi – Flood Resilience Program Lead – Zurich Insurance Group

In partnership  
with:



# In alliance with...



... we work on long-term, skills-based, flexible partnerships. Phase 2 of ZFRA: 2018-2023

## Our objectives

### Objective 1

Increase funding for flood resilience

### Objective 2

Policy at global, national or sub-national level is improved

### Objective 3

Improve flood resilience practice

# How do we define resilience?

“The ability of a system, community, or society to pursue its social, ecological, and economic development and growth objectives, while managing its disaster risk over time in a mutually reinforcing way”



Individual:  
Get a degree



Household:  
Buy a vehicle



Small business:  
Expand production



Community:  
Electrify the community



There's a  
flood event

Are the community members going to be able to  
achieve their goals in their planned timeframes?

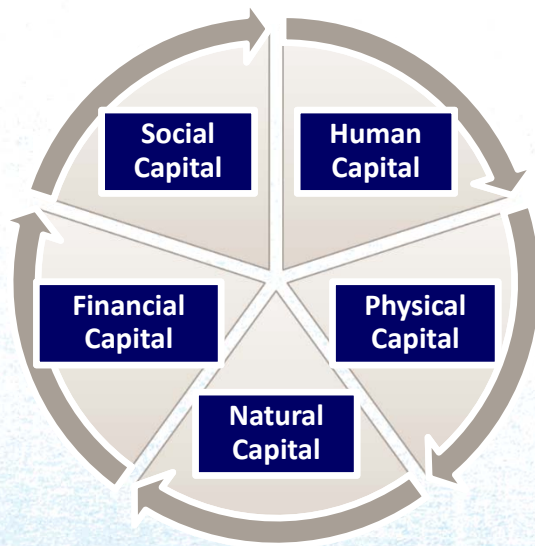
**Take away: Resilience is NOT just bouncing back. It is NOT the inverse of vulnerability**



# We have developed a robust community flood resilience measurement approach

- Our 5C-4R framework is using established models and Zurich Risk Engineering expertise (“Zurich Risk Grading”)

**SUSTAINABLE LIVELIHOODS  
FRAMEWORK: THE 5CS**



**44 SOURCES  
OF RESILIENCE**

Each mapped to 5C, 4R,  
7 themes, ...

Each Source graded A-D

**ROBUSTNESS** (ability to withstand a shock)

for example, housing and bridges built to withstand flood waters

**REDUNDANCY** (functional diversity)

for example, having many evacuation routes

**RESOURCEFULNESS** (ability to mobilize when threatened)

for example, a community group who can quickly turn a community centre into a flood shelter

**RAPIDITY** (ability to contain losses and recover in a timely manner)

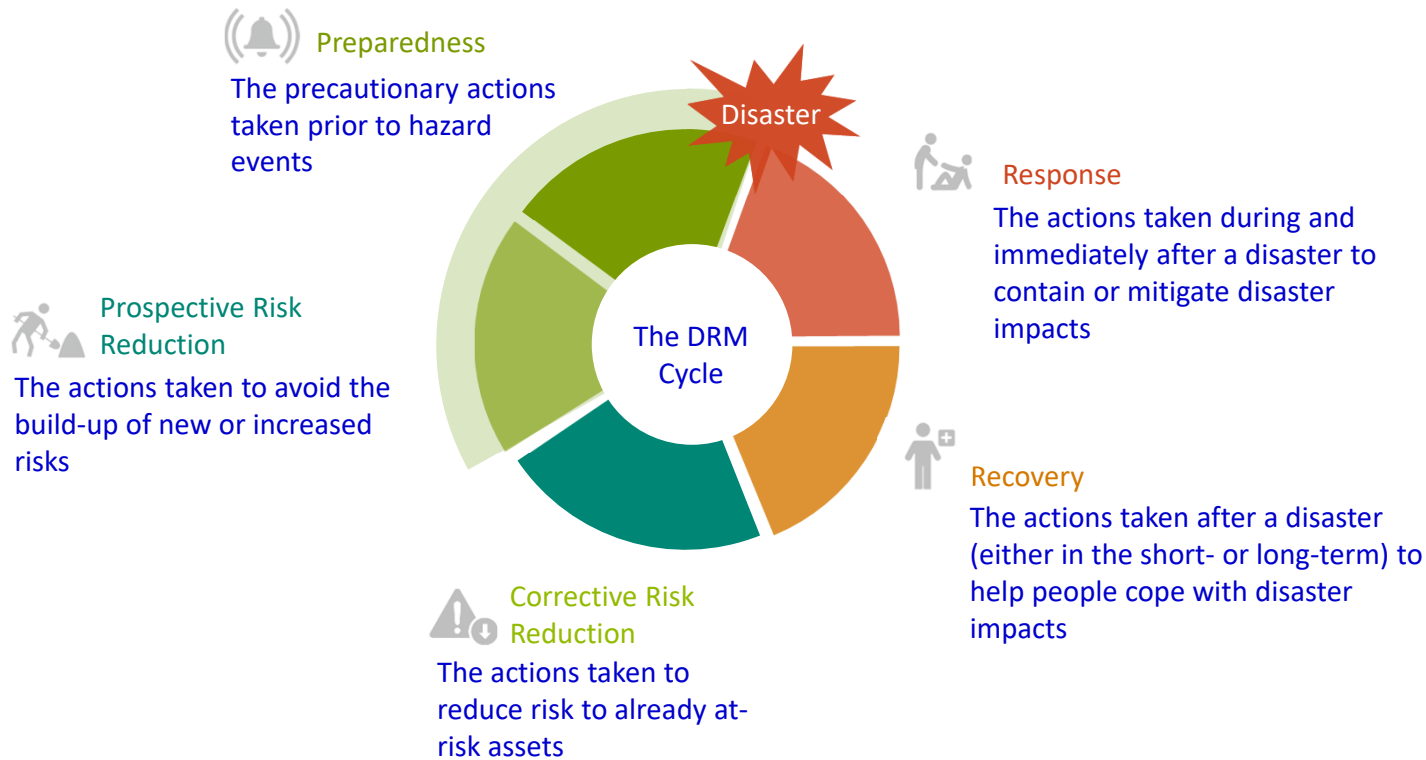
for example, access to quick finance for recovery

Developed by the Multidisciplinary Center for Earthquake Engineering Research at the University of Buffalo in the US (MCEER)

# Flood Resilience – Events are natural, disasters are not

The Disaster Risk Management (DRM) cycle

## Role of Insurance as part of the integrated Risk Management Cycle



# Flood Resilience – Events are natural, disasters are not

The creation of risk. 1. Understand the hazard

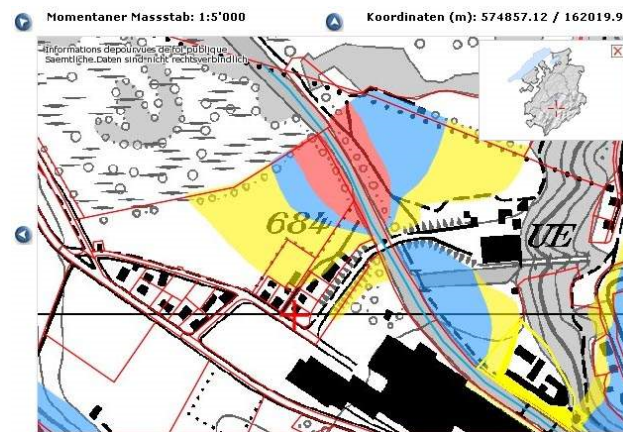


# Flood Resilience – Events are natural, disasters are not

The creation of risk. 1. Understand the hazard

Left: Example flood hazard map (Germany)

Right: Example flood probability/intensity map (Switzerland)

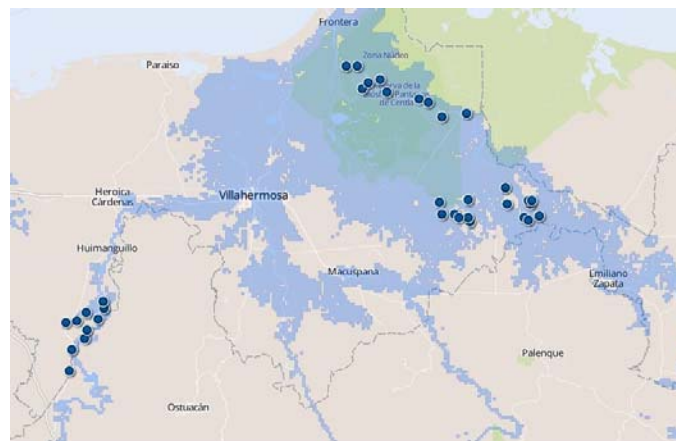
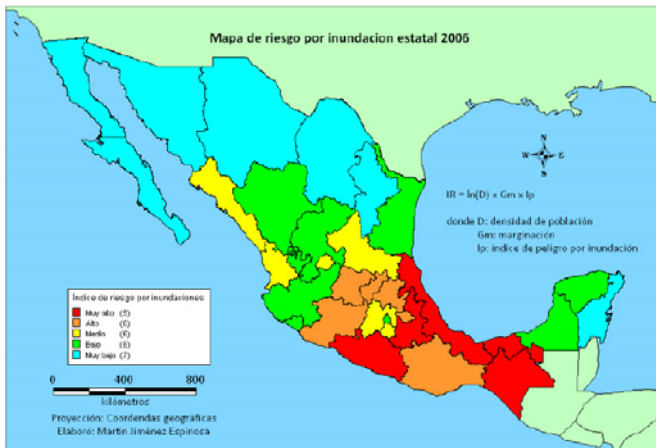


**Hazard models** (trying to answer the question of how often does it flood how much)

- Availability?
- Resolution / detail?
- Validity?
- Do you understand it?

# Flood Resilience – Events are natural, disasters are not

The creation of risk. 1. Understand the hazard



## Hazard models (trying to answer the question of how often does it flood how much)

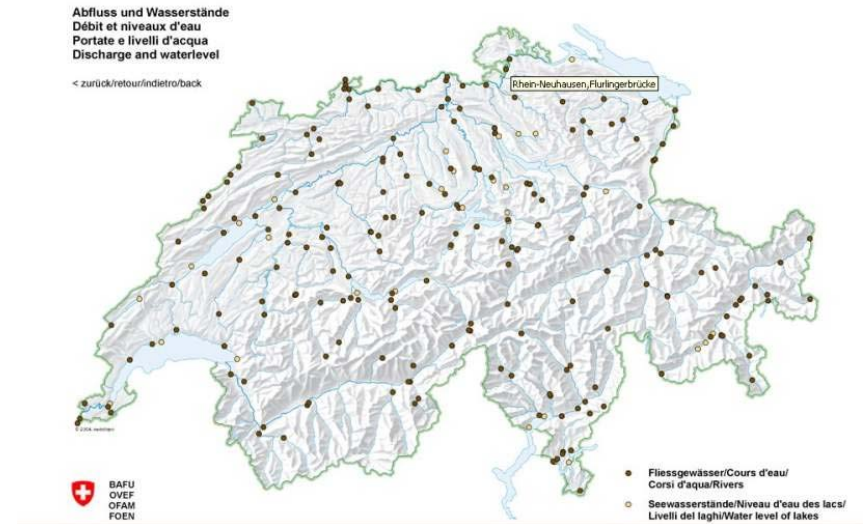
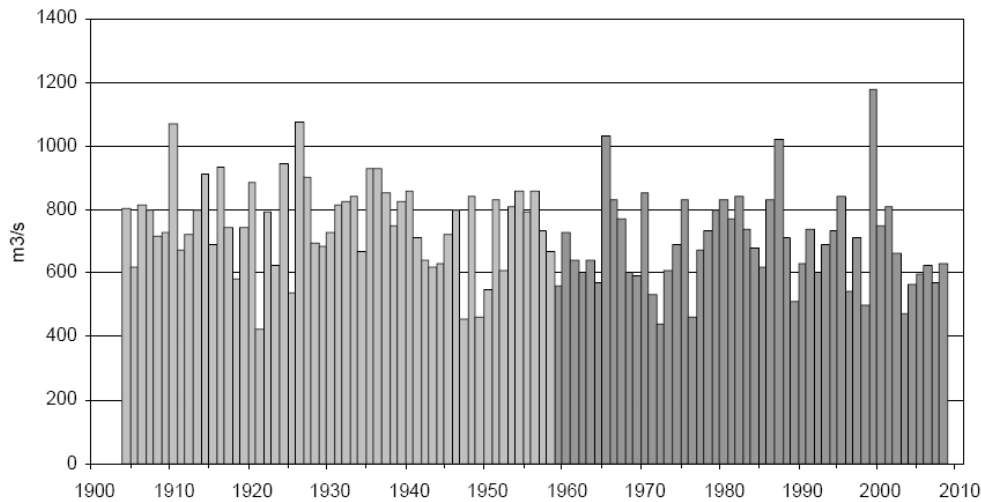
- Availability?
- Resolution / detail?
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- Do you understand it?



# Flood Resilience – Events are natural, disasters are not

The creation of risk. 1. Understand the hazard

Jahreshochwasser der gesamten Beobachtungsperiode 1904- 2008:



<http://www.hydrodaten.admin.ch/d/oberfl.html>

## Data

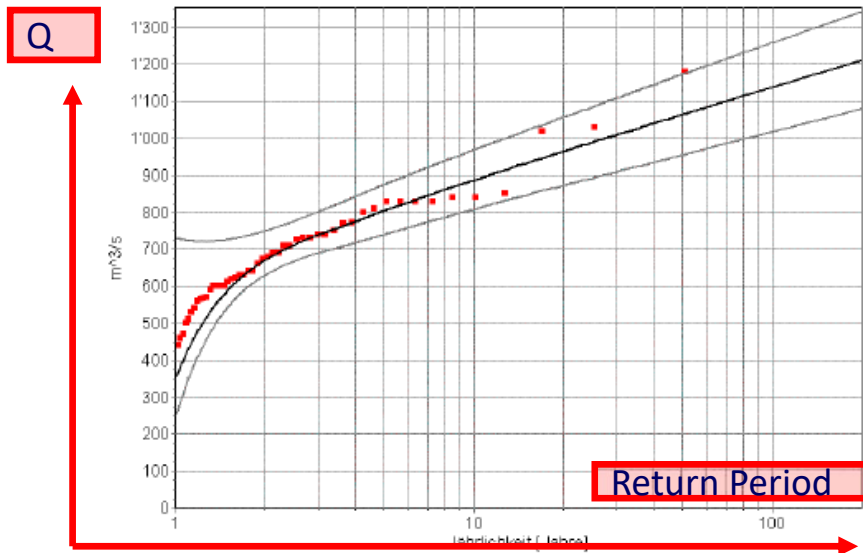
- Availability? Trustworthy? Cost?
- Completeness?
- Process understanding? → Riverine versus pluvial versus inner-city flooding very different!
- Forward looking???

# Flood Resilience – Events are natural, disasters are not

The creation of risk. 1. Understand the hazard

Statistik der Jahreshochwasser der Untersuchungsperiode 1959-2008 ( 50 Jahre):

Grösste Jahresspitze: 1180 m <sup>3</sup> /s (1999)	Kleinste Jahresspitze: 441 m <sup>3</sup> /s (1972)		
Mittelwert: 691.133 m <sup>3</sup> /s	Standardabweichung: 148.461	Schiefe: 0.935	
Median: 676.57 m <sup>3</sup> /s	Variationskoeffizient: 0.215	Exzess (Kurtosis): 1.547	



Verteilung: Log-Pearson-III  
Vertrauensintervall: 95%

Jährlichkeit [Jahre]	Abfluss [m <sup>3</sup> /s]
2	671
5	803
10	887
30	1009
50	1064
100	1138
300	1260



Source: Swiss Federal Office of the Environment

# Flood Resilience – Events are natural, disasters are not

The creation of risk. Avoid the creation of new risk: Exposure management

$$\text{Risk} = \text{Hazard} \times \text{Exposure} \dots$$



## Exposure mapping

### Exposure management

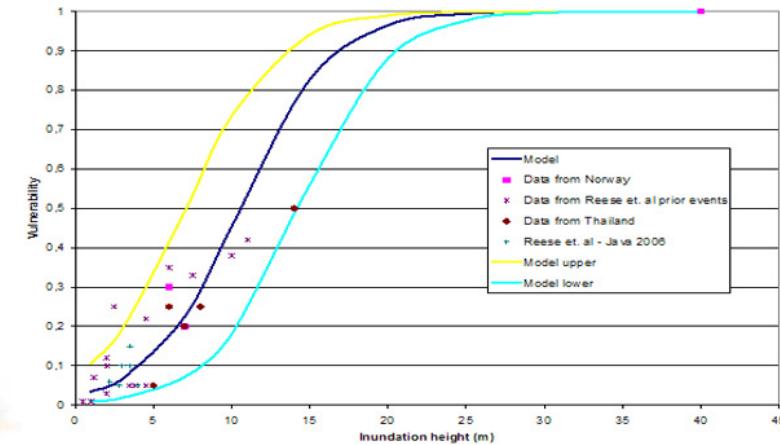
- Georeference of assets and population
- Availability of information?
- Transect walk, local mapping exercise
- Social versus financial exposure
- Competing interests

# Flood Resilience – Events are natural, disasters are not

The creation of risk. Manage your existing risk. Reduce vulnerability

We need to address risk holistically, i.e. look at hazard, exposure, vulnerability

$$\text{Risk} = \text{Hazard} \times \text{Exposure} \times \text{Vulnerability}$$



**Vulnerability:** functional relationship between hazard intensity (e.g. flood height) and the amount of the consequences (e.g. loss, damage).

**Context Dependence!**

Social, economic and physical vulnerability to the hazard

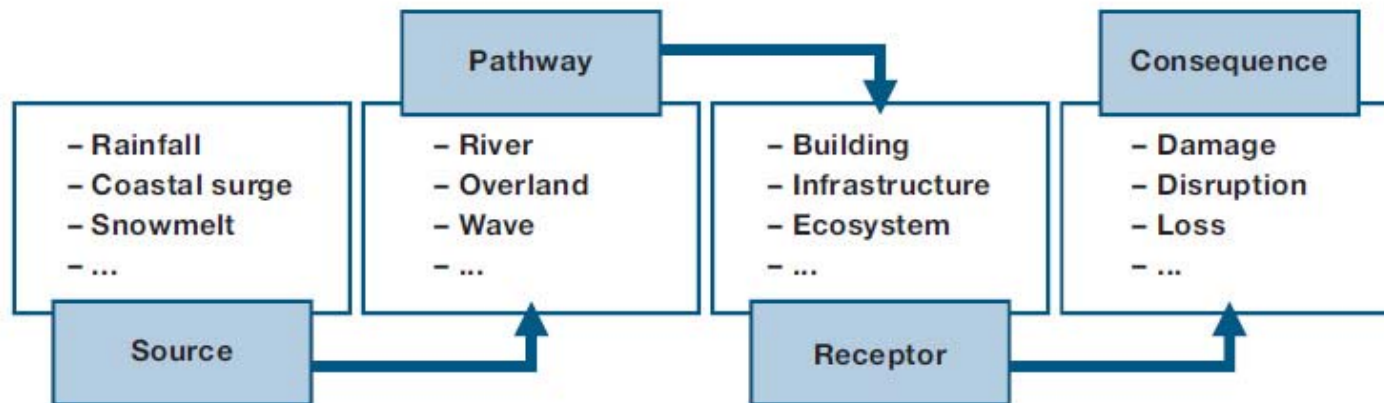


## Another option: SPRC model

### Consequences: A look at receptors and their vulnerability

Receptors will need a different 'resilience lens'. How do we tackle specifically the following receptors?

- People
- The built environment
- Critical systems and cascading failures
- Agriculture, livelihoods



# Thank you

Zurich Insurance Group – Flood Resilience  
<https://www.zurich.com/flood-resilience>



Photo: Michael Szönyi

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# Solutions we can offer

## Flood Resilience Portals for cross-cutting knowledge sharing

–Knowledge from the Alliance and beyond on how to build community resilience published on the Alliance’s online portals:

–Global

<http://floodresilience.net/>

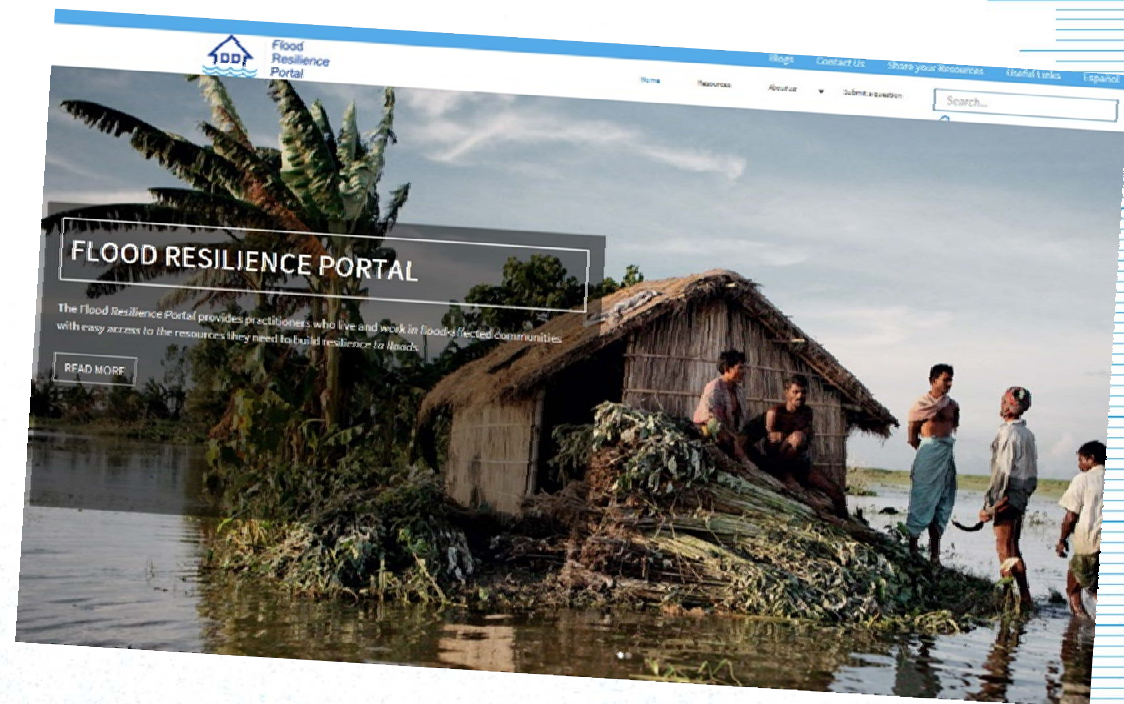
–Latin America

<https://infoinundaciones.com/>

–Nepal

<http://floodresilience.net.np/>

–FRMC: <http://floodresilience.net/frmc>





## More resources to understand the Alliance

- Zurich Flood Resilience Program webpage: <https://www.zurich.com/flood-resilience>
- Learning to support the SDGs: Post Event Review Capability (PERC): <https://www.zurich.com/en/corporate-responsibility/flood-resilience/learning-from-post-flood-events>
- Videos explaining the measurement approach in detail: <https://www.zurich.com/en/sustainability/flood-resilience/measuring-flood-resilience>
- Four-pager explaining the approach in text and illustrations: <https://floodresilience.net/resources/item/the-flood-resilience-measurement-for-communities-frmc>
- The Alliance knowledge & learning webpage: <http://floodresilience.net/>
- COP24 reflections on the economic case for resilience: <https://www.euractiv.com/section/climate-environment/news/climate-change-the-economic-case-of-prevention-and-resilience/>

## More resources – Scientific output (selection)

- Flood Resilience Measurement Framework (NHES): <http://www.nat-hazards-earth-syst-sci.net/17/77/2017/>
- Disaster forensics (PERC) cross-cutting lessons (NHES): <http://www.nat-hazards-earth-syst-sci.net/16/1603/2016/>
- Disaster resilience and how it helps change development policy (Wiley): <http://onlinelibrary.wiley.com/doi/10.1111/dpr.12201/abstract>
- Technologies to support community flood disaster risk reduction (IJDRS): <http://link.springer.com/article/10.1007%2Fs13753-016-0086-5>
- Economic efficiency of disaster risk management and cost-benefit (NH): <http://link.springer.com/article/10.1007%2Fs11069-016-2170-y>
- Building resilience into our communities (Nature): <http://www.nature.com/news/we-must-build-resilience-into-our-communities-1.18223>
- What drives households to buy flood insurance (EE): <http://www.sciencedirect.com/science/article/pii/S0921800915002876>