

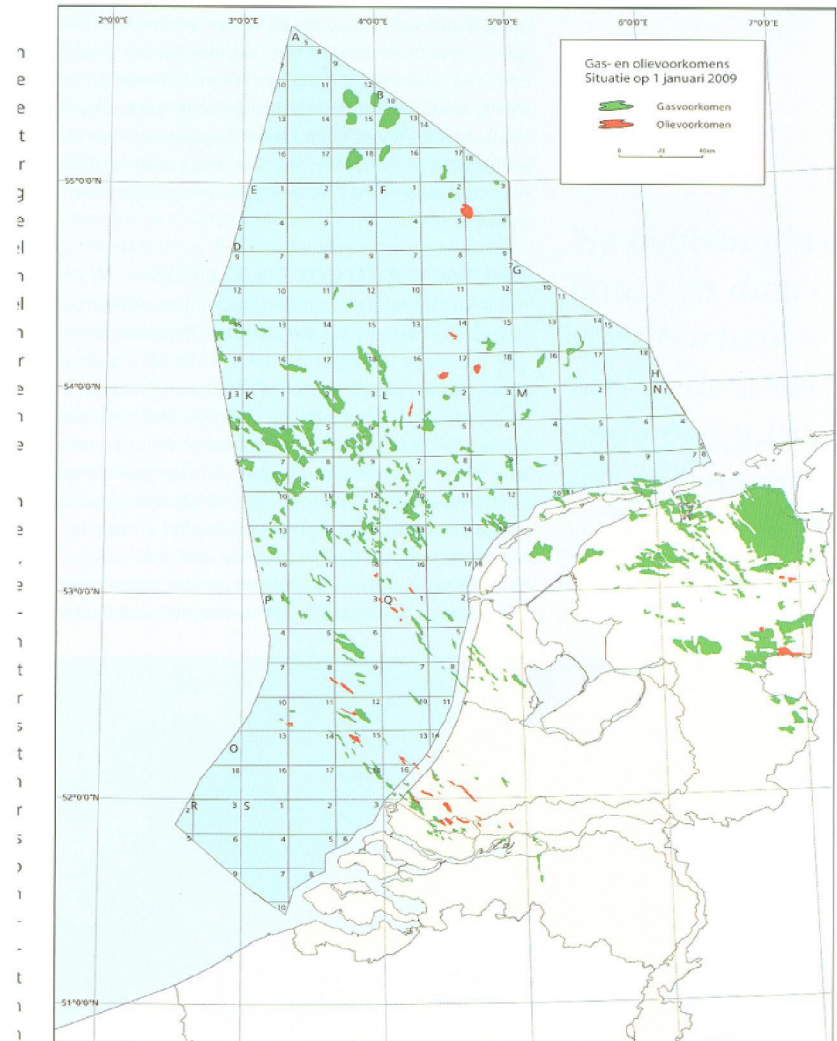
Aardbevingen; dreiging en risico's

5.1.2e

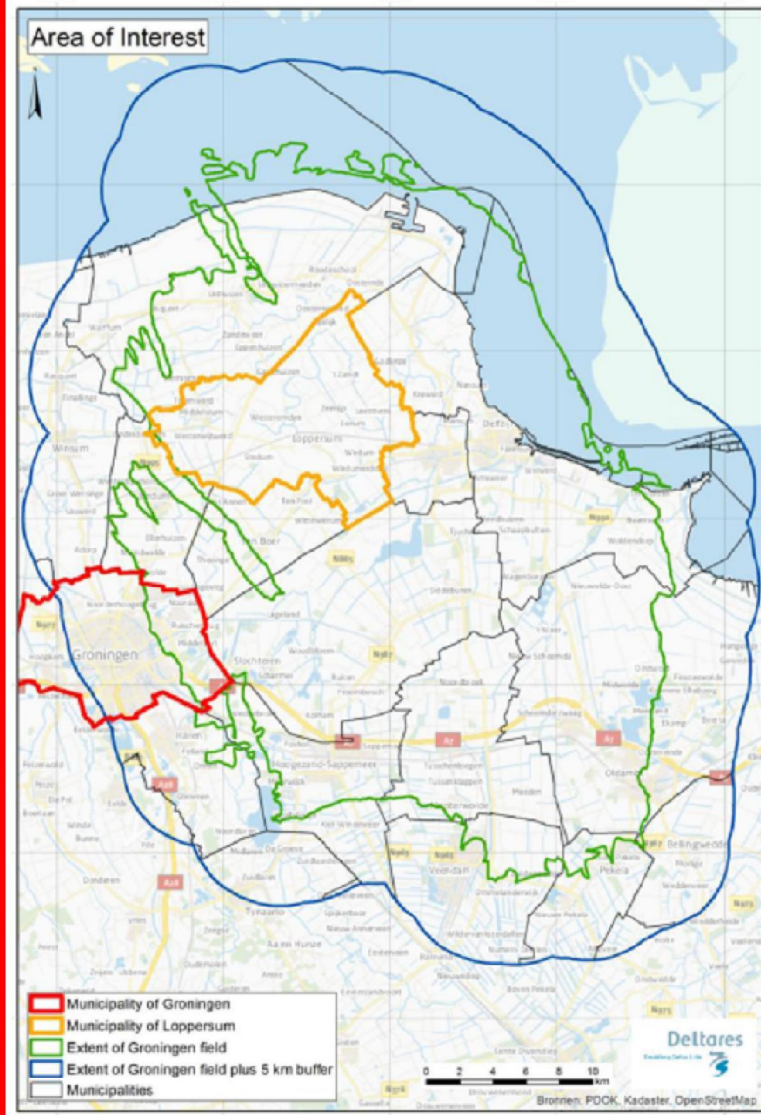
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belang aardgas

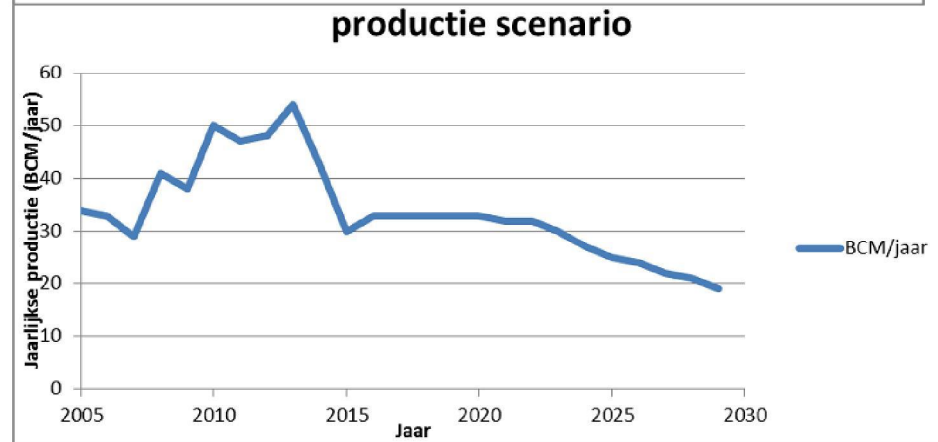
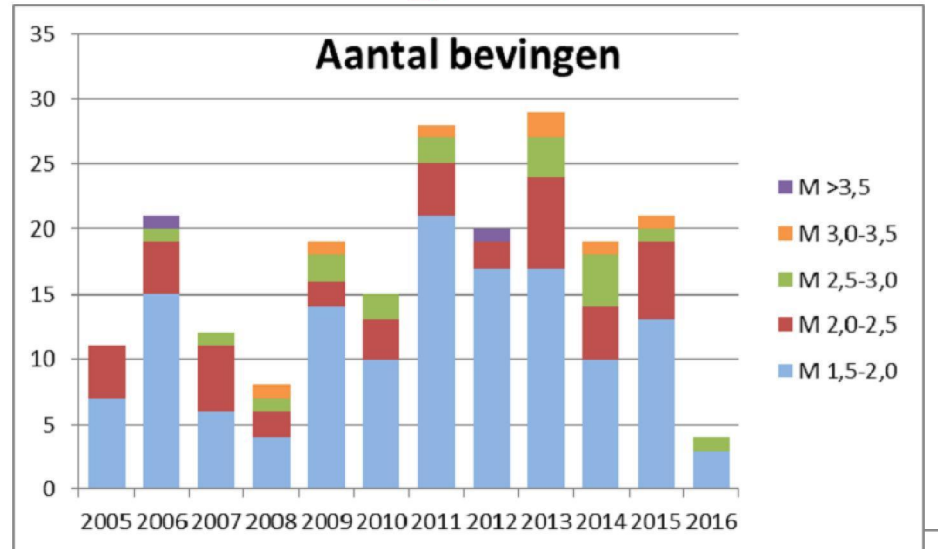
- 42% van al onze energie.
- 60% van onze elektriciteit.
- 5-10% staatsinkomsten.
- Top 10 gasproducenten.
- 40 miljard m³ eigen gebruik
- 50 miljard m³ export



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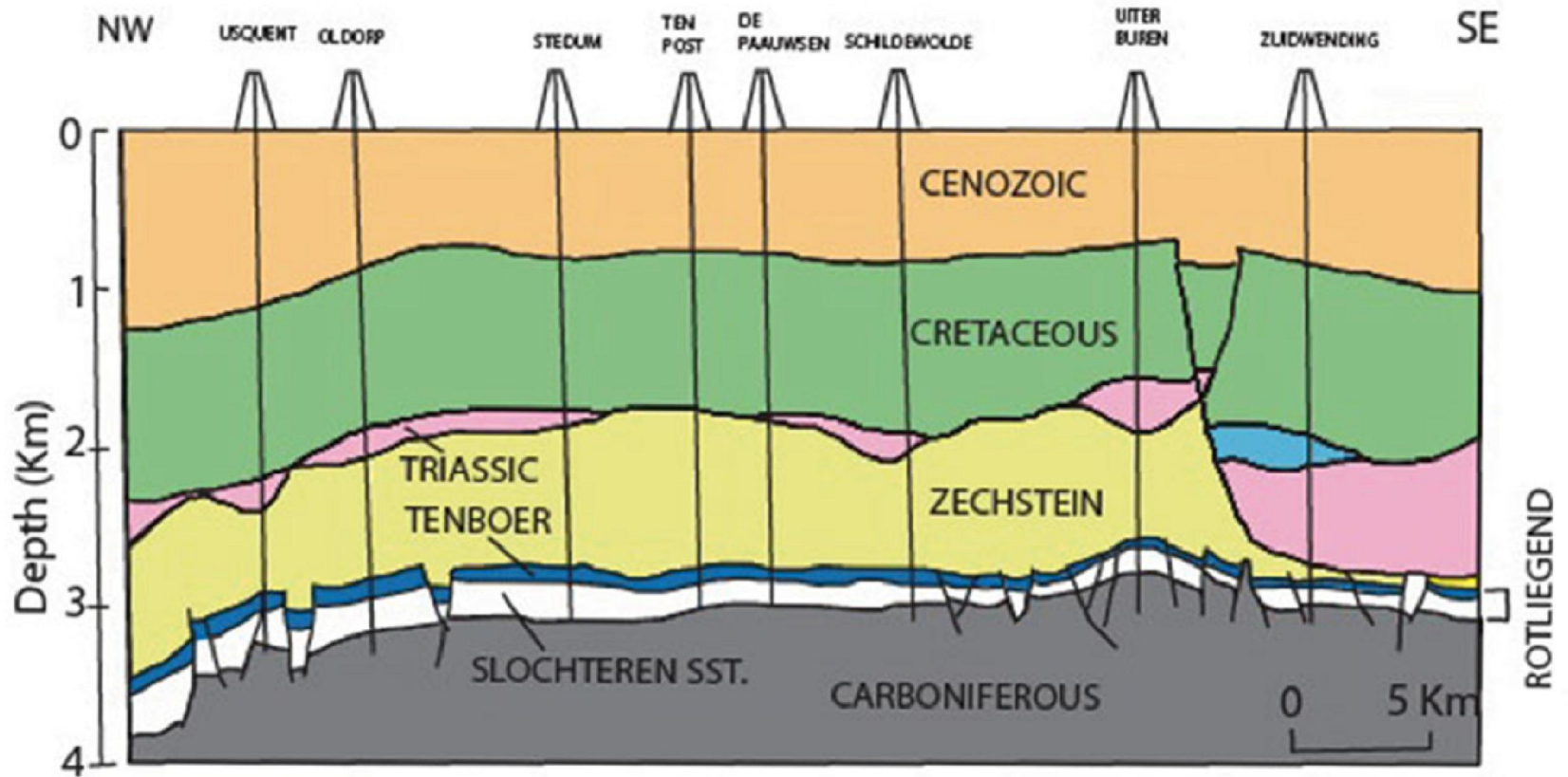


Groningenveld



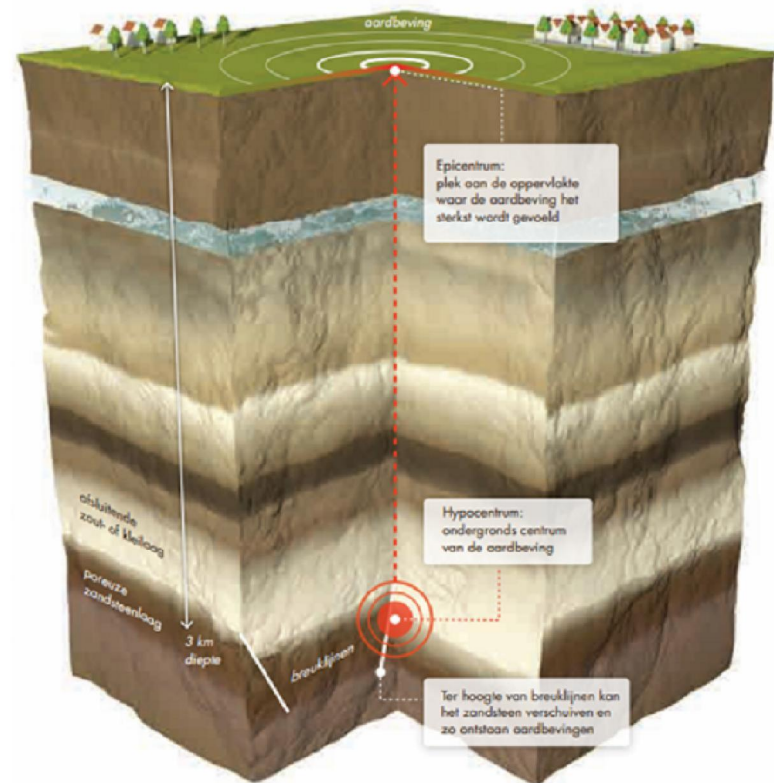
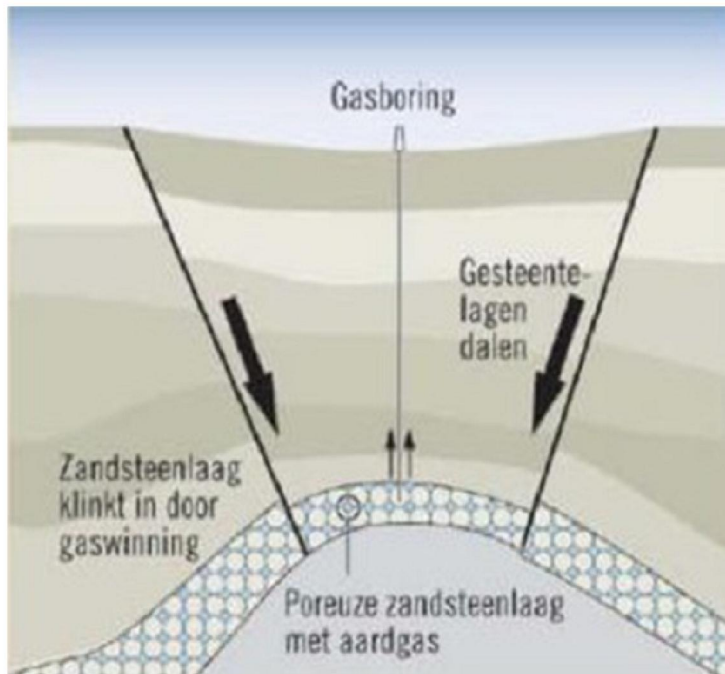
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Dwarsdoorsnede



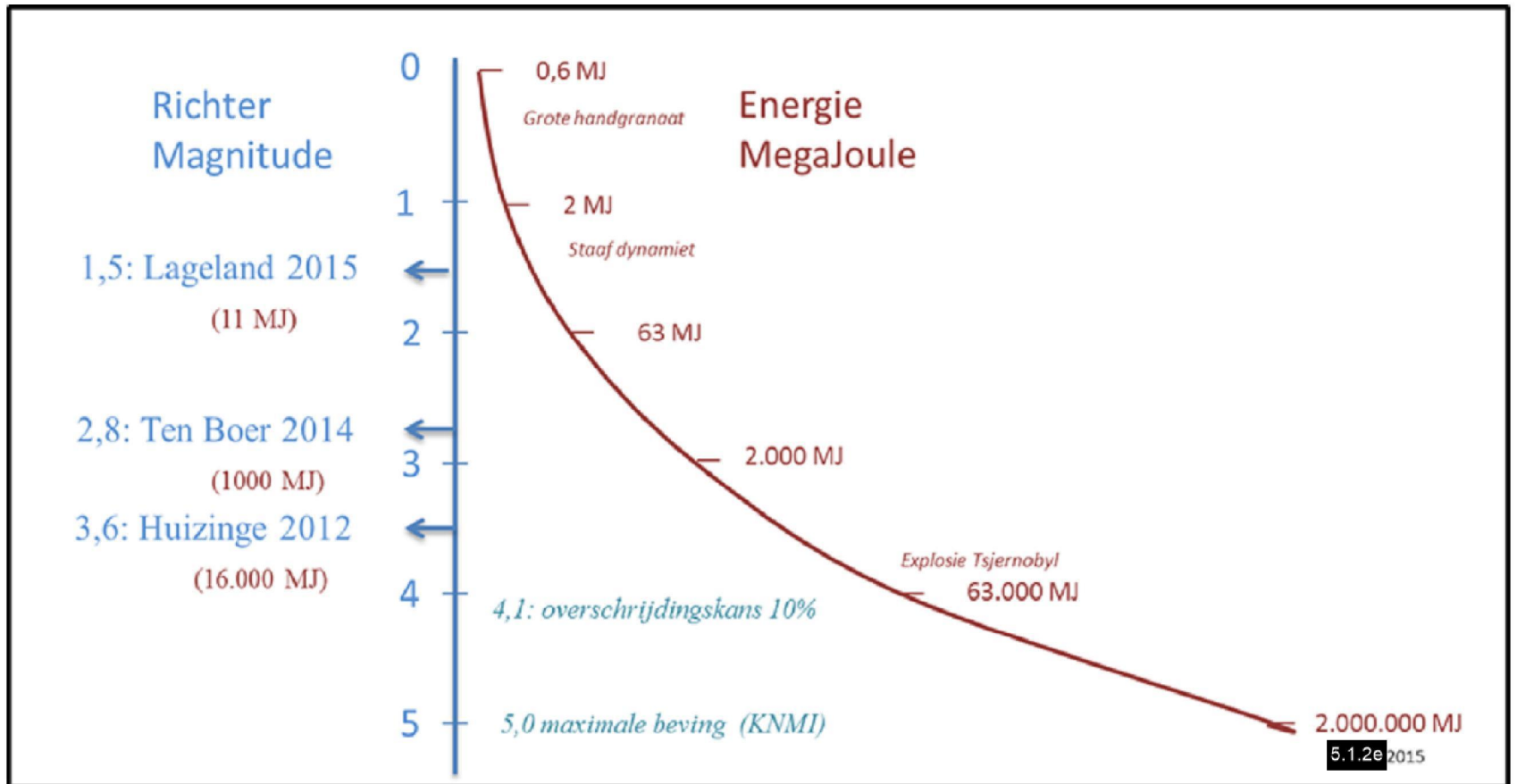
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Bodemdaling en aardbevingen



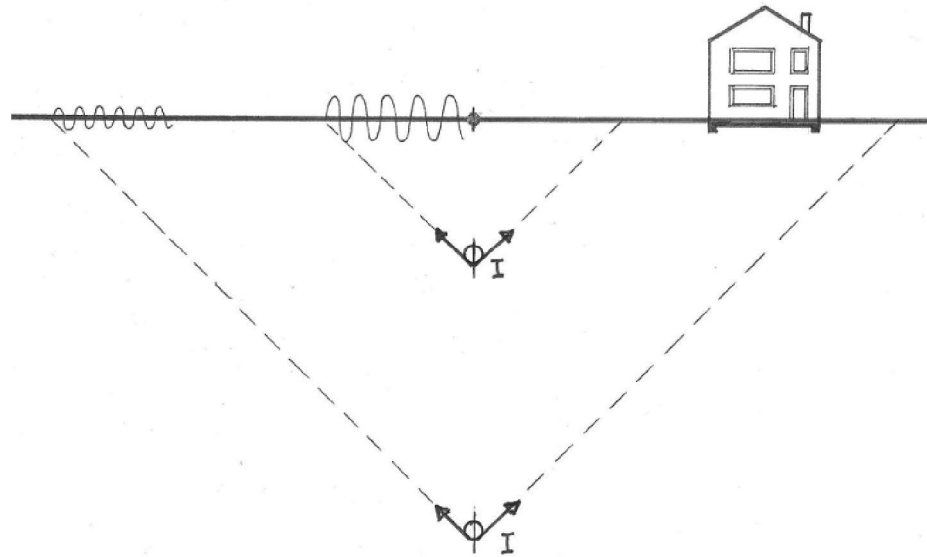
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Magnitude Richter



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Diepte en Richter



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grondversnelling

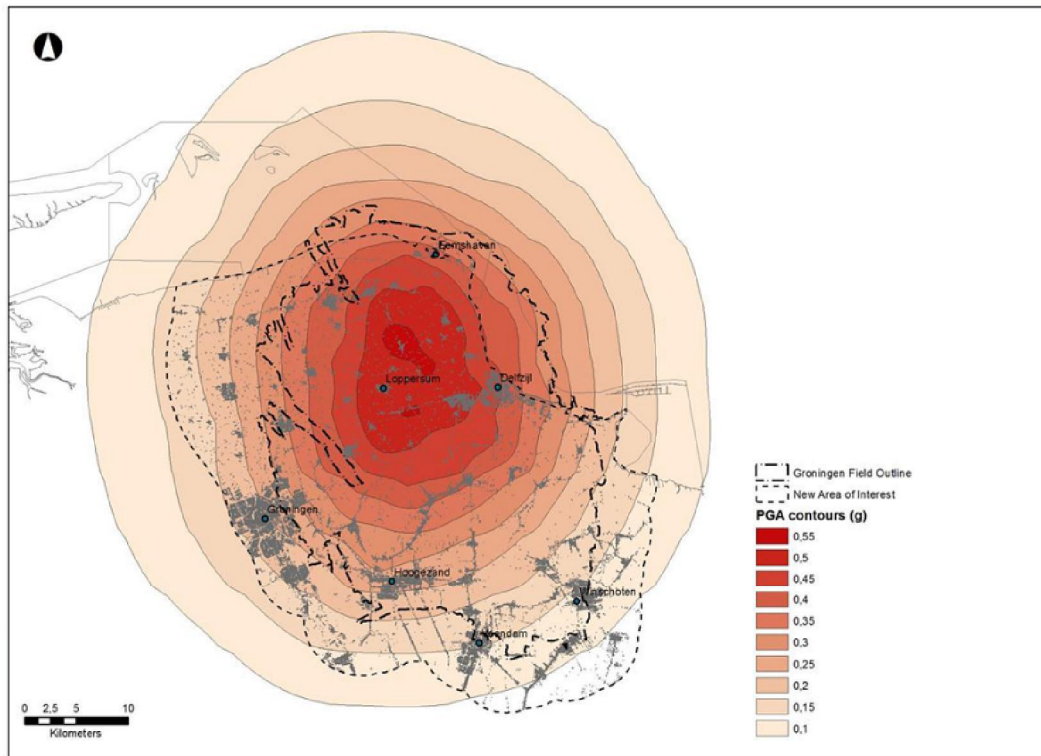
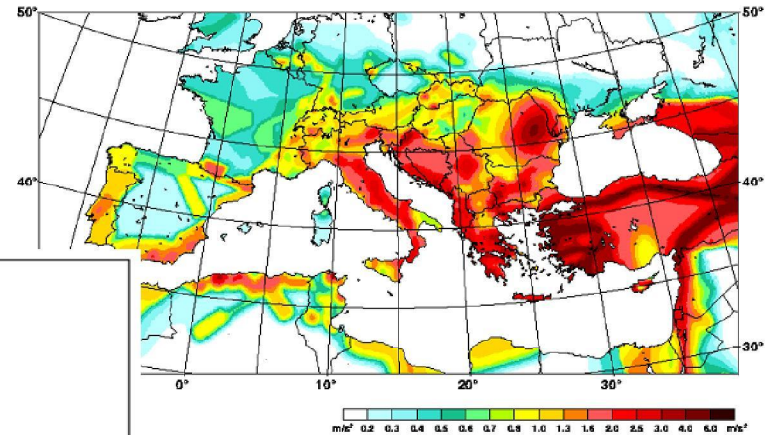


Peak Ground Accelaration (pga)

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Stand van zaken 2013

Periode	Maximum Magnitude Richter			Maximum PGA		
	P50	P10	P2	P50	P10	P2
'13-16	3.4	4.1	4.6	0.02g	0.12g	0.30g
'13-18	3.6	4.4	4.9	0.03g	0.18g	0.42g
'13-23	3.9	4.8	5.3	0.06g	0.33g	0.67g

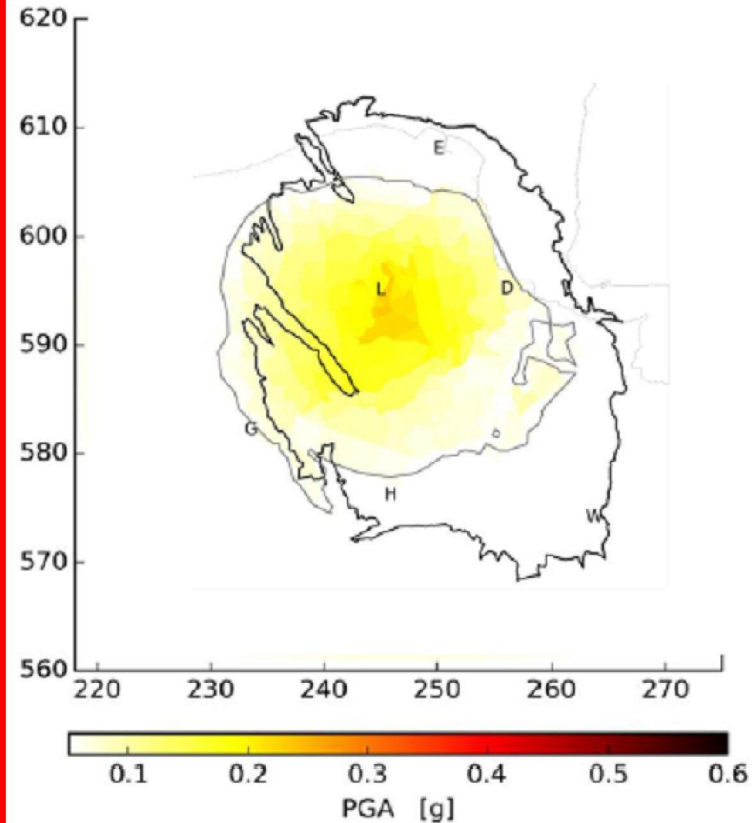


0,2%/jaar
Max pga = 0,55g

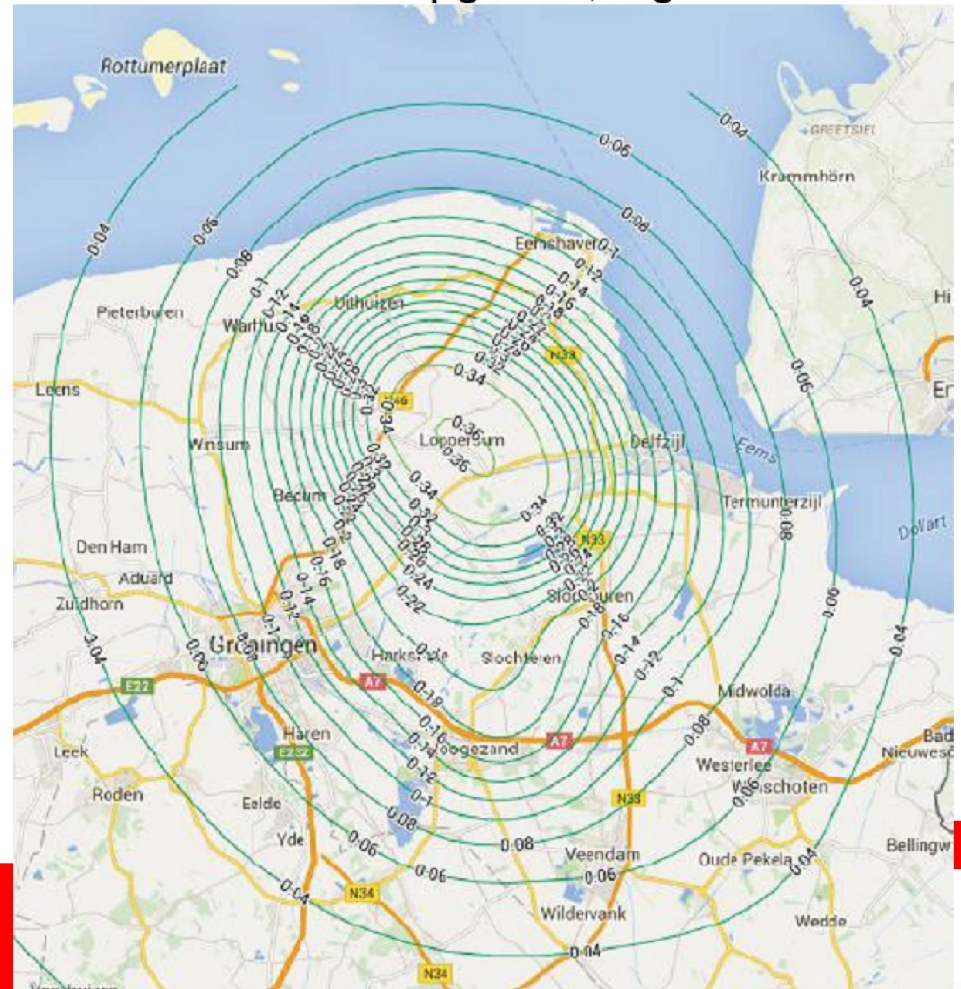
stad

Stand van zaken 2015/2016

0,2%/jaar, NAM
Max pga = 0,27g



0,2%/jaar, KNMI
Max pga = 0,36g



Toename dreiging

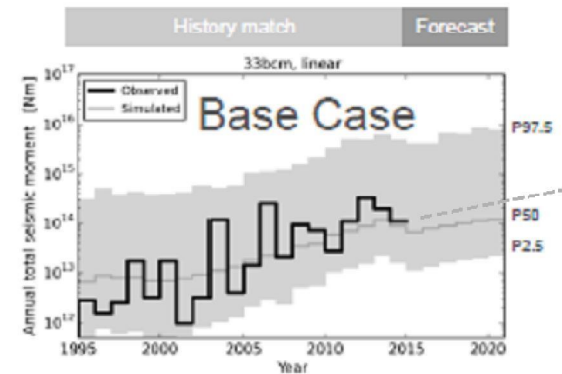
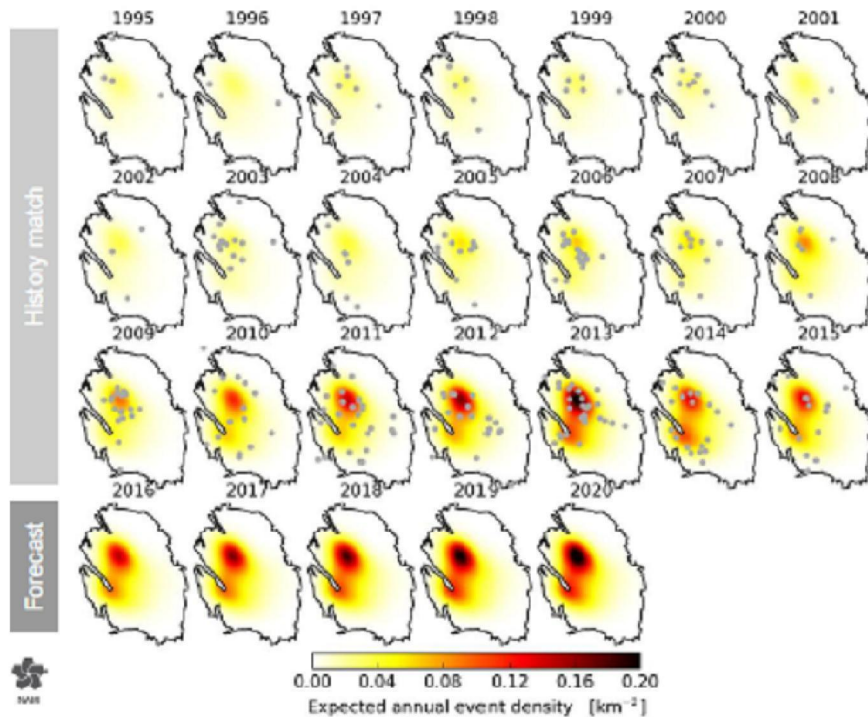


Figure 4.5 Annual $M \geq 1.5$ event density maps for a production plan based on 33 bcm/year.

Van dreiging naar risico's

Onderdeel	Kader	Omvang eind 2015	Omvang 2013/2014	opmerkingen
Gebouwen	Ja	5.000- 12.000	90.000- 150.000	1=2,5%/jaar 10 = 0,2%/jaar
Dijken	Nee	Onderzoek	Onbekend	43 km zeedijk en 75 km keringen
Ind. installaties	Nee	Onderzoek	Onbekend	50 BRZO
Gas, water licht	Nee	Onderzoek	Onbekend	oudere gasleidingen
Falling objects	NAM	Paar duizend	Onbekend	
Schade- meldingen	NAM	65.000	12.000	47.000 geaccepteerd

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Dreiging en risico

- Seismische dreiging (hazard) is complex;
- Geen helder en compleet beeld van risico's;
- Halfjaarlijks nieuwe inzichten;
- Experts spreken elkaar tegen.



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