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Onderwerp

Analyse van IVS90-data bij diverse schutsluizen

Dit memo bevat een data-analyse van IVS90-registraties bij diverse schutsluizen. De resultaten zijn aanleverend voor de studie naar 'schutbeperkingen door watertekort'. Dit memo wordt collectief opgenomen als bijlage bij deze rapportage (mogelijk in ingekorte vorm). De data-analyse is verder uitgevoerd dan voor deze studie strikt noodzakelijk is.

1 Ontvangen data

Data is aangeleverd door RWS-WVL voor:

- Sluizen (zie Figuur 1)¹: Krammersluizen, Kreekraksluizen, Volkeraksluizen, Sluis Terneuzen, Oranjesluizen, Prins Bernhardsluis Tiel, Prinses Beatrixsluis, Prinses Irenesluis, Sluis Eefde, Sluis Delden, Houtribsluizen, Krabbersgatsluis, Lorentzsluizen, Stevinsluis, Roggebotsluis, Prinses Margrietsluis, Zeesluis Farmsum, Sluis I, Sluis Schijndel, Sluis Panheel
- Jaren: 2014 (een representatief jaar) en 2018 (om de reactie tijdens de droogte te zien)
- Datasets: Schuttingen, passages, ladingpassages

De ontvangen bestanden zijn anders dan eerdere uitleveringen (De Jong & Boschetti, 2021). Op sommige punten is aanvullende data toegevoegd (meer informatie over de vrachtypen) en diverse kolommen die eerder enkel als index waren gegeven, bevatten nu hun volledige beschrijving. De eigenschappen van schepen ontbreken, waardoor geen analyse mogelijk is van laadvermogen of dimensies. Dit is echter niet beperkend voor de studie.

¹De volgende sluizen waren aangevraagd maar konden om diverse redenen niet geleverd worden: Nijkerkersluis, IJmuiden, Zandvlietsluizen, Lozen



Figuur 1: Overzicht geanalyseerde sluizen

2 Analyse

De volgende analyses zijn uitgevoerd en worden in onderstaande paragrafen behandeld. In de bijbehorende figuren zijn de informatie van alle sluizen gezamenlijk weergegeven.

- Intensiteit per jaar (aantal passages, vervoerde vracht, en aantal schuttingen)
- Verdeling over de kolken
- Asymmetrie in vaarrichting (aantal passages en vervoerde vracht)

Daarnaast zijn de volgende analyses uitgevoerd, maar resulteert dit in figuren per sluis. Deze figuren zijn daarom per sluis gegroepeerd in hoofdstuk 3.

- Verdeling in scheepstypen (beroepsvaart, recreatievaart, en overige vaart)
- Aankomstpatroon over dag
- Jaarvariatie (aantal passages, en aantal schuttingen, gemiddelde vracht)
- Kolkindeling
- Jaarvariatie in kolkindeling (relatief aantal lege schuttingen, aantal beroepsvaart per schutting, kolkvulling met recreatievaart)

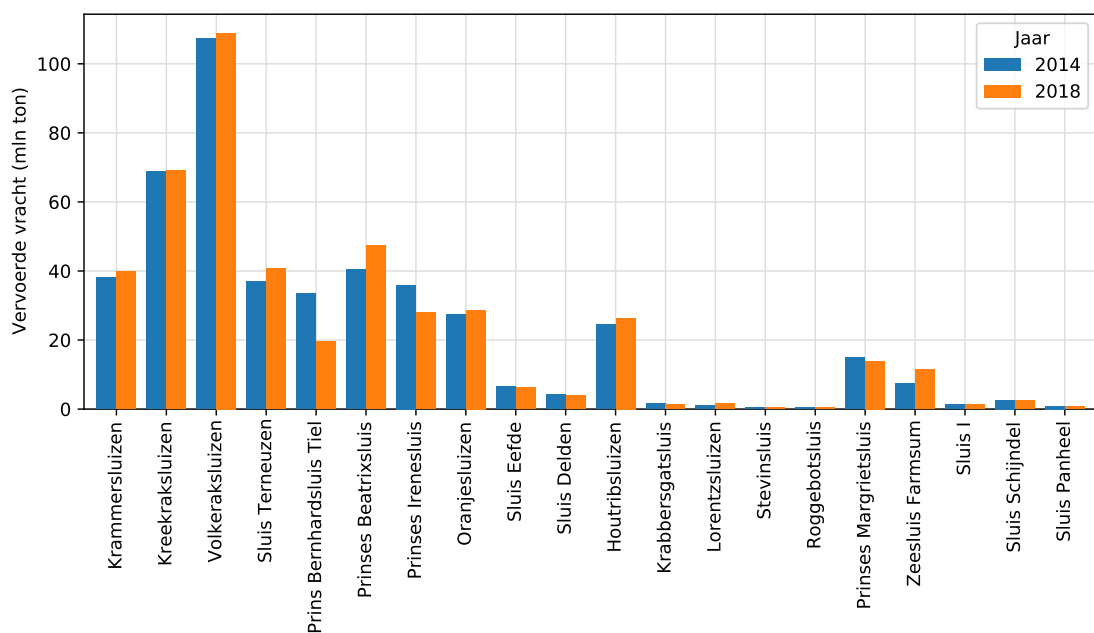
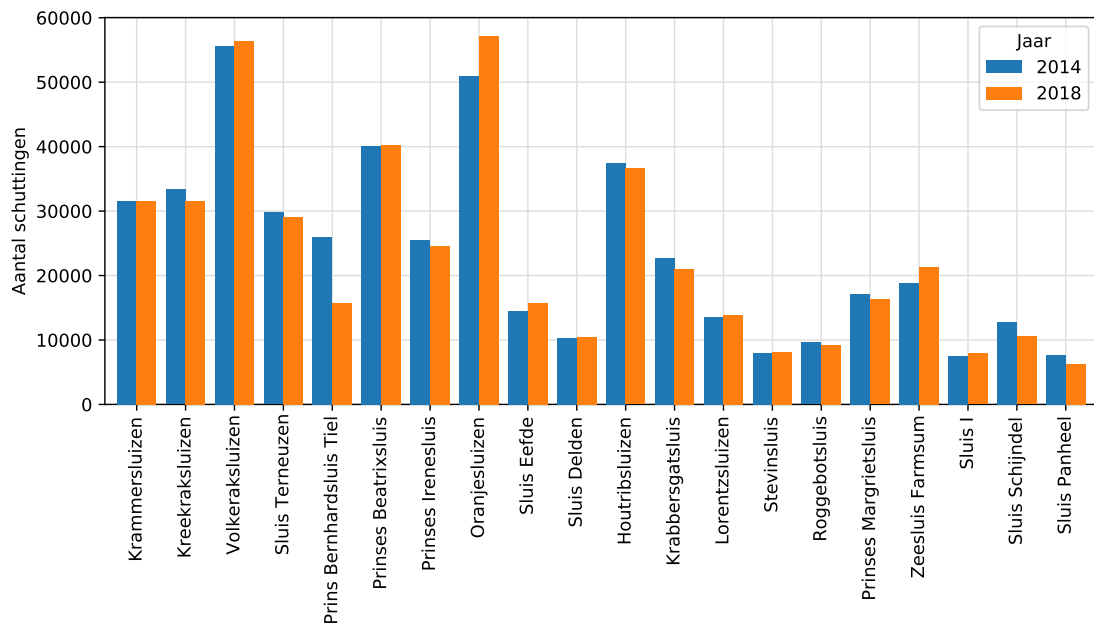
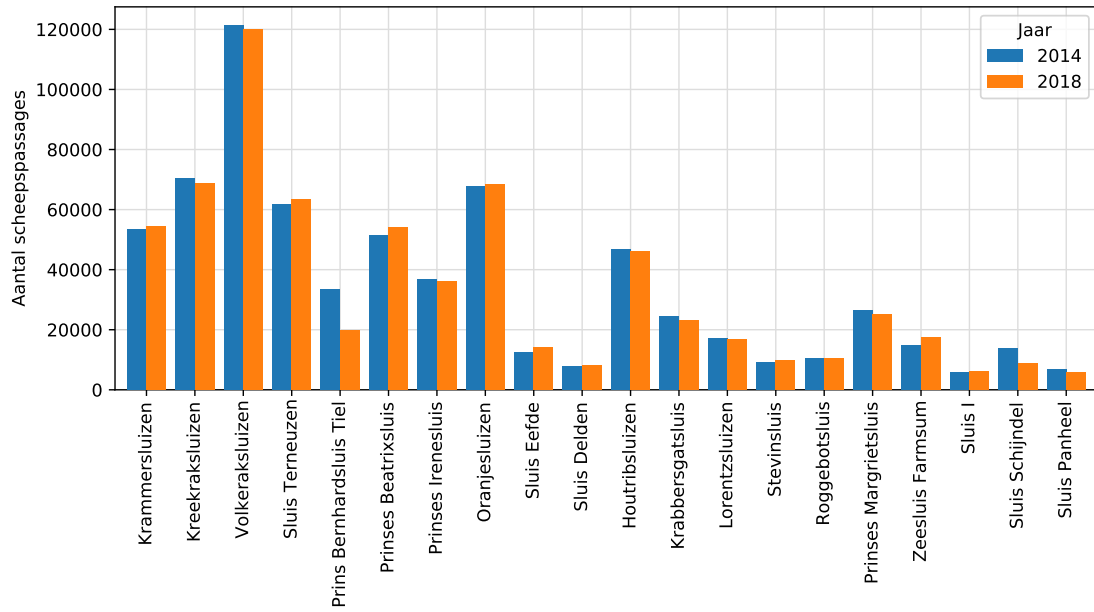
De figuren zijn opgenomen in gevectoriseerde formaat waardoor in het PDF-bestand ingezoomd kan worden. In hoofdstuk 3 zijn de figuren niet genummerd en wordt naar de

figuren verwezen op basis van de titel

2.1 Intensiteit per jaar

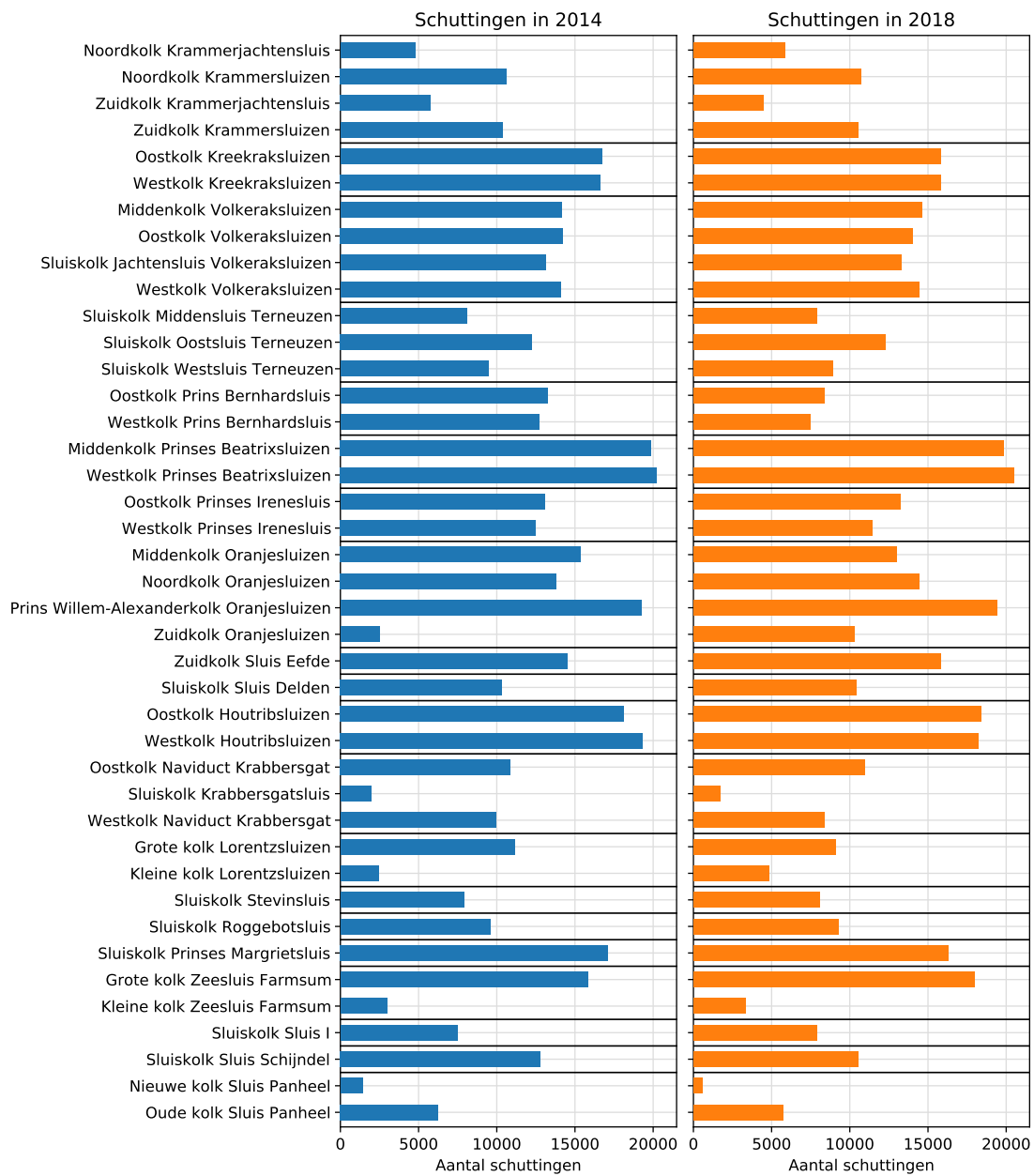
Op basis van de figuur wordt het volgende geconcludeerd:

- Meeste vracht via Schelde-Rijnverbinding (Volkeraksluizen)
- Diverse sluizen hebben relatief veel schuttingen terwijl de hoeveel vracht nauwelijks waarneembaar is. Dit wordt veroorzaakt door de zeer kleine binnenvaartschepen (Brabantse Kanalen) en het grote aandeel recreatievaart (met name de meren)



Figuur 2: Aantal scheepspassages (boven), aantal schuttingen (midden) en vervoerde vracht (onder) per sluis

2.2 Verdeling over de kolken

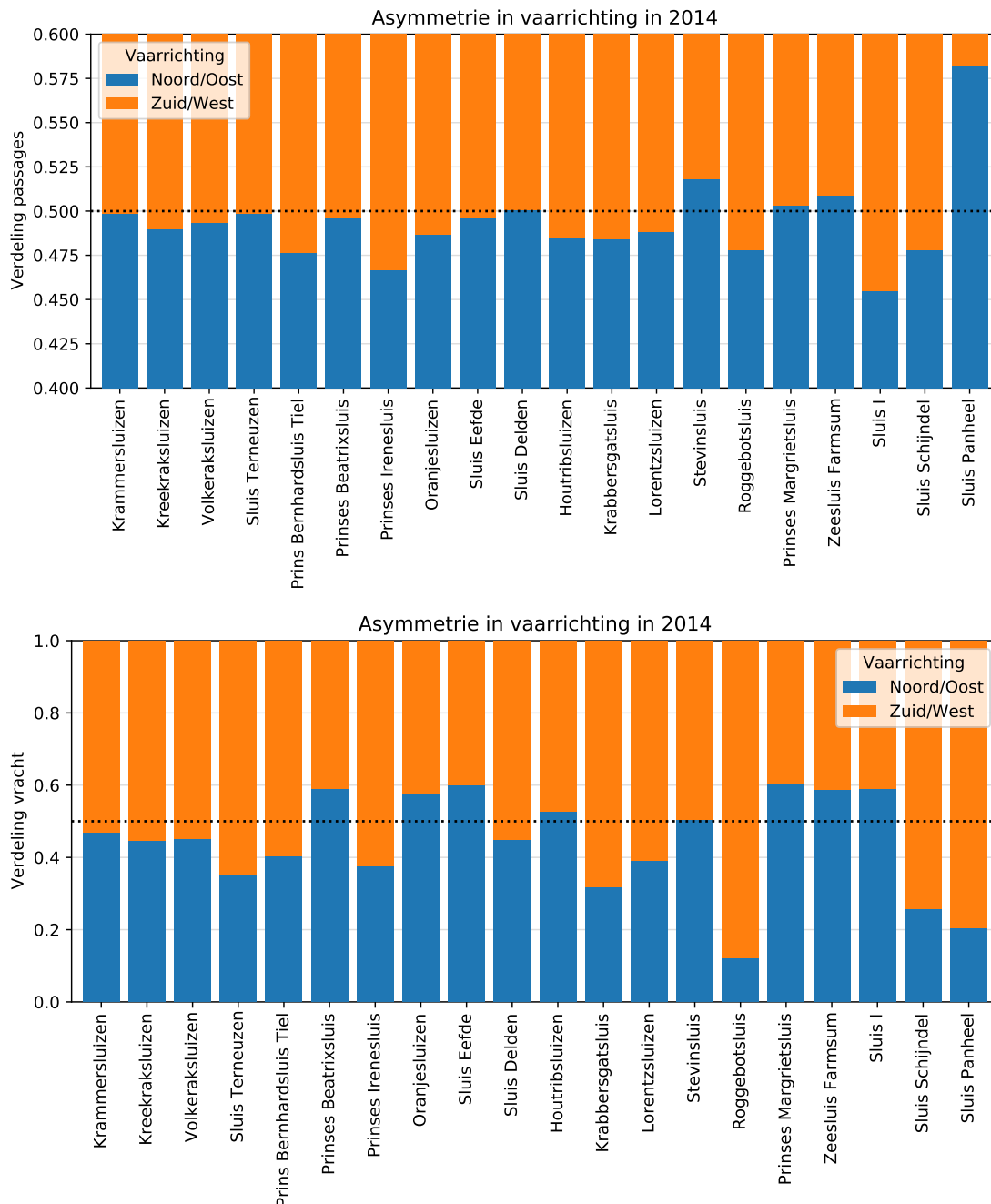


Figuur 3: Verdeling van schuttingen in een jaar over de kolken in 2014 (links) en 2018 (rechts)

2.3 Assymetrie in vaarrichting

Op basis van de figuur wordt het volgende geconcludeerd:

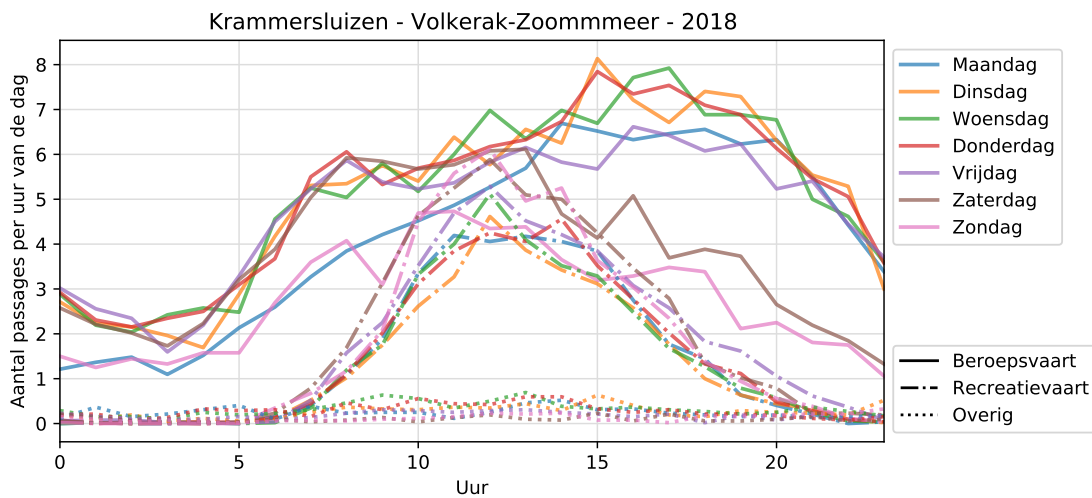
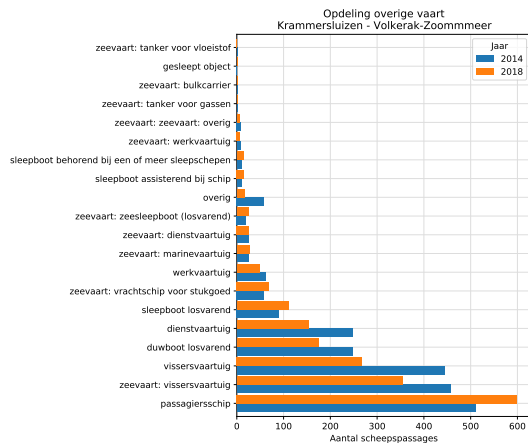
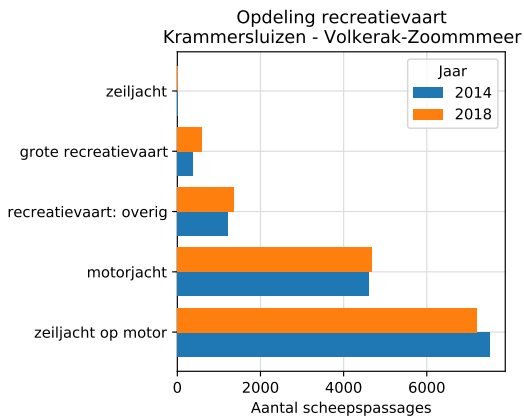
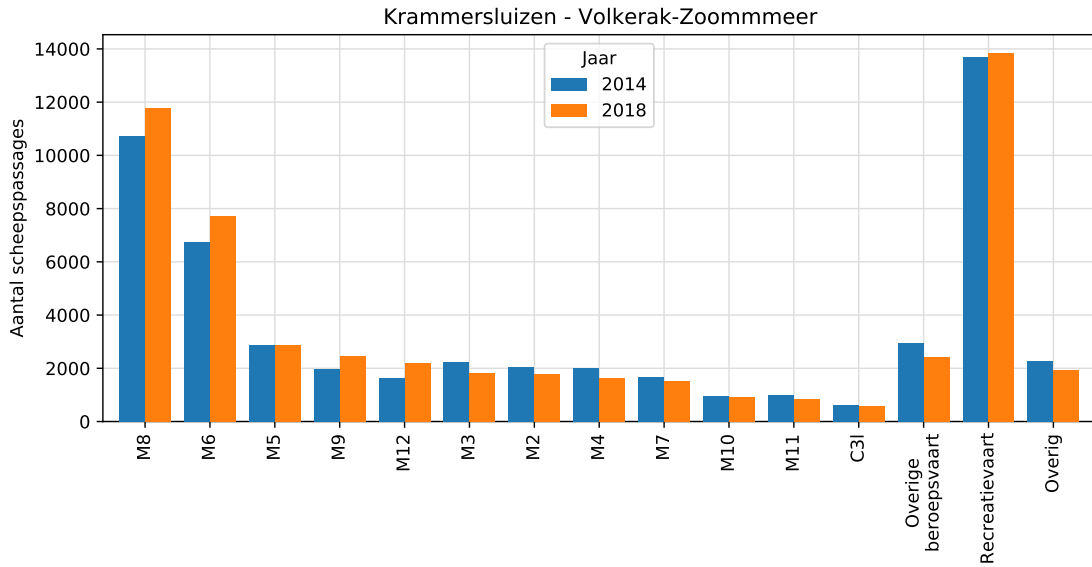
- Bij de meeste sluisen (Schelde-Rijnverbinding, Meren) zijn passages en vracht dominant in zuidelijke/westelijke richting.
- Opmerkelijke is dat bij het ARM de Prins Bernhardsluis en Prinses Irenesluis dominant in zuidelijke richting zijn, maar bij de prinses Beatrixsluis de vracht dominant in noordelijke is.
- Bij Panheel is het aantal passages dominant in oostelijke vaarrichting, maar de hoeveelheid vracht zeer dominant in westelijke richting.

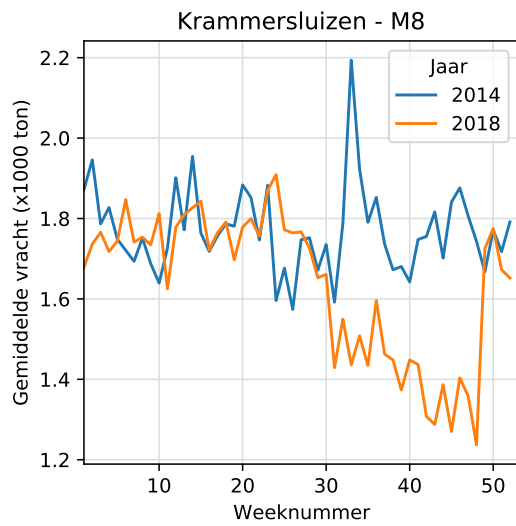
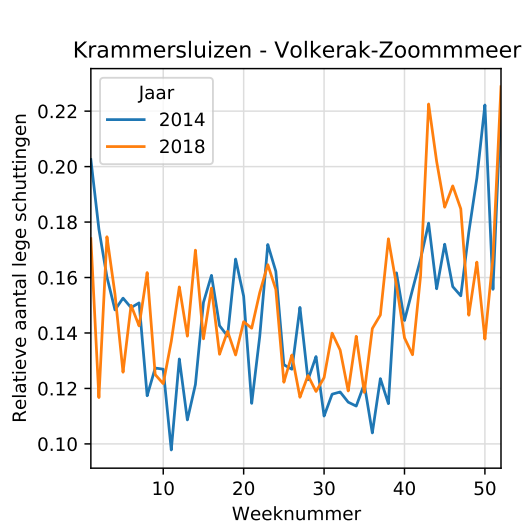
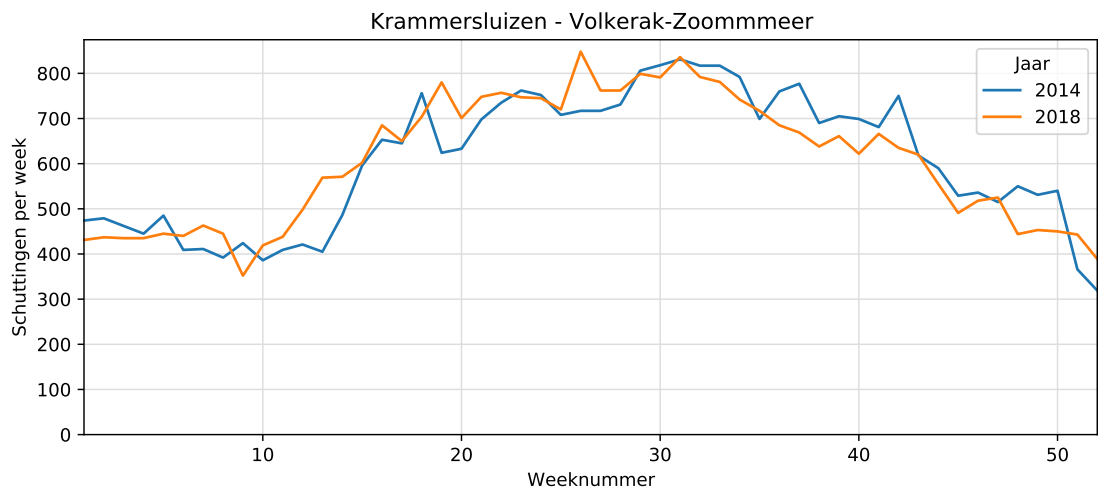
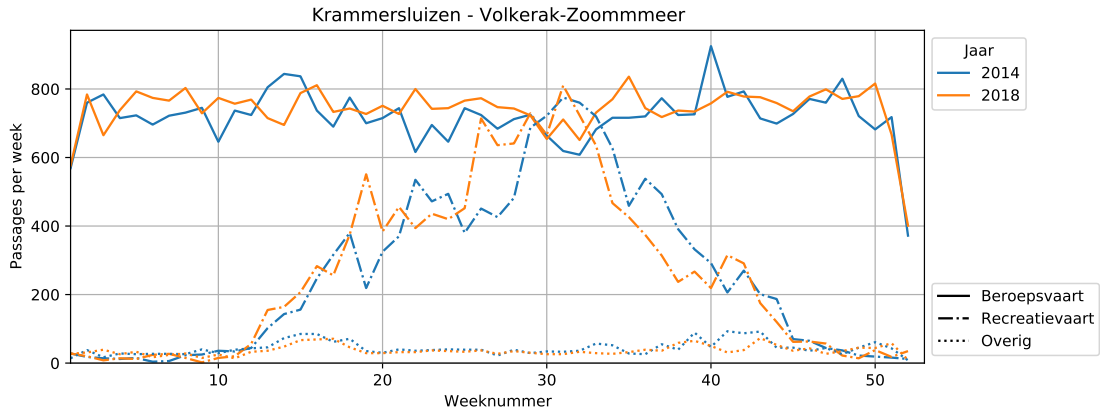


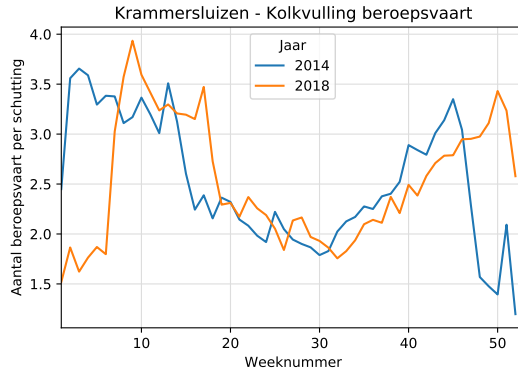
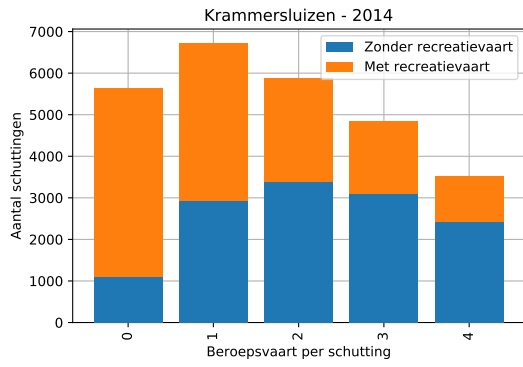
Figuur 4: Asymmetrie in vaarrichting in 2014 voor aantal passages (boven) en vervoerde vracht (onder). De limieten van de y-as verschillen!

3 Analyse per sluis

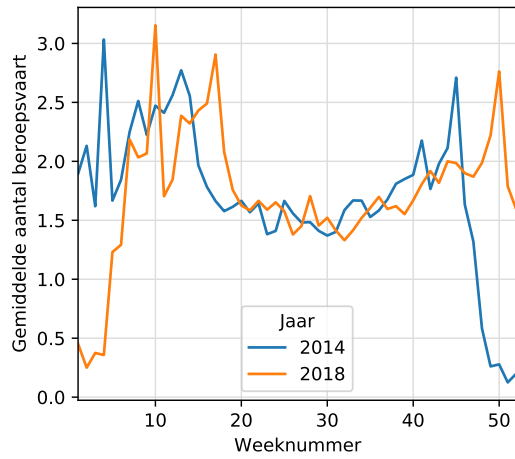
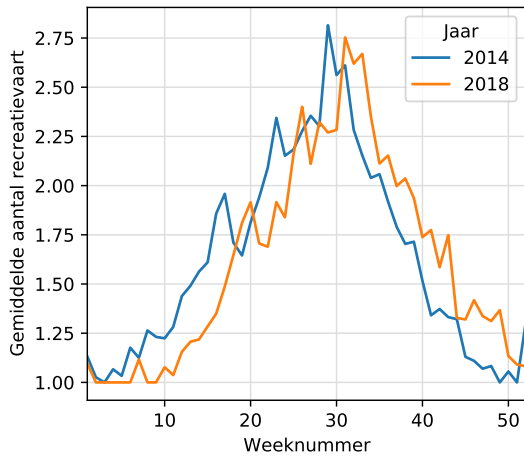
3.1 Krammersluizen





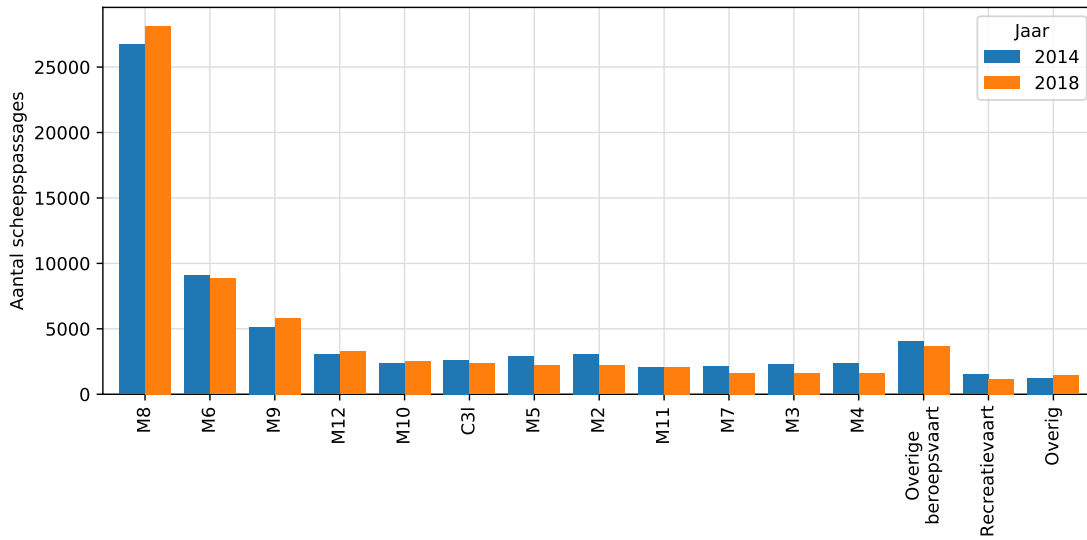


Krammersluizen - Kolkvulling bij schuttingen met recreatievaart

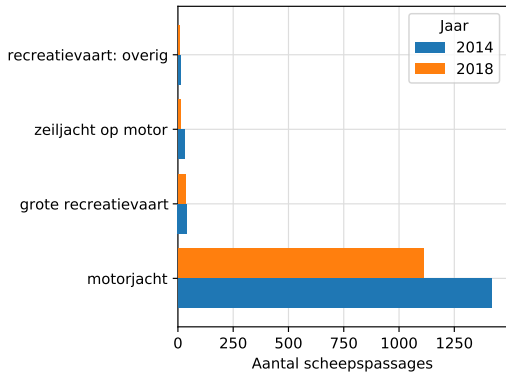


3.2 Kreekraksluizen

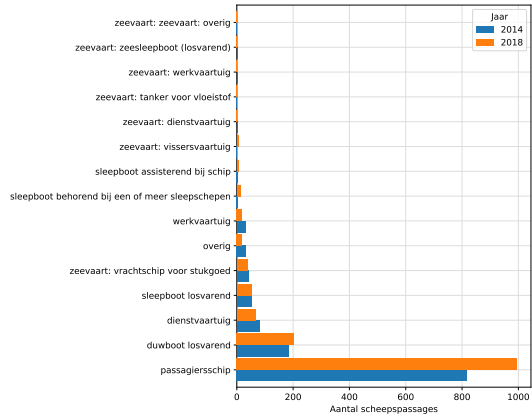
Kreekraksluizen - Volkerak-Zoommeer



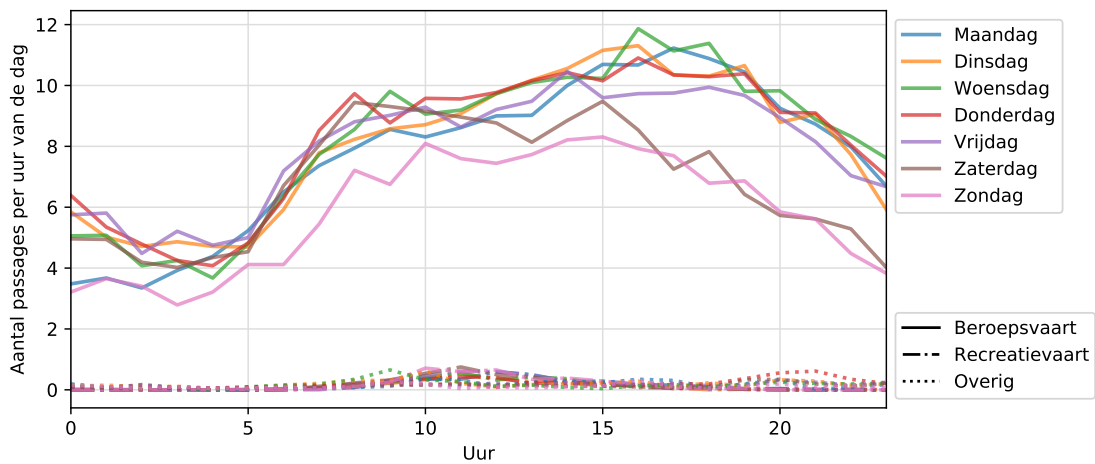
Opdeling recreatievaart
Kreekraksluizen - Volkerak-Zoommeer

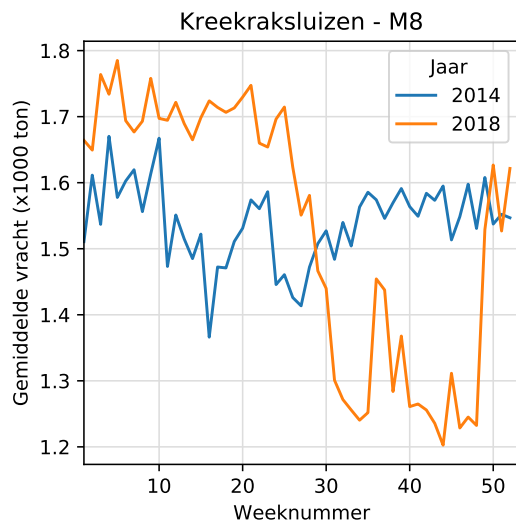
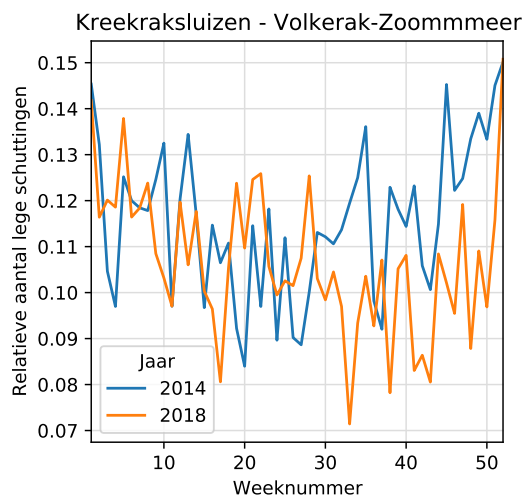
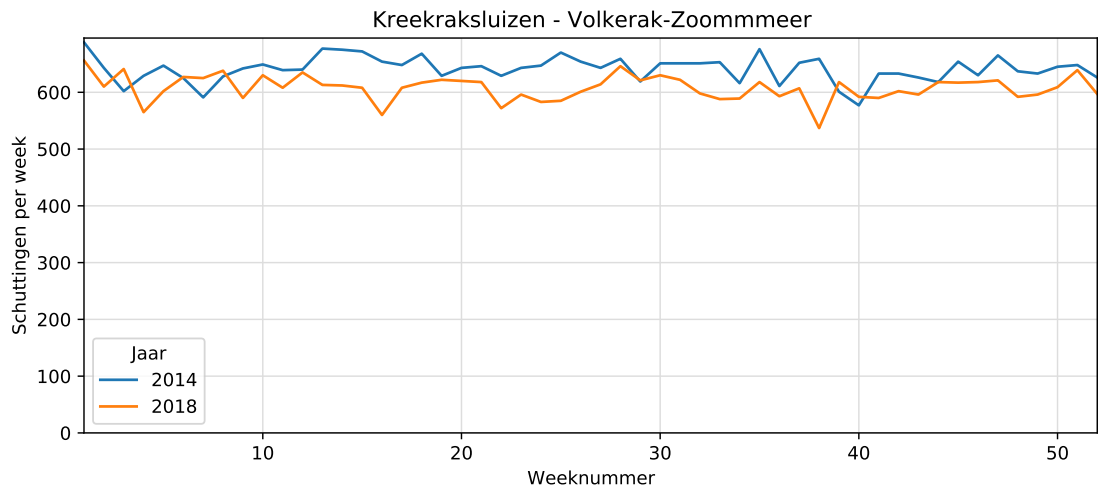
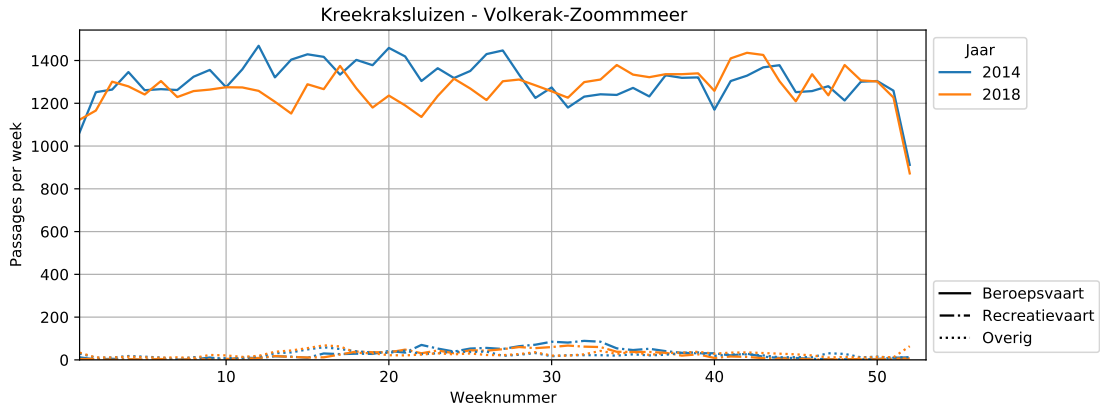


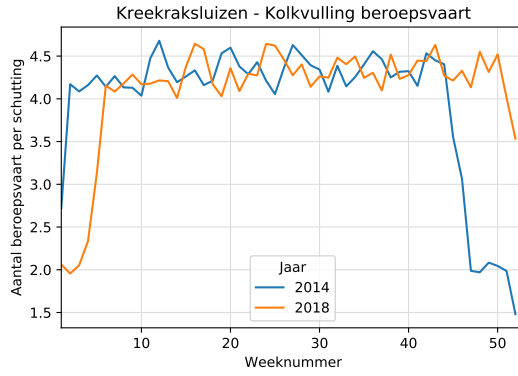
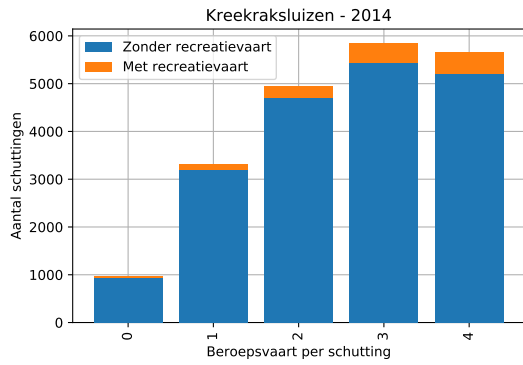
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Kreekraksluizen - Volkerak-Zoommeer



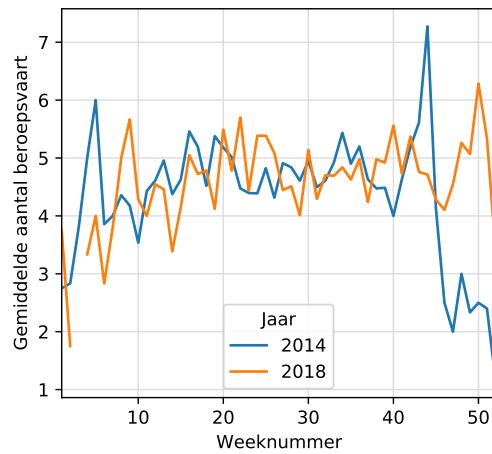
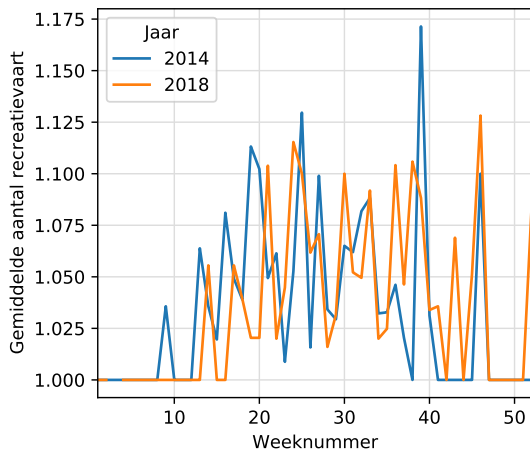
Kreekraksluizen - Volkerak-Zoommeer - 2018





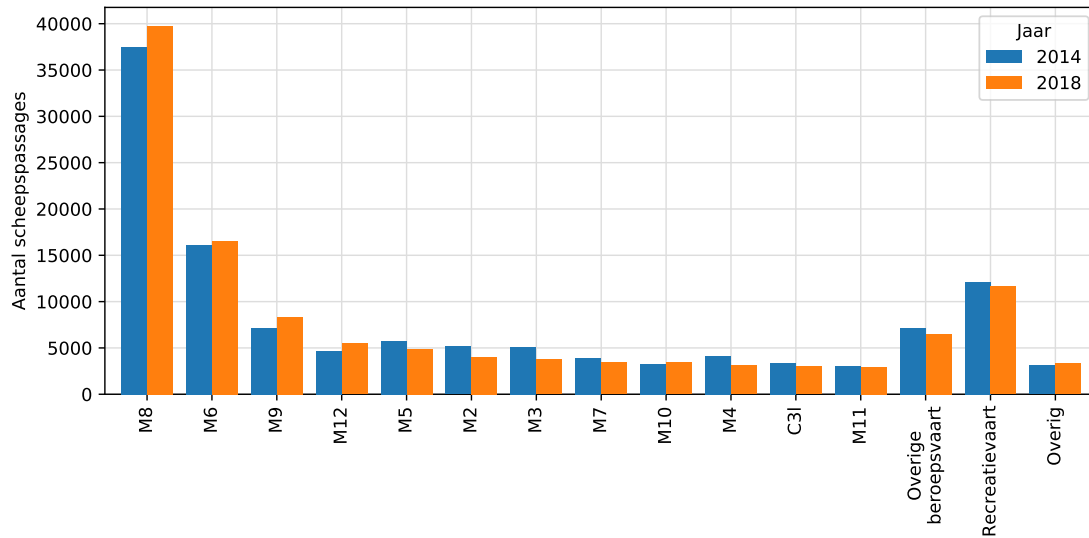


Kreekraksluizen - Kolkvulling bij schuttingen met recreatievaart

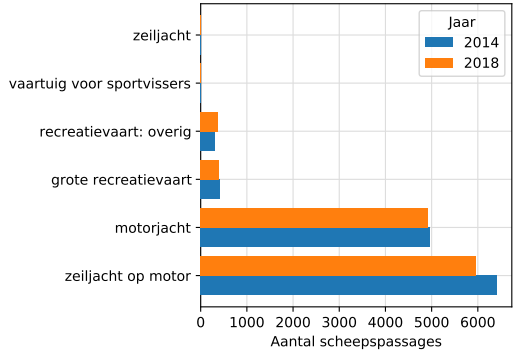


3.3 Volkeraksluizen

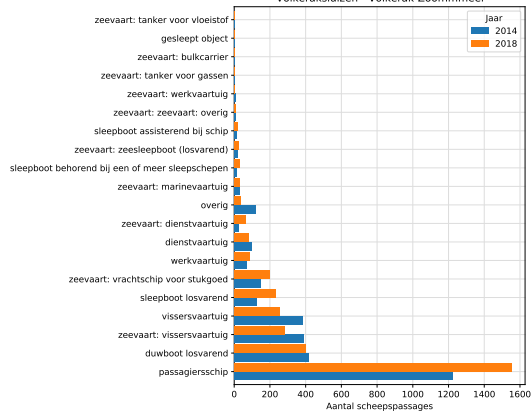
Volkeraksluizen - Volkerak-Zoommeer



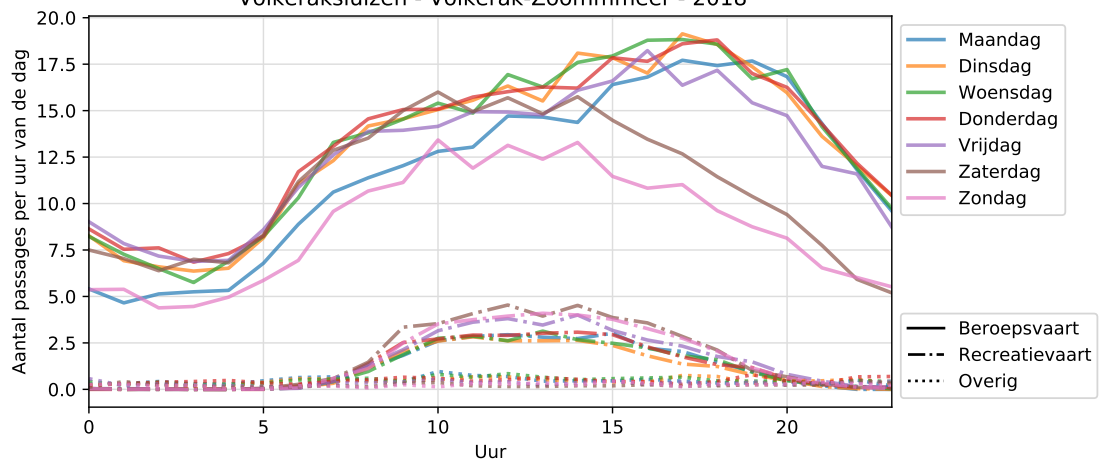
Opdeling recreatievaart
Volkeraksluizen - Volkerak-Zoommeer

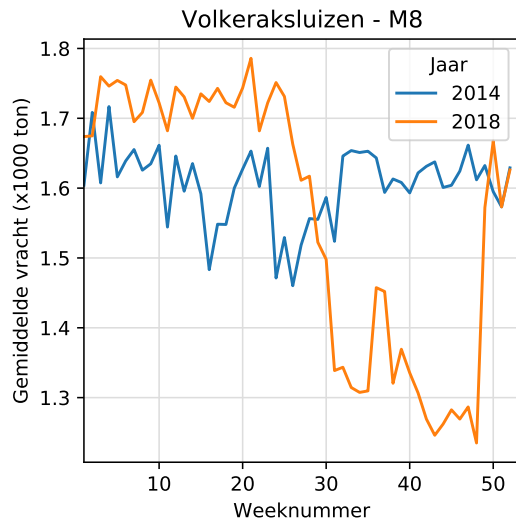
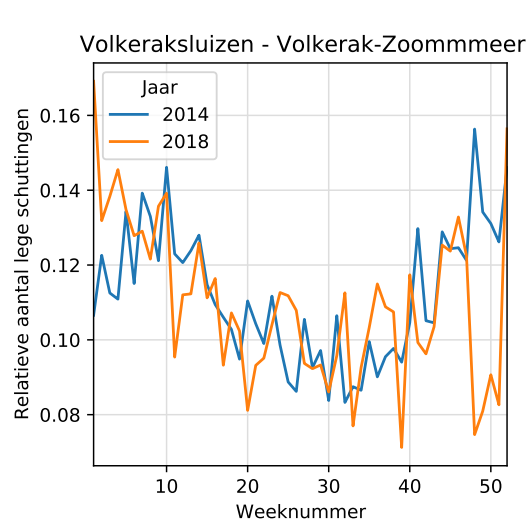
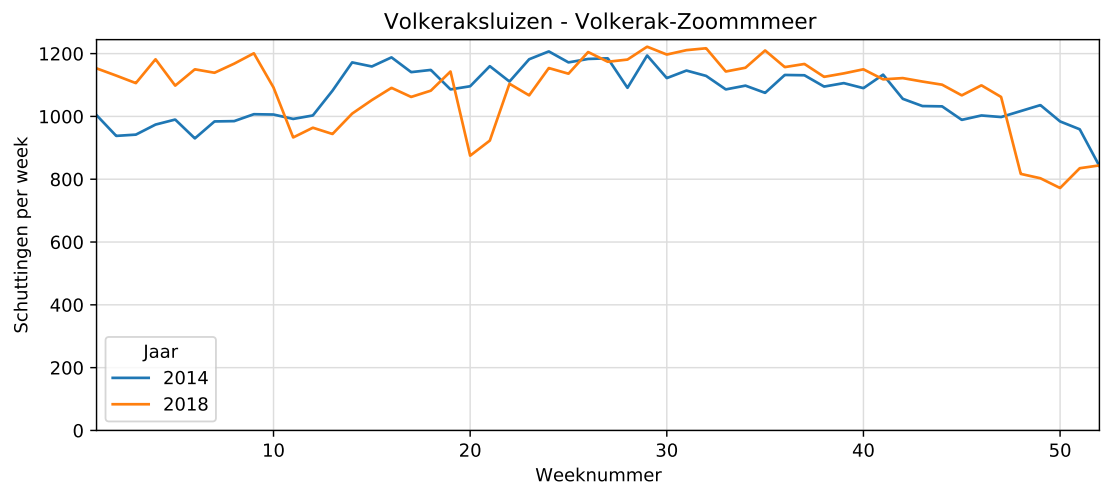
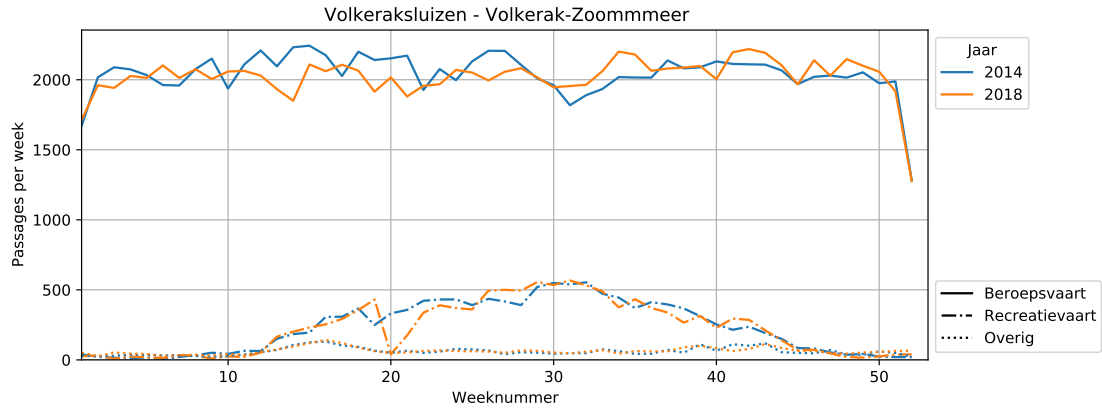


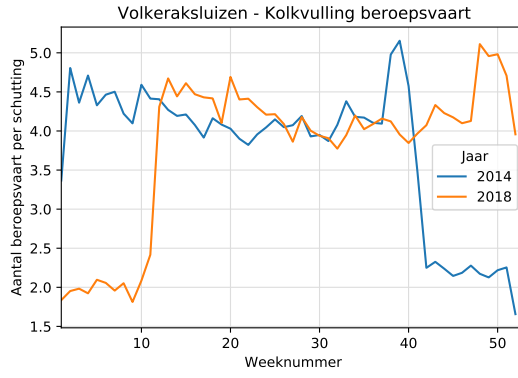
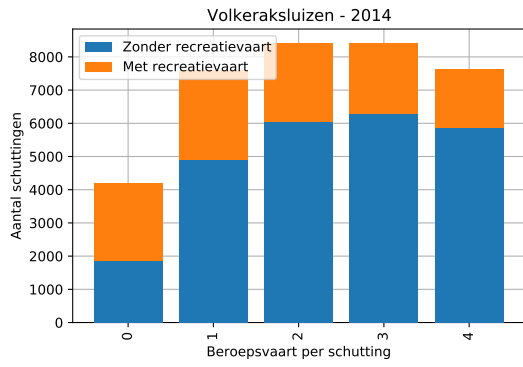
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Volkeraksluizen - Volkerak-Zoommeer



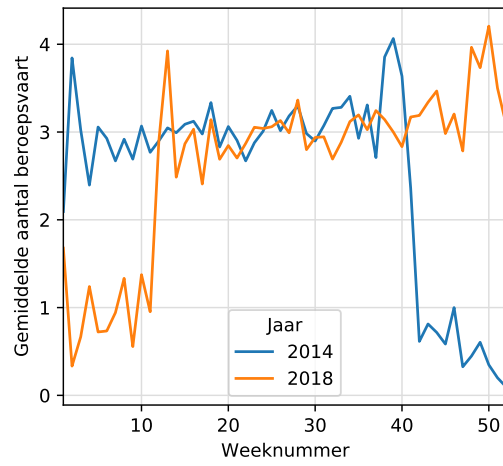
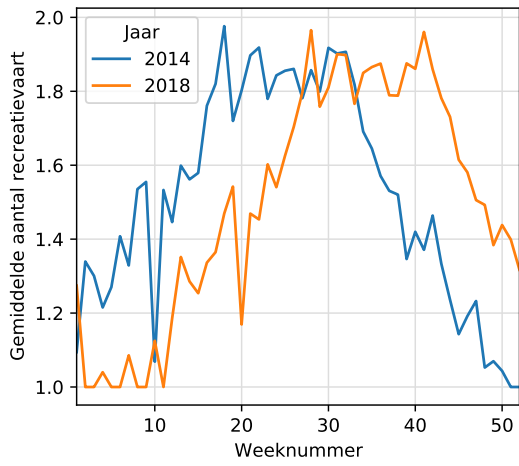
Volkeraksluizen - Volkerak-Zoommeer - 2018



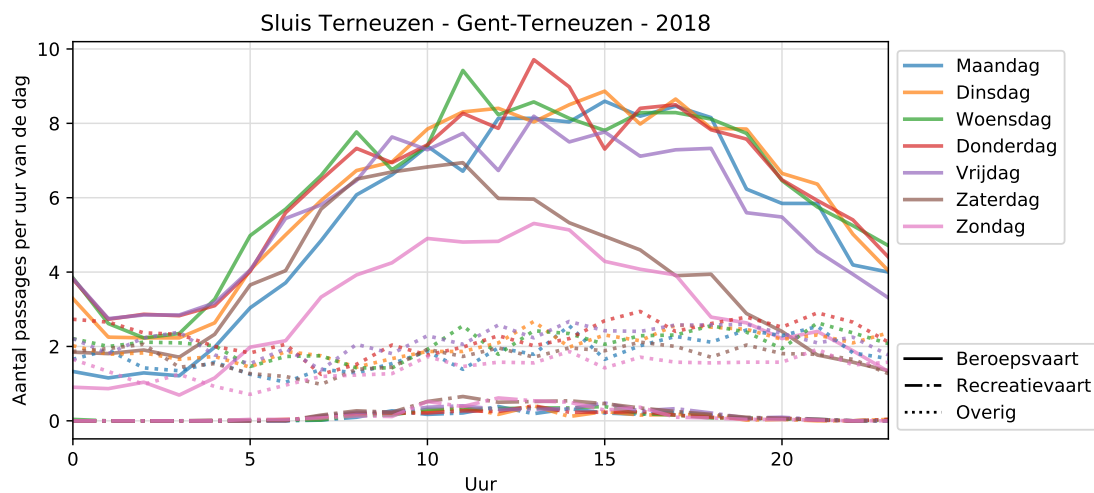
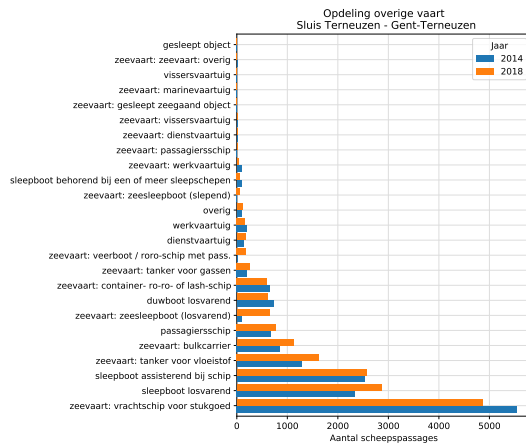
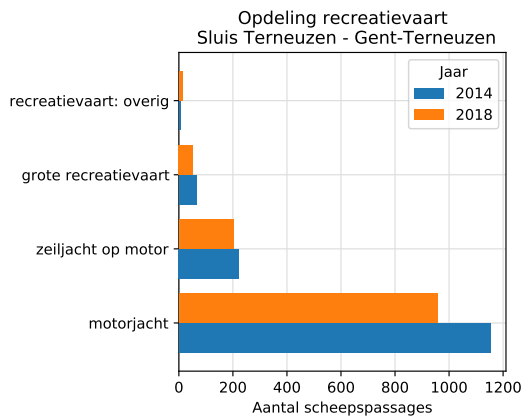
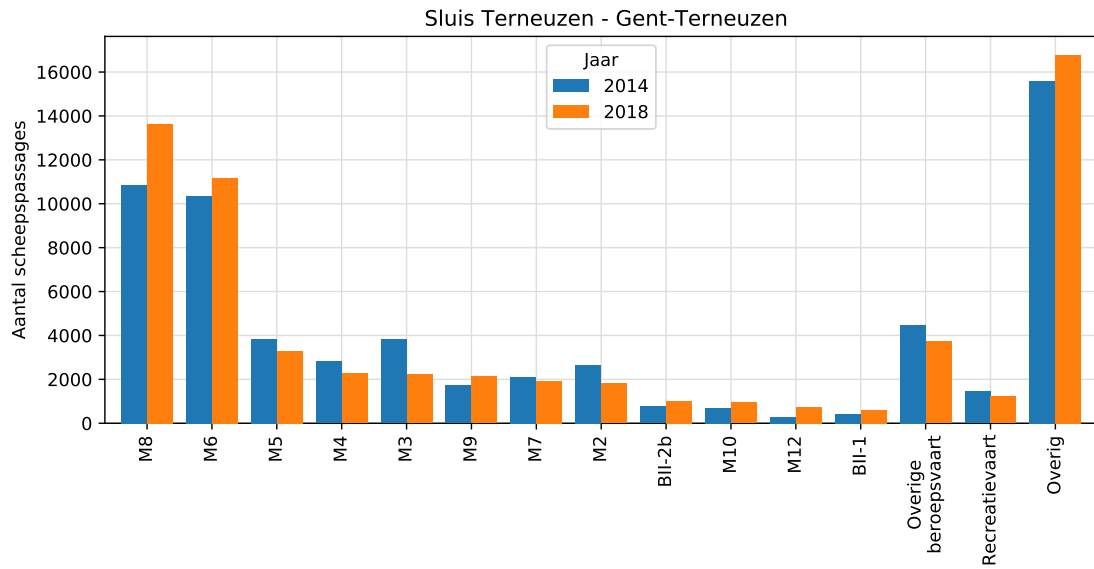


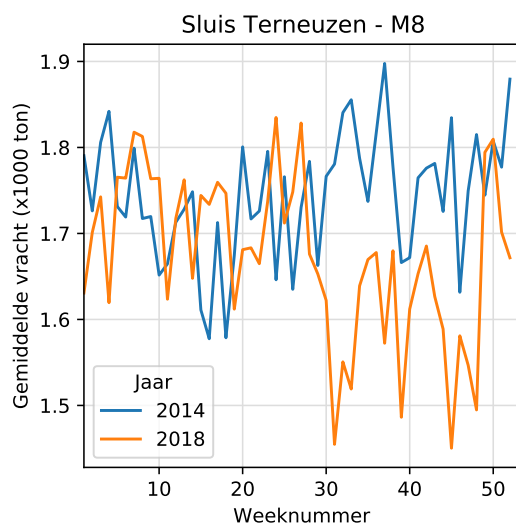
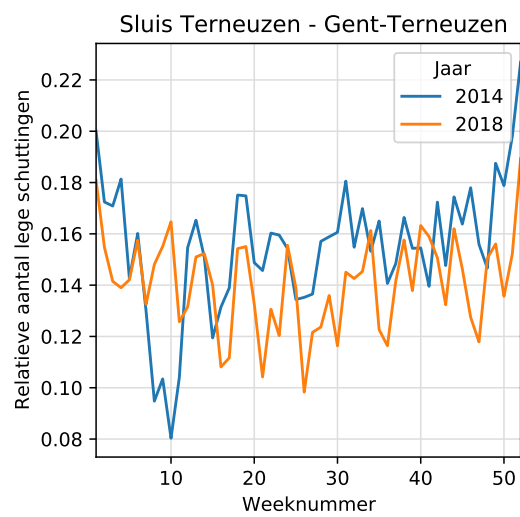
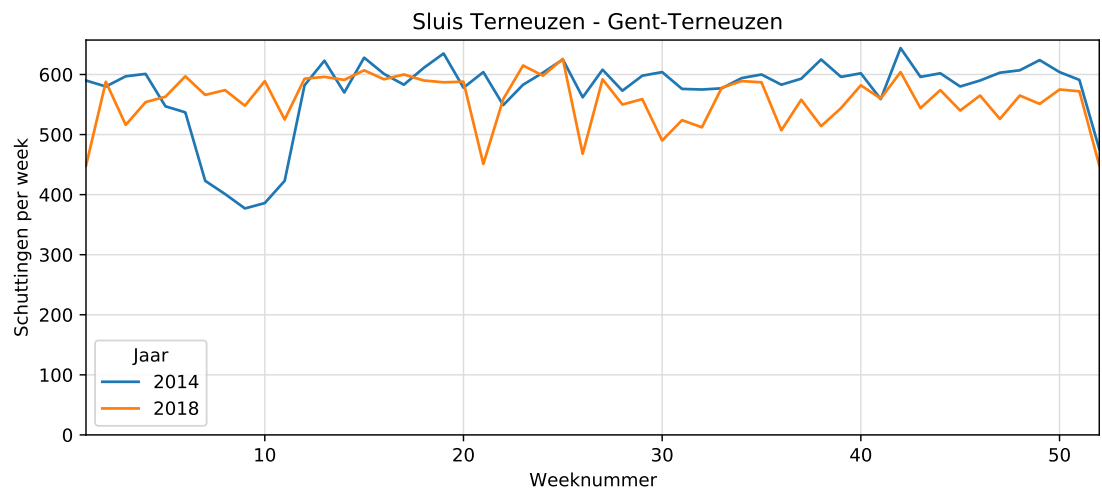
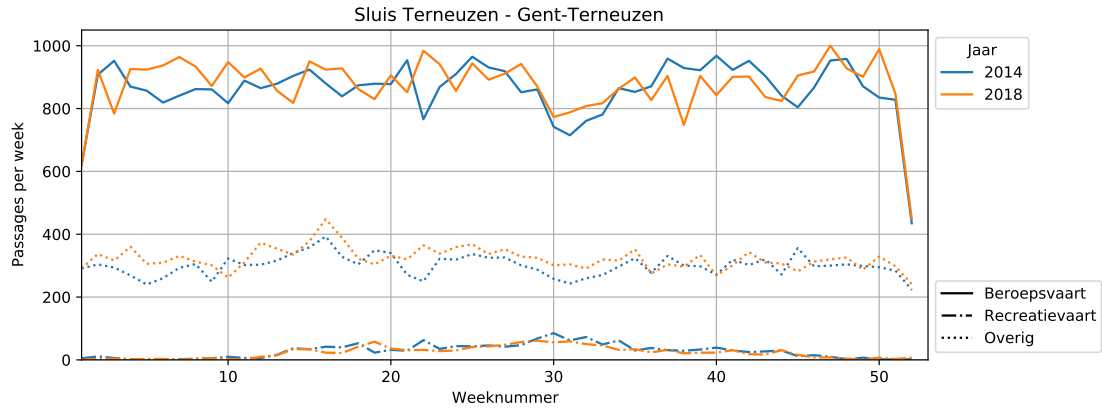


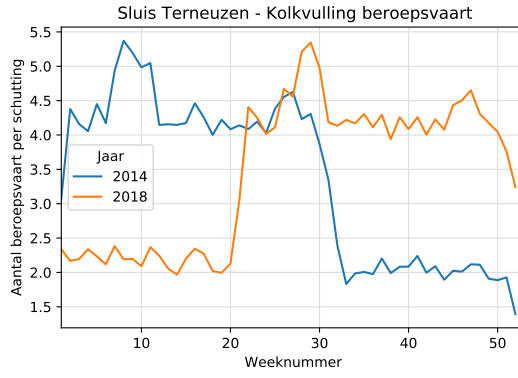
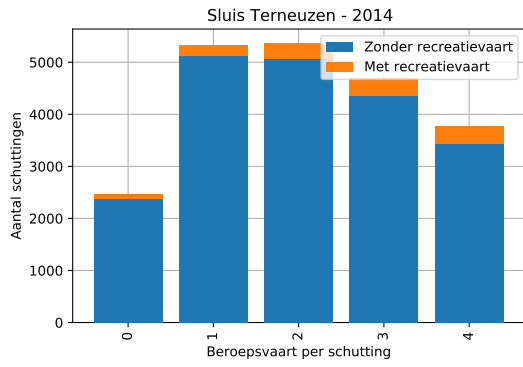
Volkeraksluizen - Kolkvulling bij schuttingen met recreatievaart



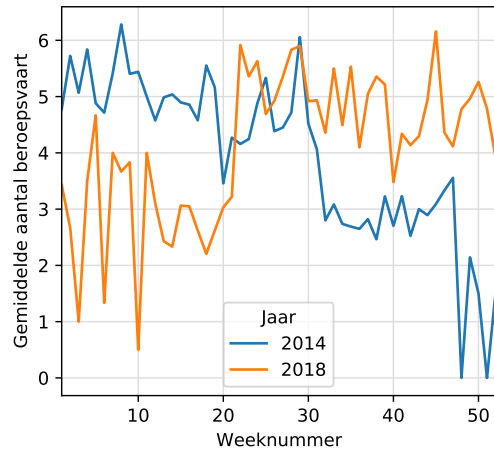
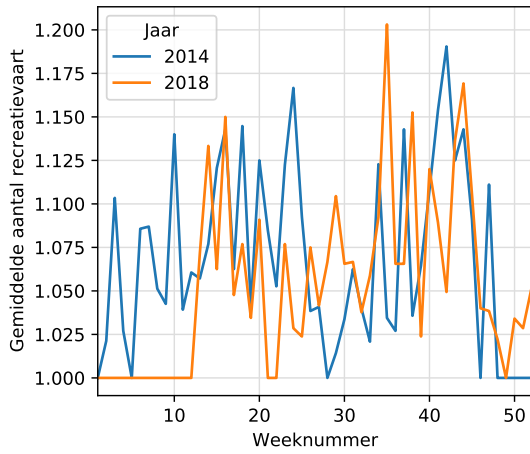
3.4 Sluis Terneuzen





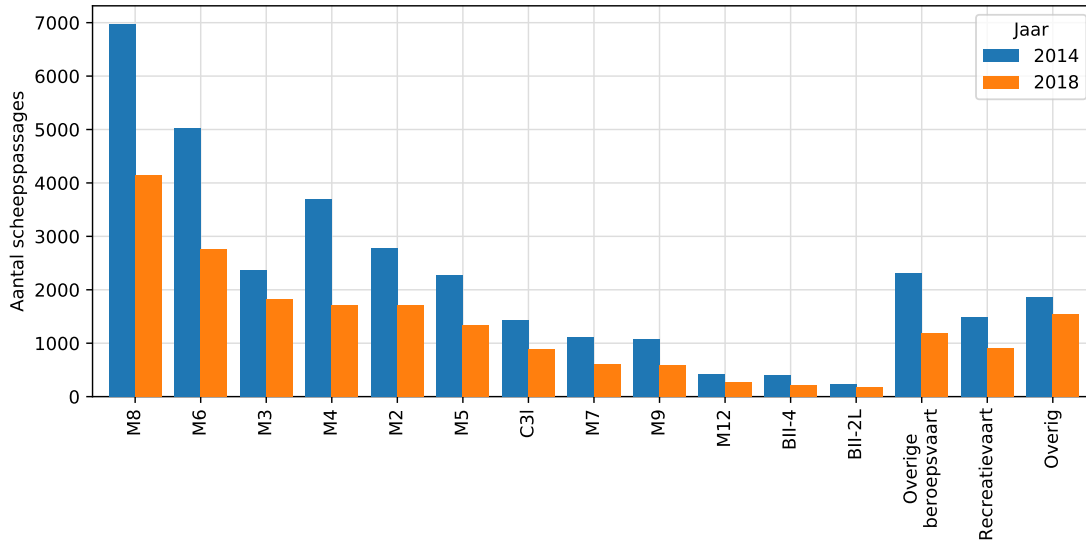


Sluis Terneuzen - Kolkvulling bij schuttingen met recreatievaart

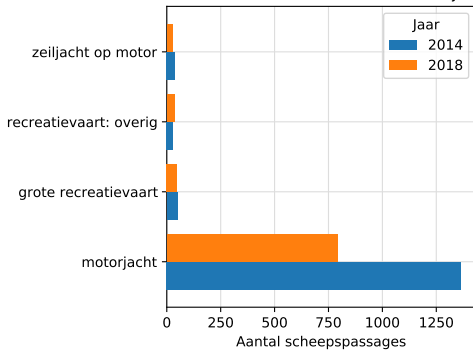


3.5 Prins Bernhardsluis Tiel

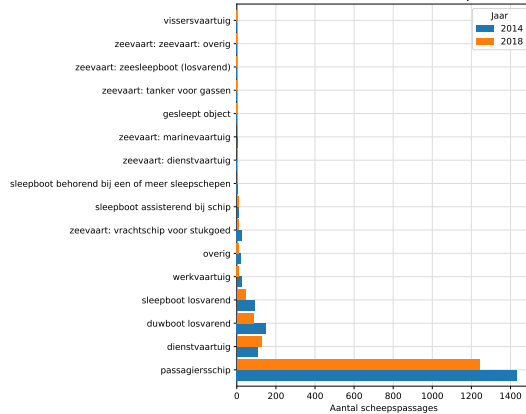
Prins Bernhardsluis Tiel - Amsterdam-Rijnkanaal



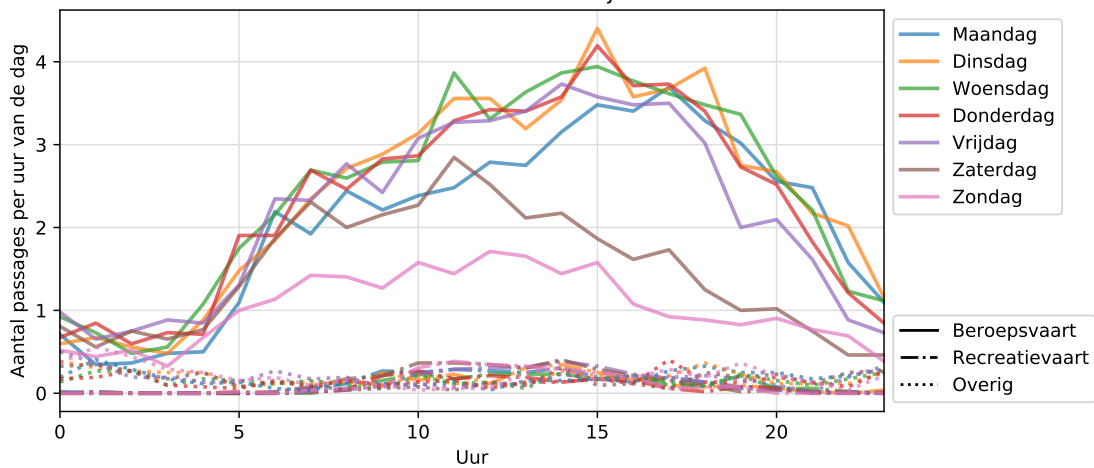
Opdeling recreatievaart
Prins Bernhardsluis Tiel - Amsterdam-Rijnkanaal

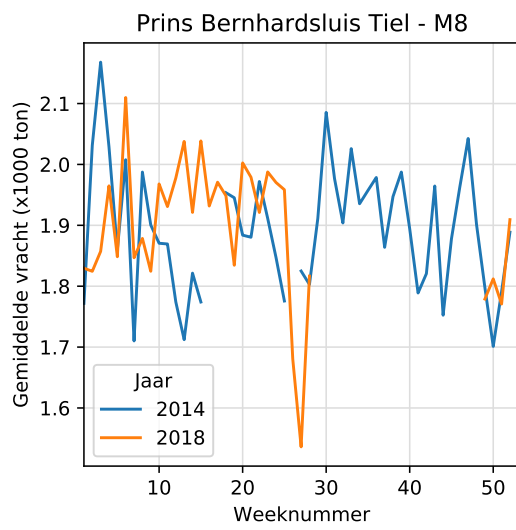
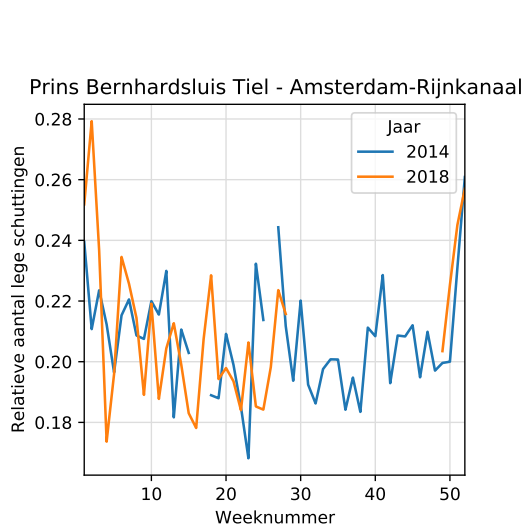
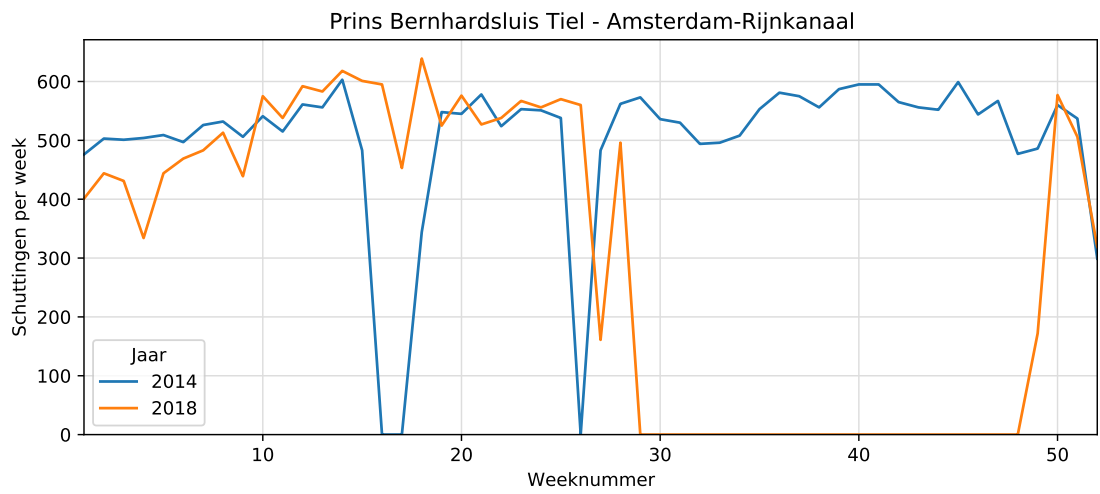
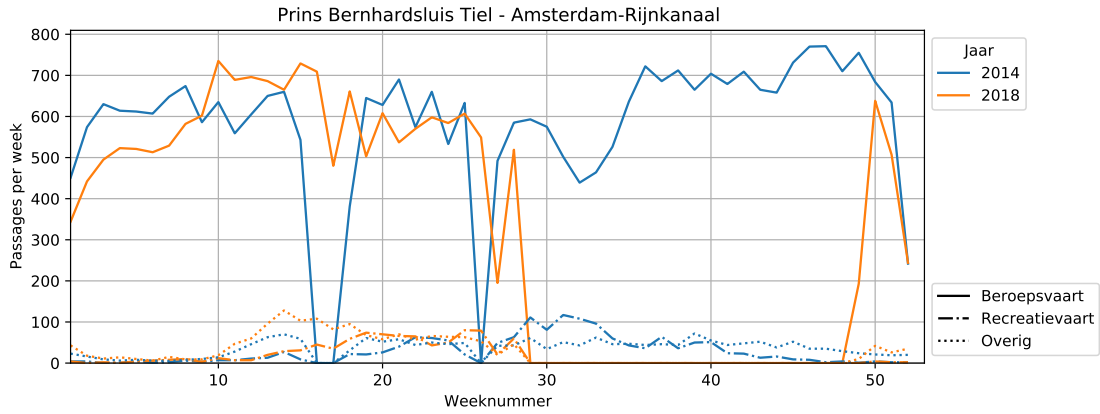


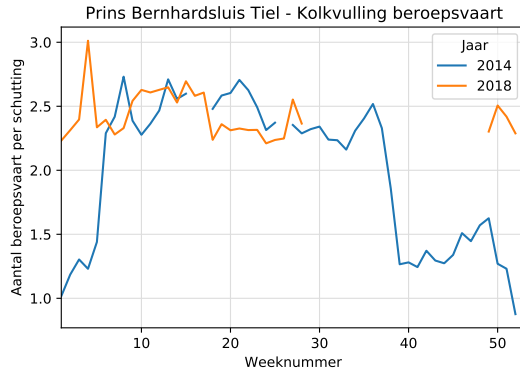
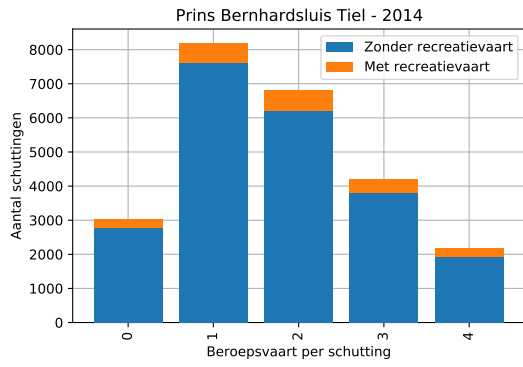
Opdeling overige vaart
Prins Bernhardsluis Tiel - Amsterdam-Rijnkanaal



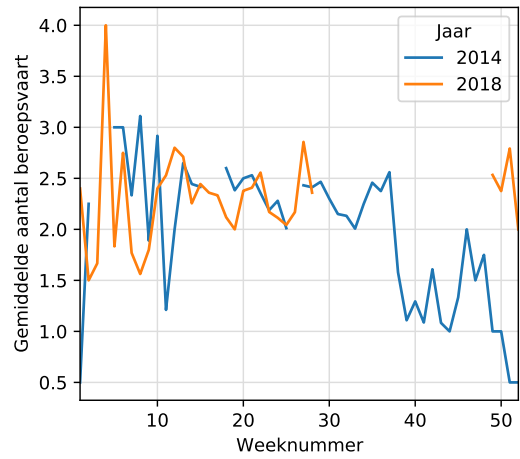
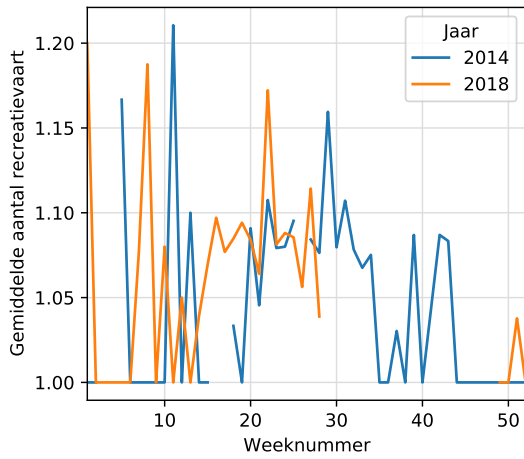
Prins Bernhardsluis Tiel - Amsterdam-Rijnkanaal - 2018





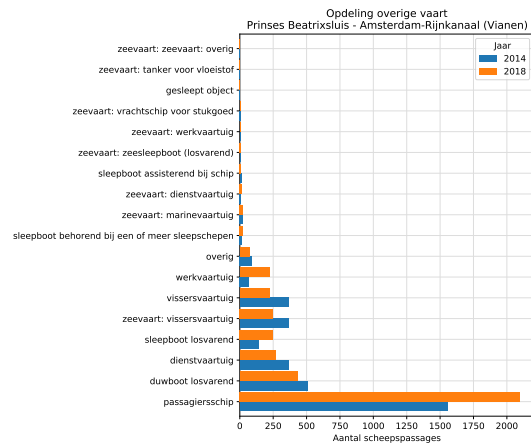
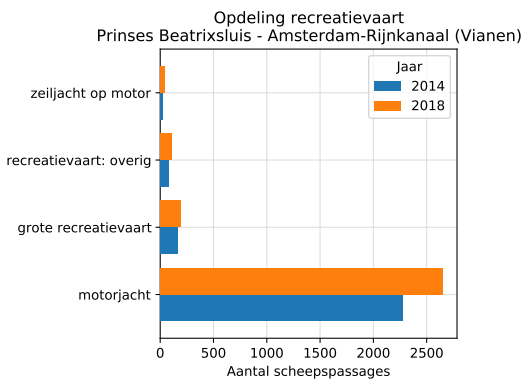
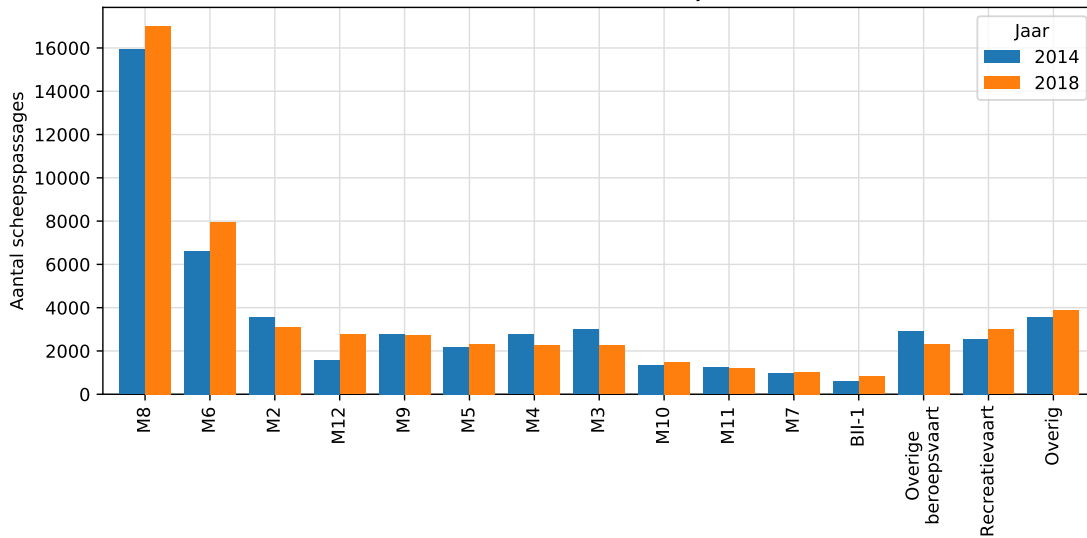


Prins Bernhardsluis Tiel - Kolkvulling bij schuttingen met recreatievaart

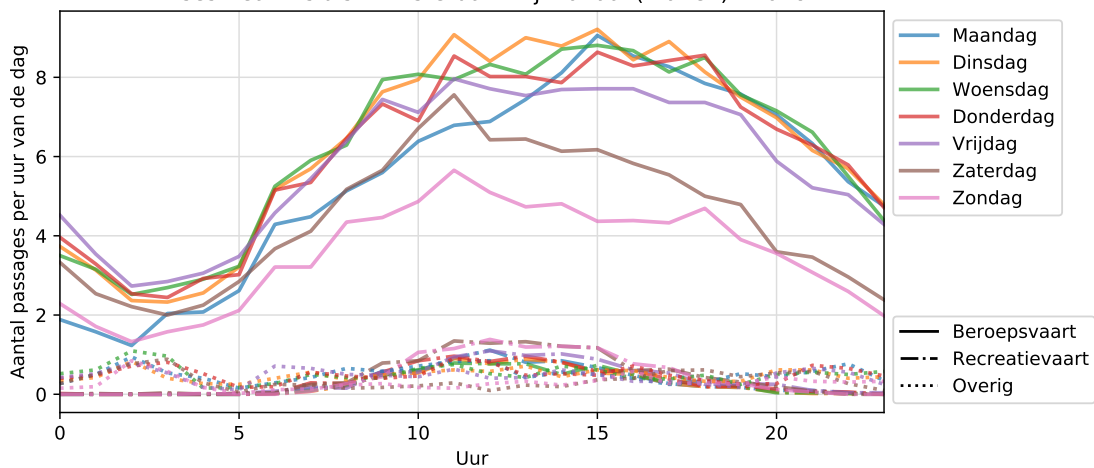


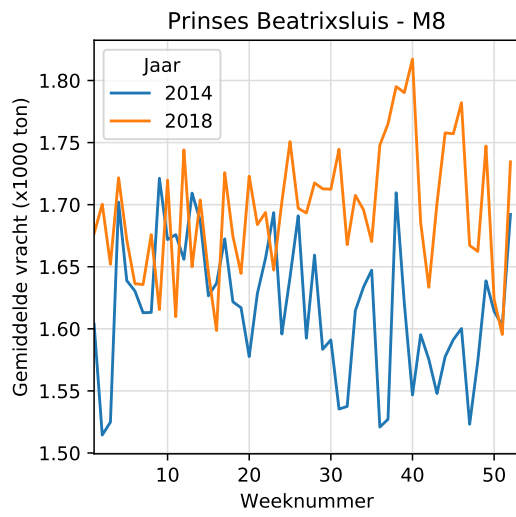
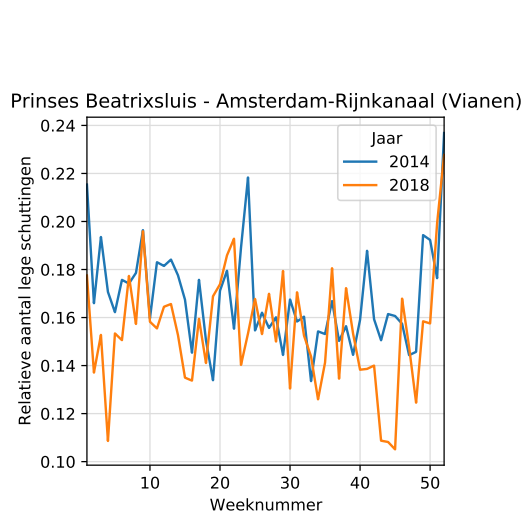
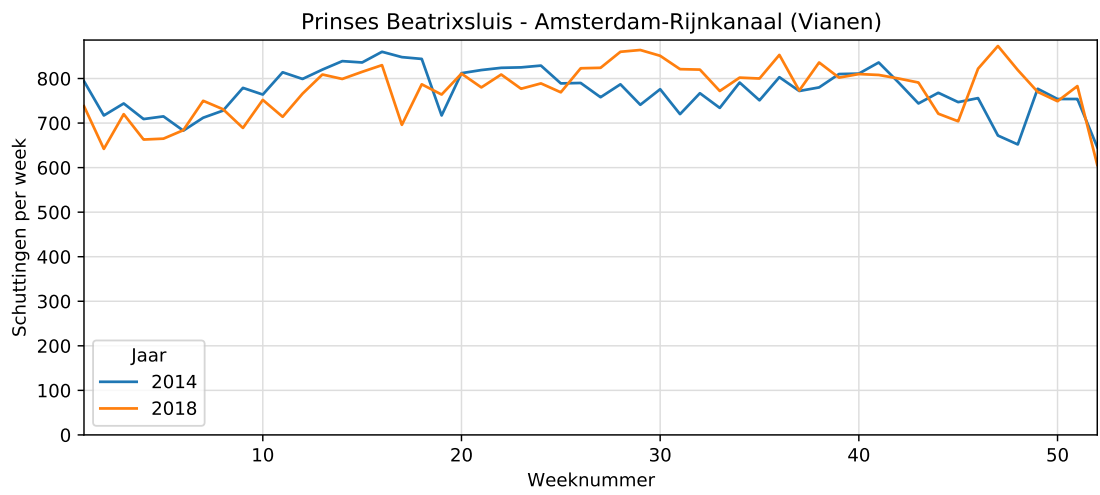
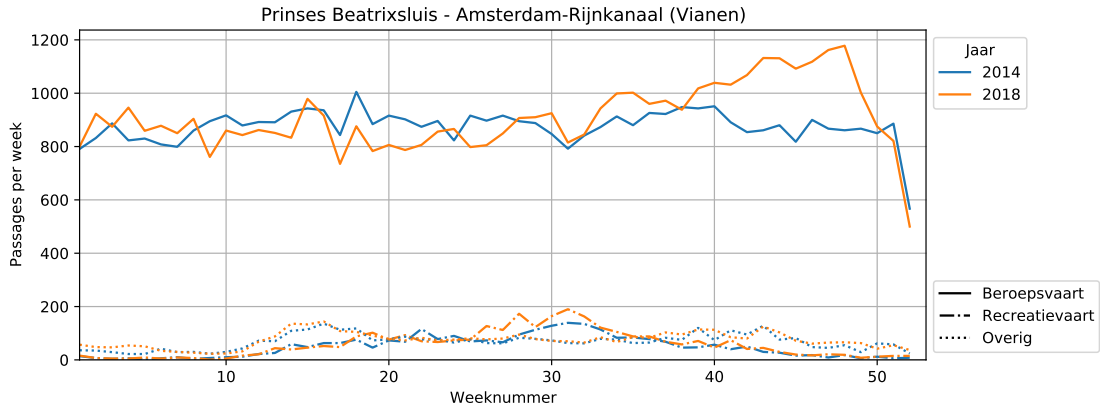
3.6 Prinses Beatrixsluis

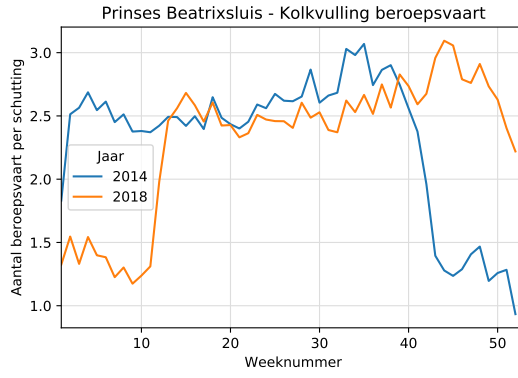
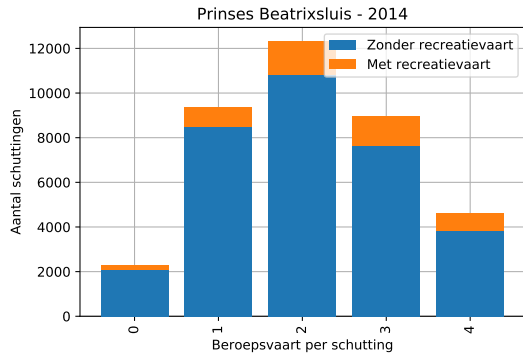
Prinses Beatrixsluis - Amsterdam-Rijnkanaal (Vianen)



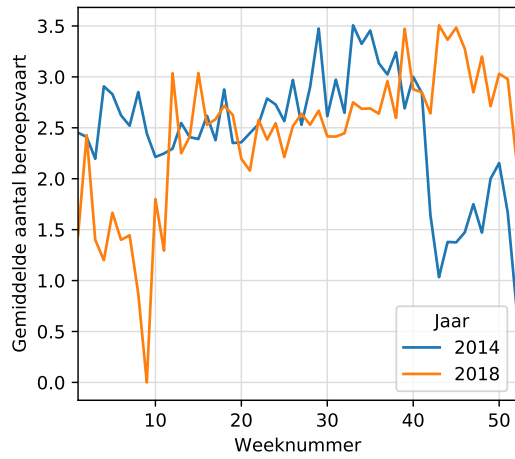
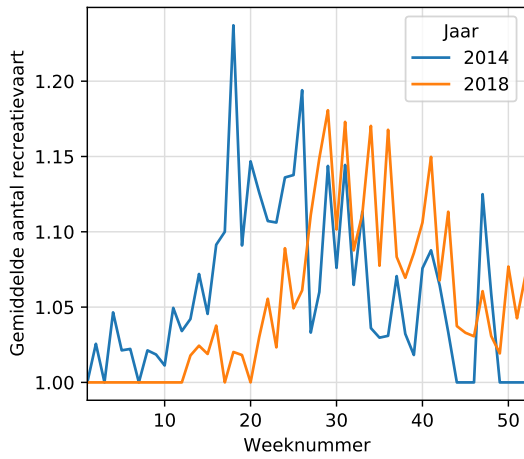
Prinses Beatrixsluis - Amsterdam-Rijnkanaal (Vianen) - 2018



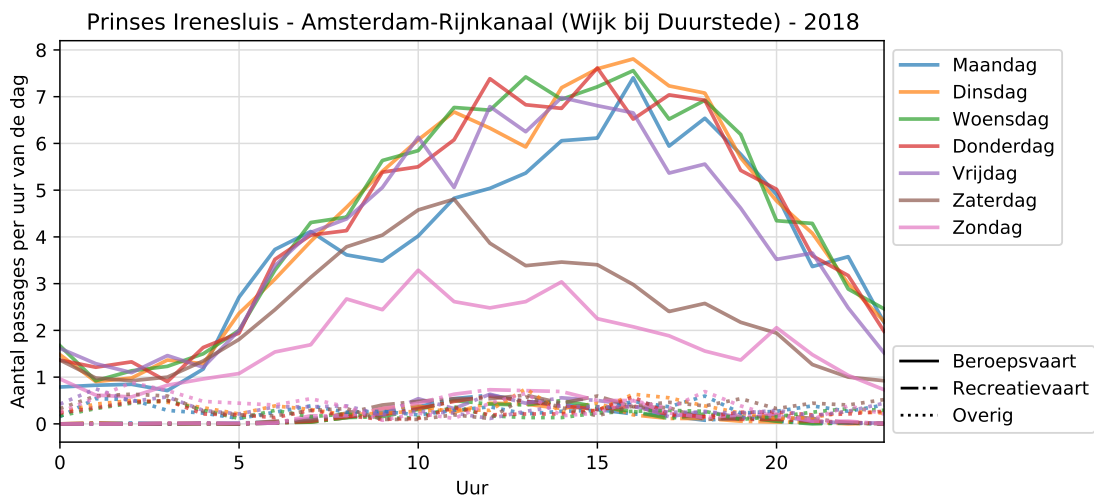
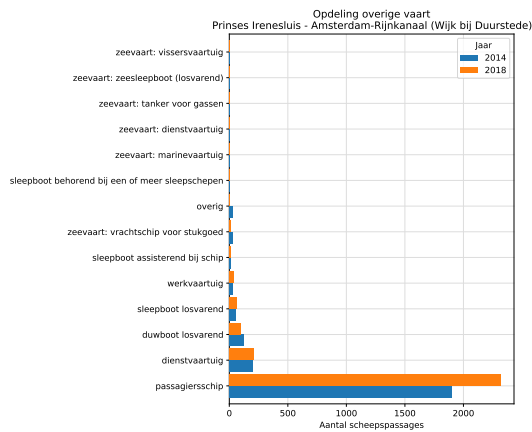
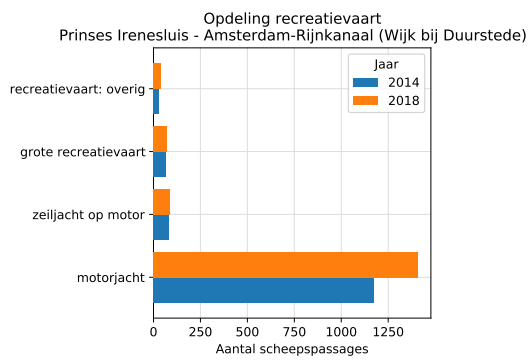
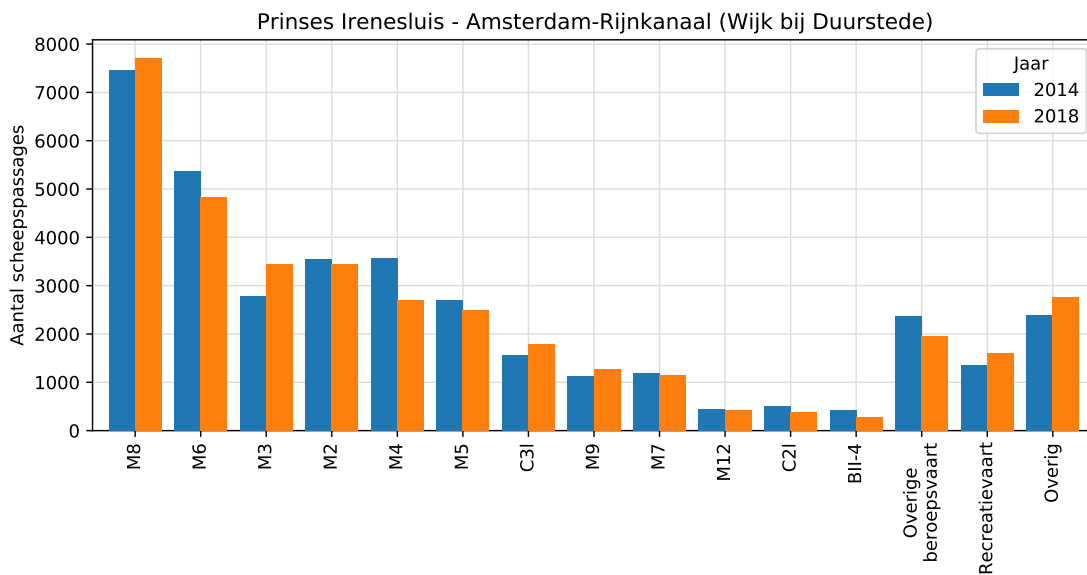


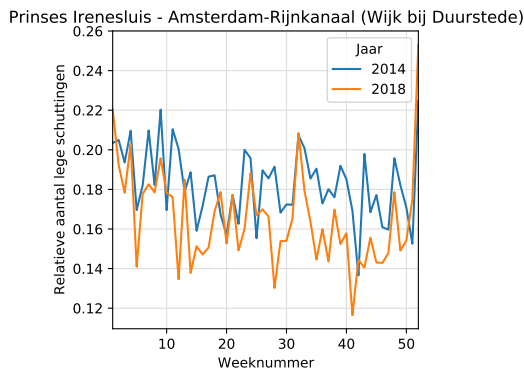
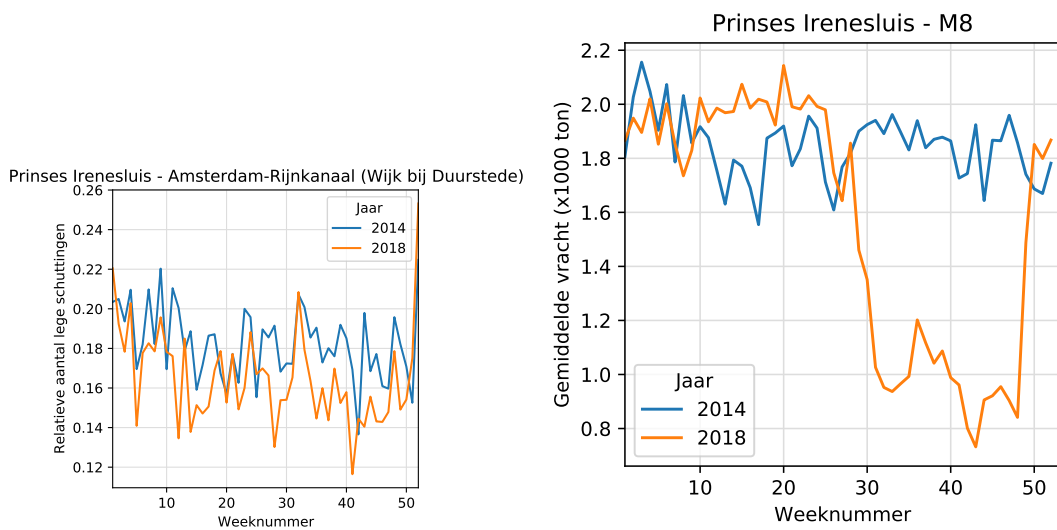
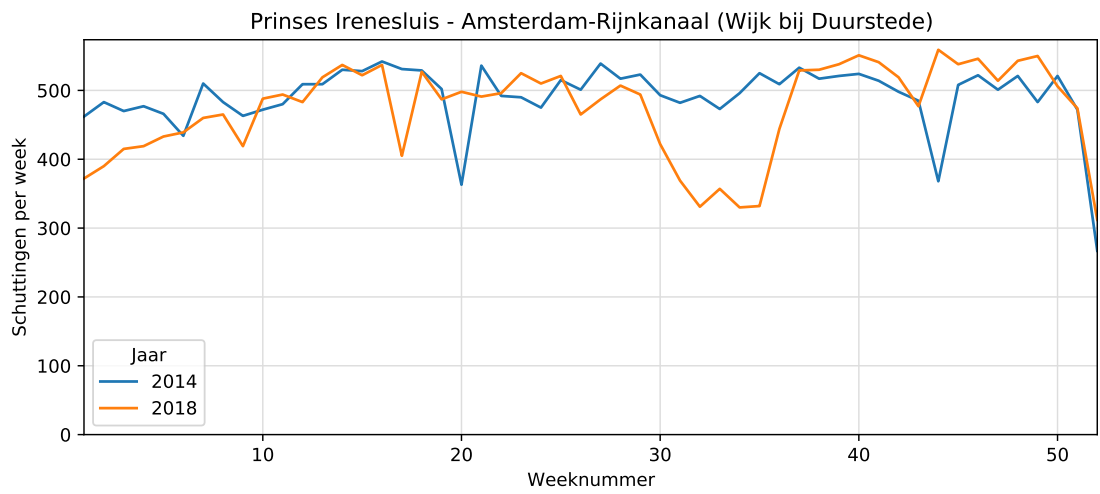
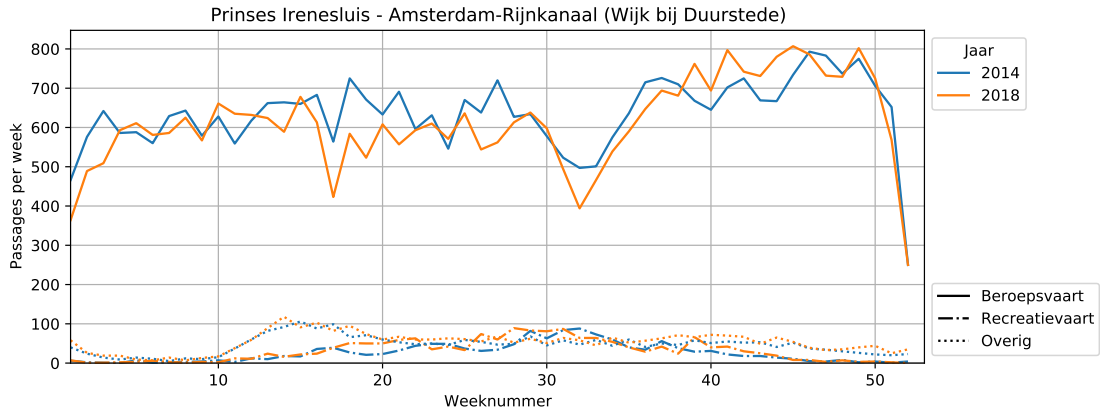


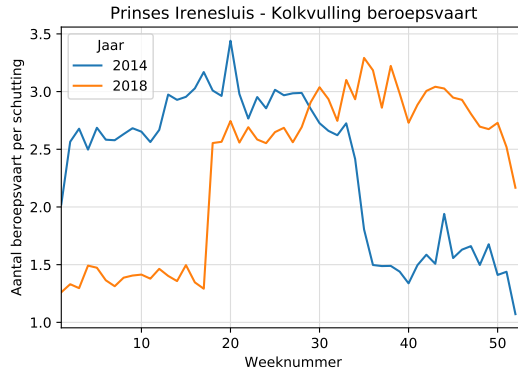
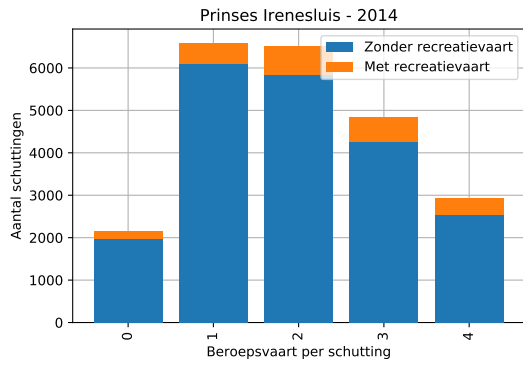
Prinses Beatrixsluis - Kolkvulling bij schuttingen met recreatievaart



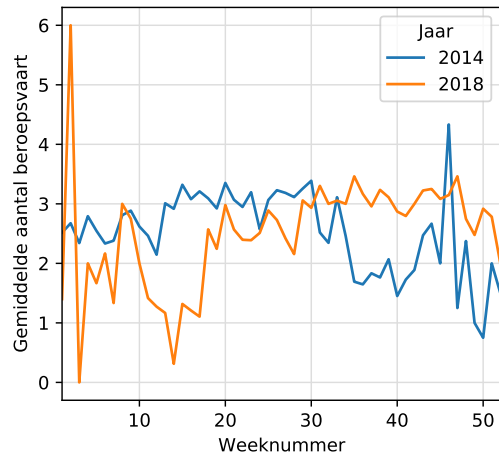
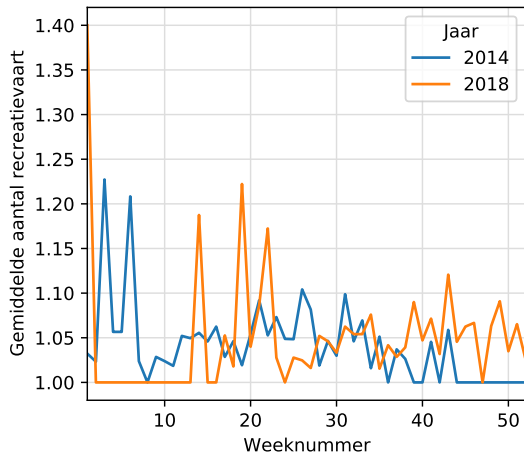
3.7 Prinses Irenesluis





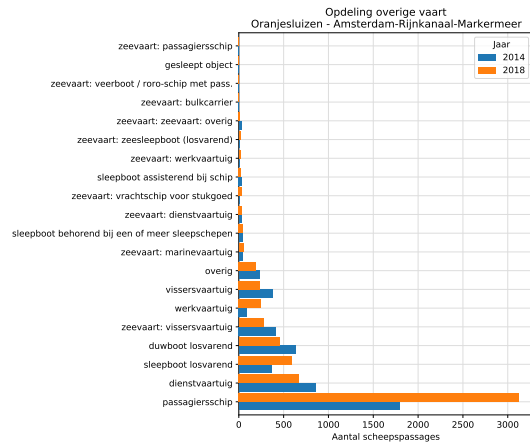
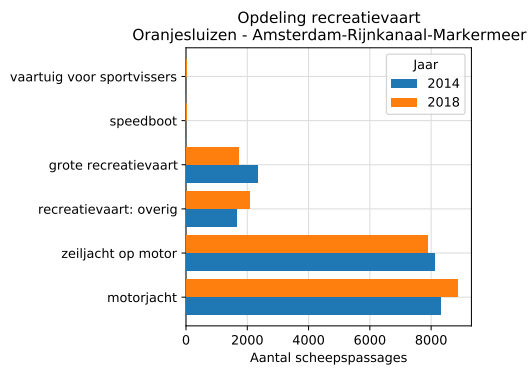
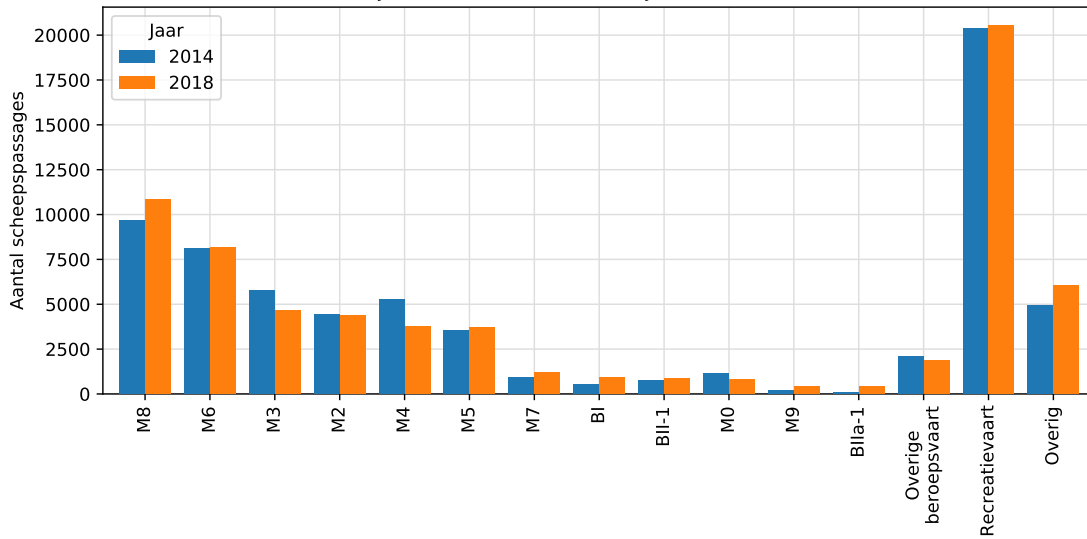


Prinses Irenesluis - Kolkvulling bij schuttingen met recreatievaart

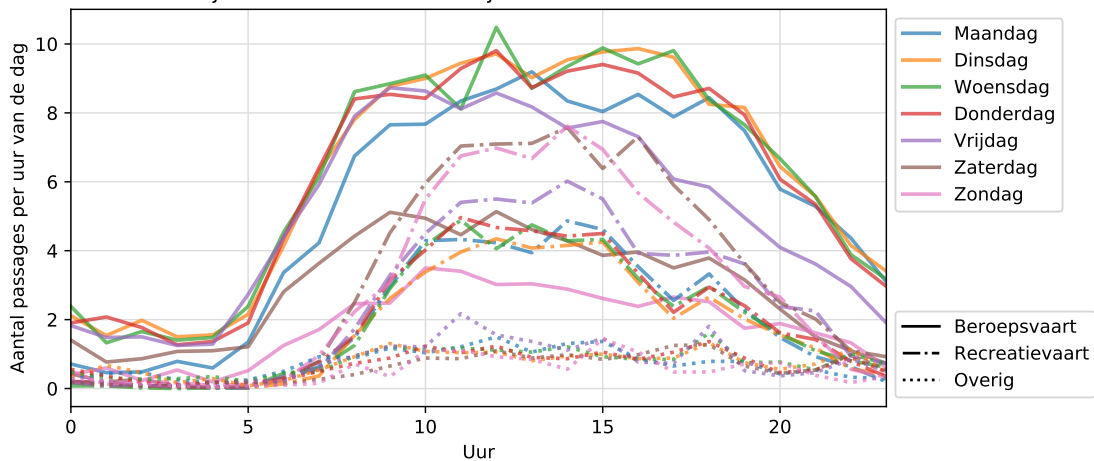


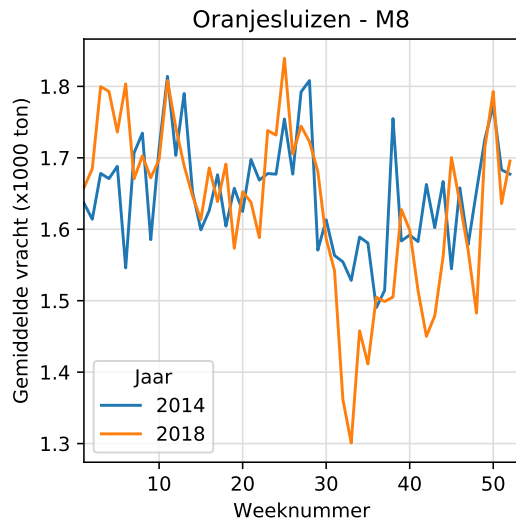
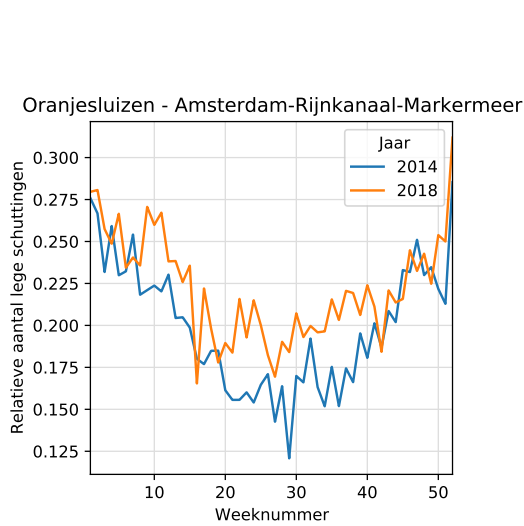
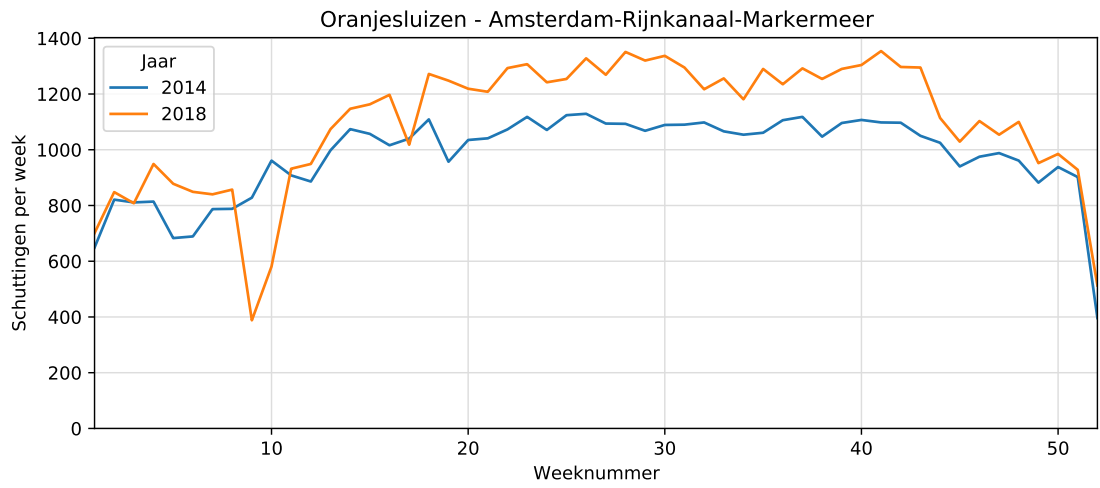
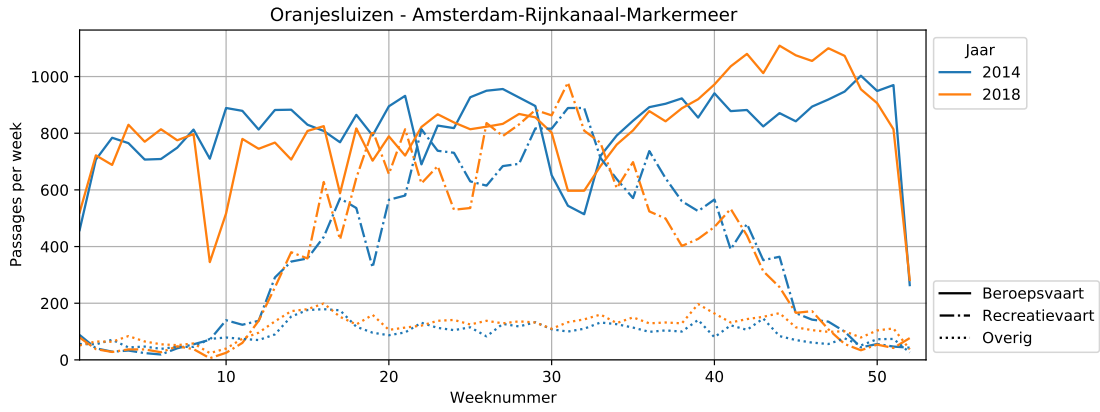
3.8 Oranjesluizen

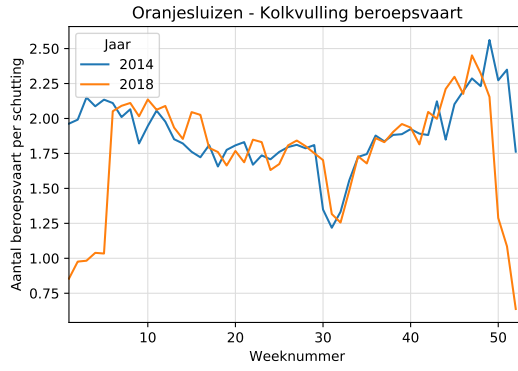
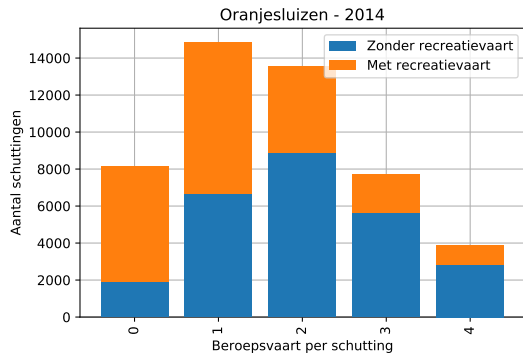
Oranjesluizen - Amsterdam-Rijnkanaal-Markermeer



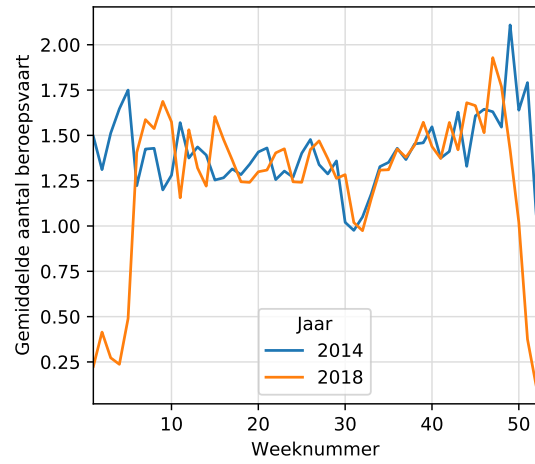
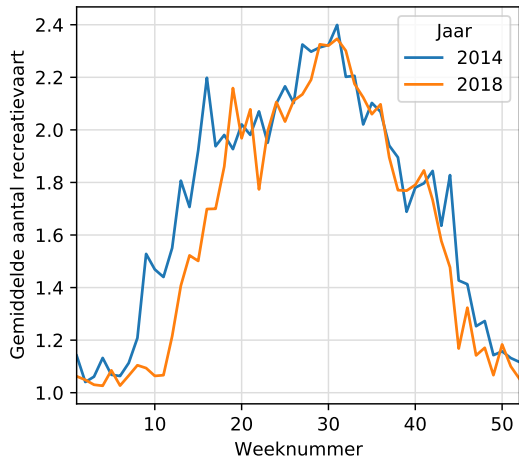
Oranjesluizen - Amsterdam-Rijnkanaal-Markermeer - 2018





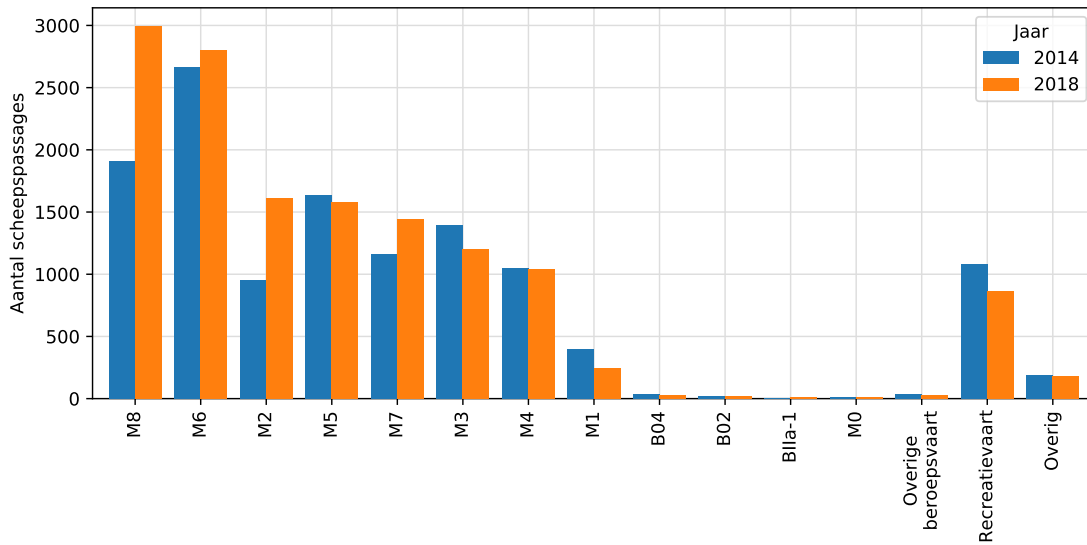


Oranjesluizen - Kolkvulling bij schuttingen met recreatievaart

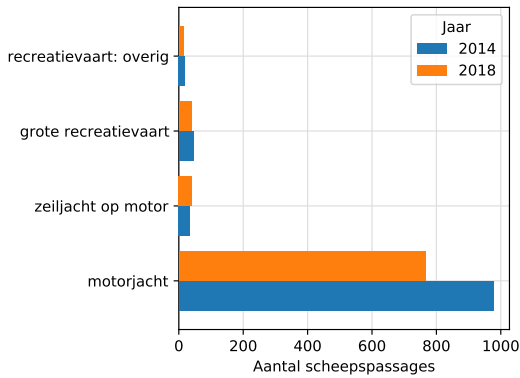


3.9 Sluis Eefde

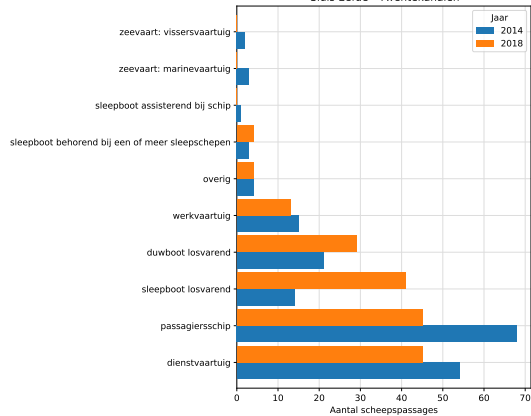
Sluis Eefde - Twentekanalen



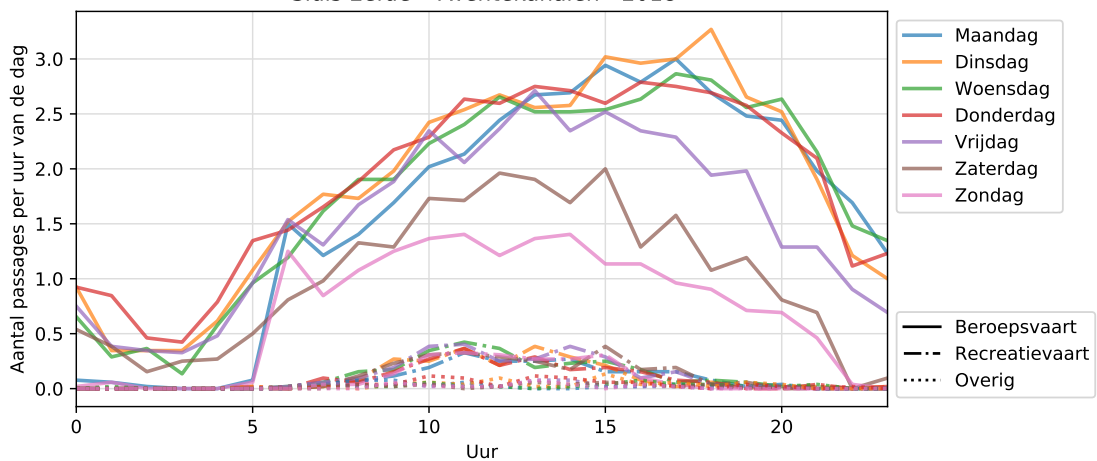
Opdeling recreatievaart
Sluis Eefde - Twentekanalen

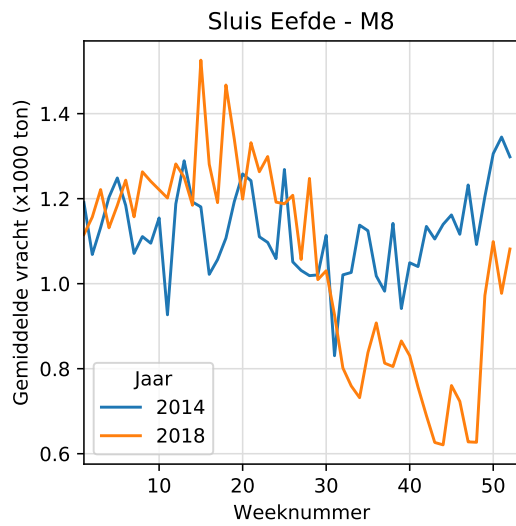
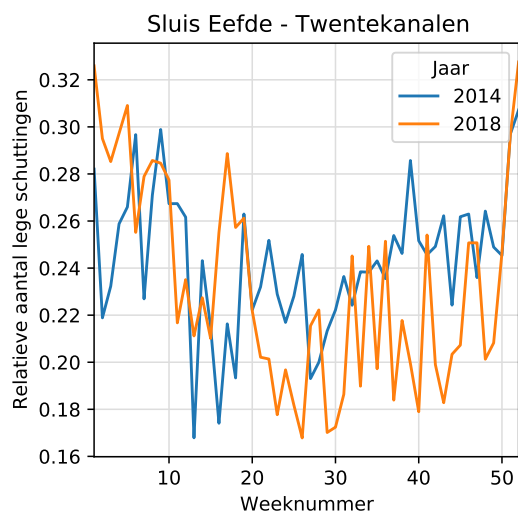
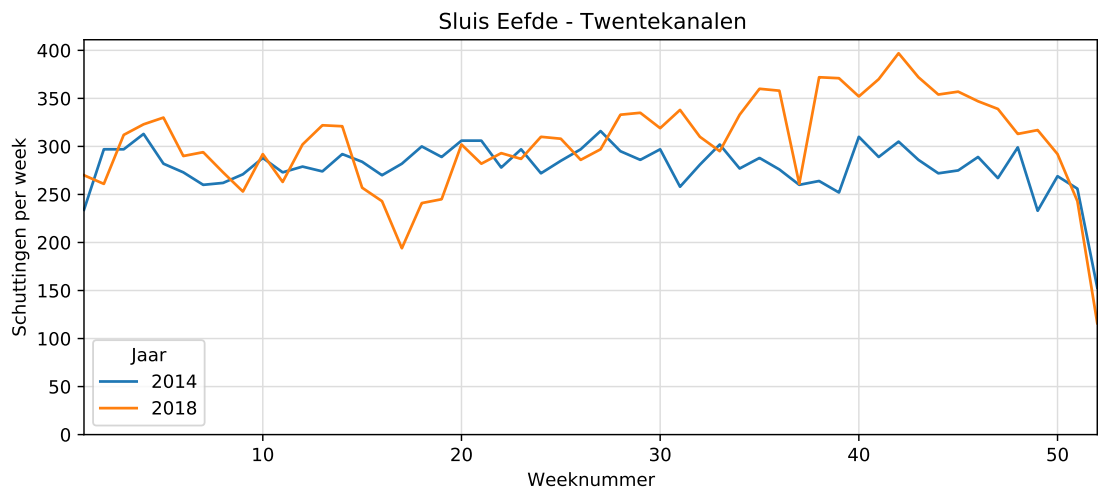
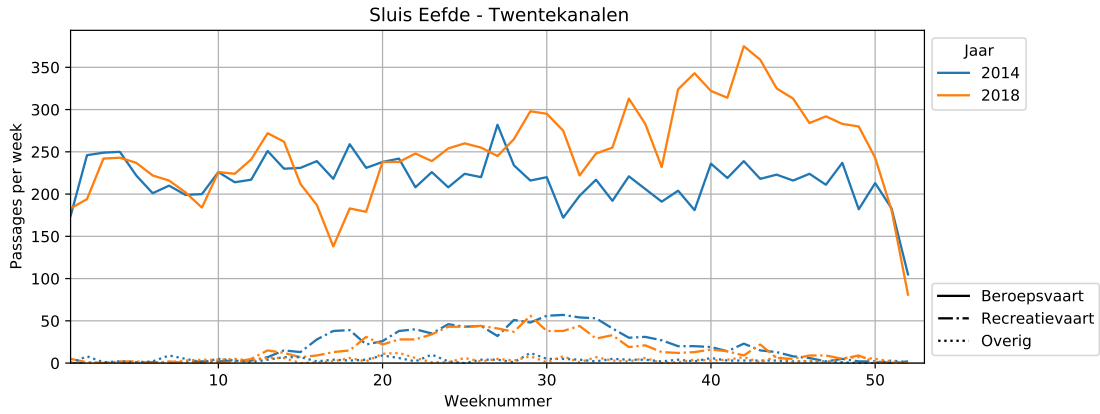


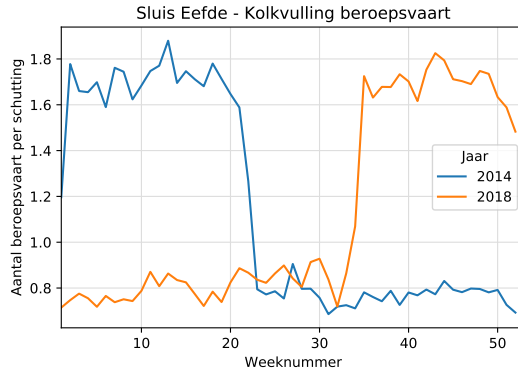
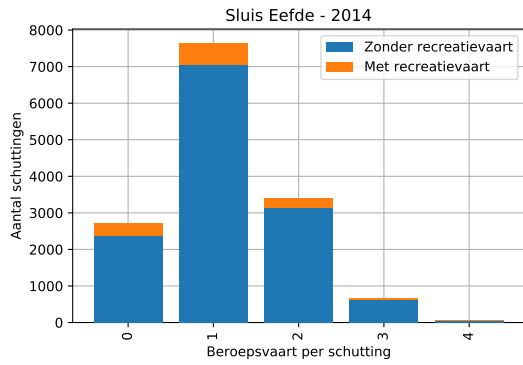
Opdeling overige vaart
Sluis Eefde - Twentekanalen



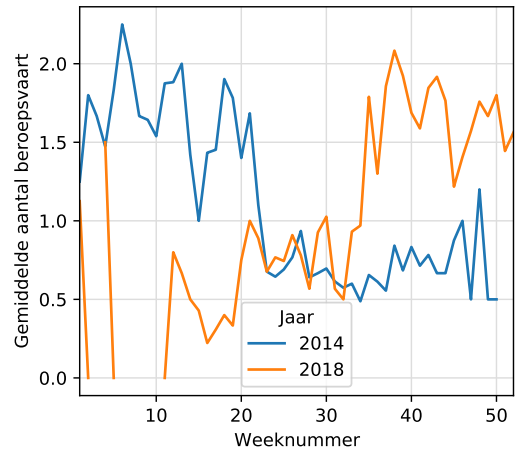
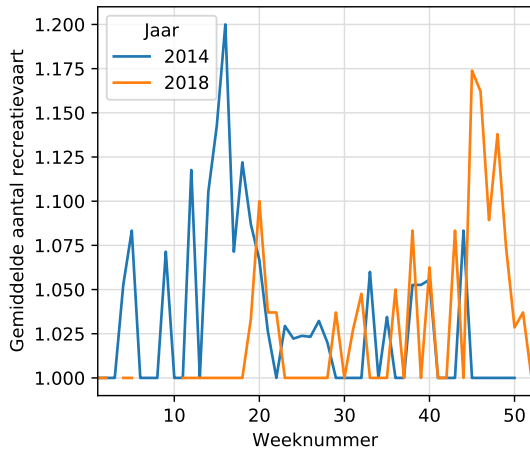
Sluis Eefde - Twentekanalen - 2018





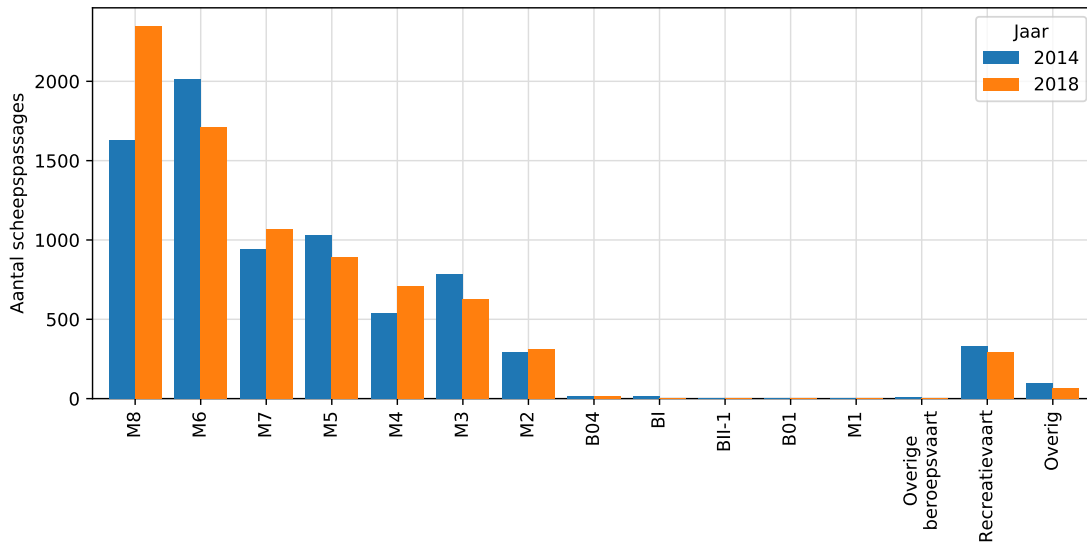


Sluis Eefde - Kolkvulling bij schuttingen met recreatievaart

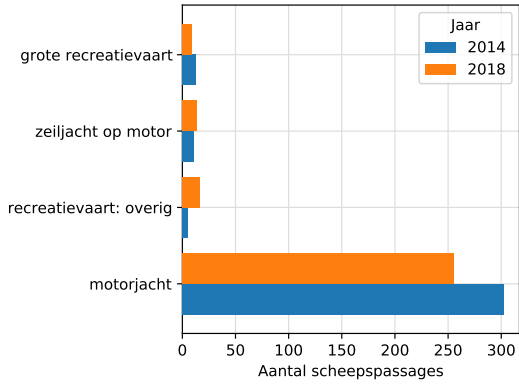


3.10 Sluis Delden

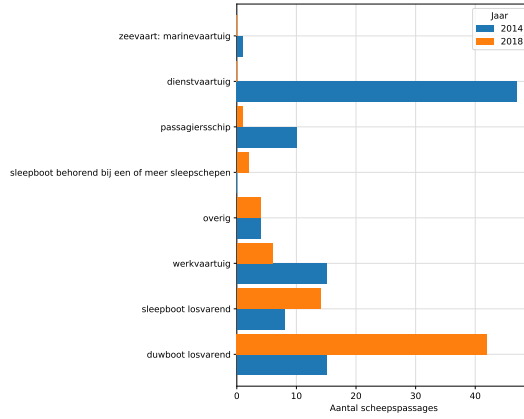
Sluis Delden - Twentekanalen



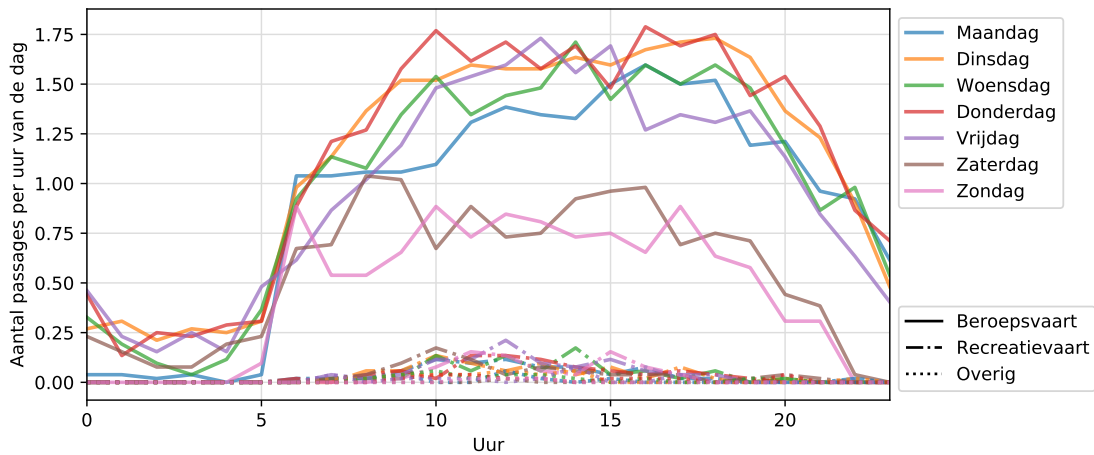
Opdeling recreatievaart
Sluis Delden - Twentekanalen

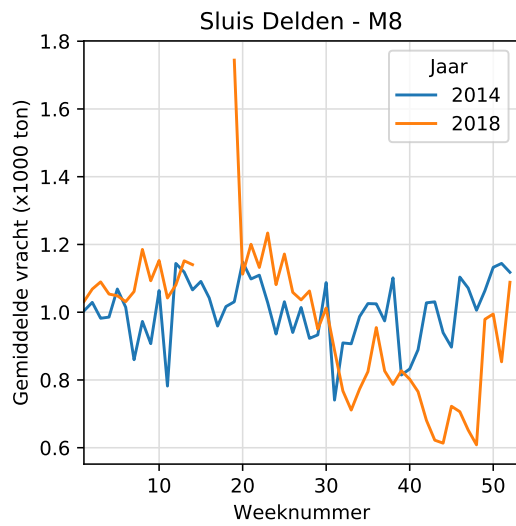
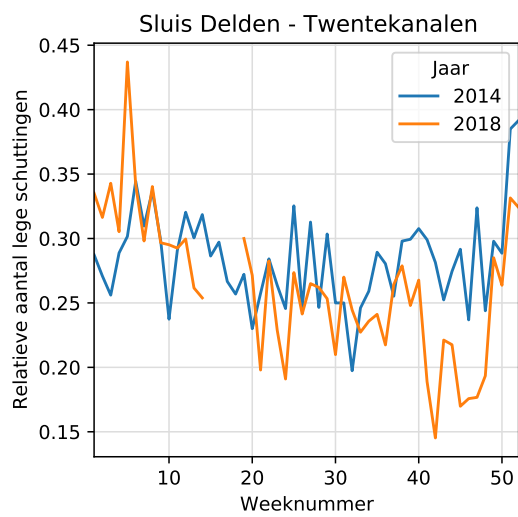
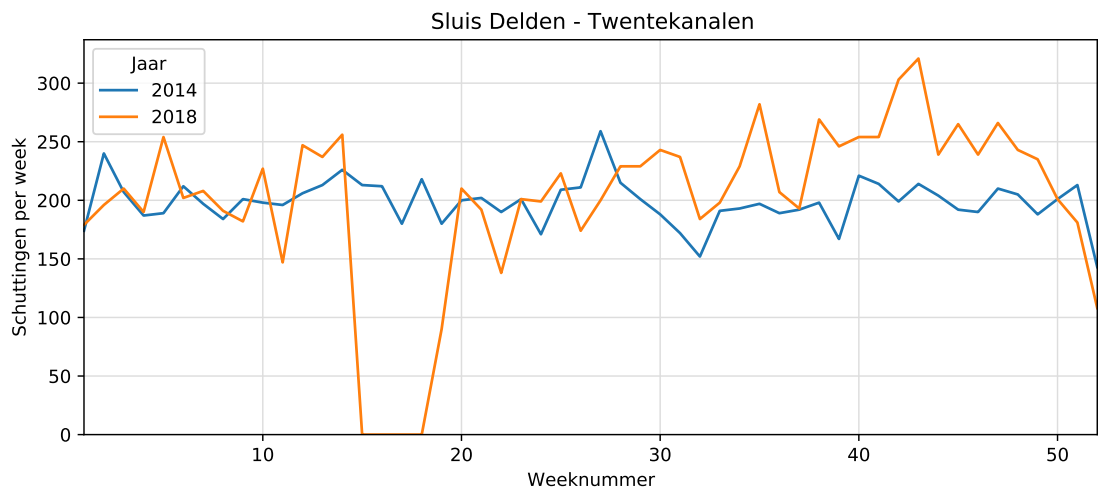
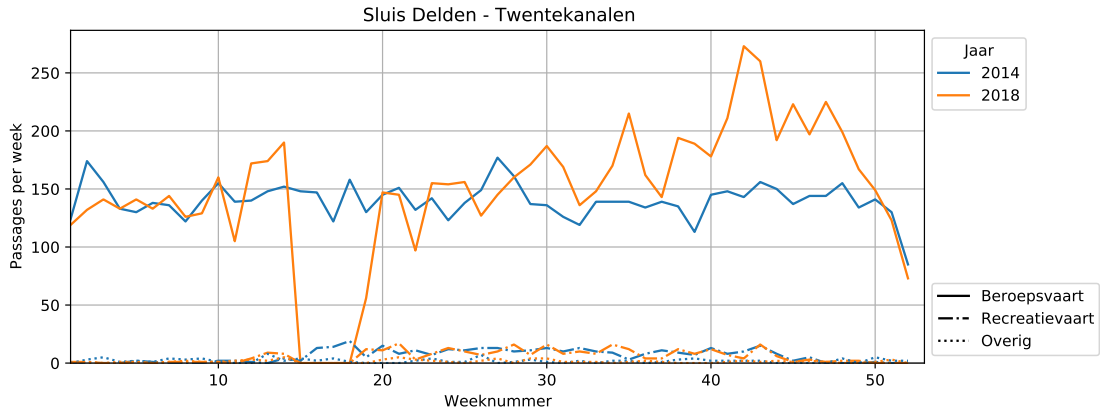


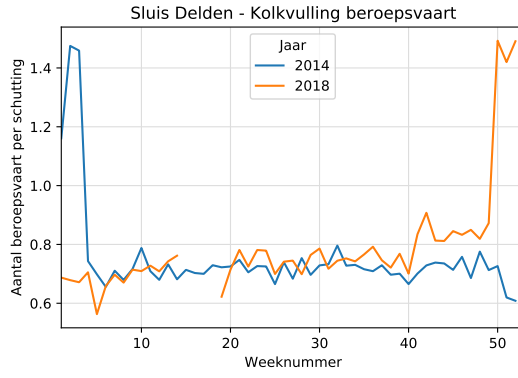
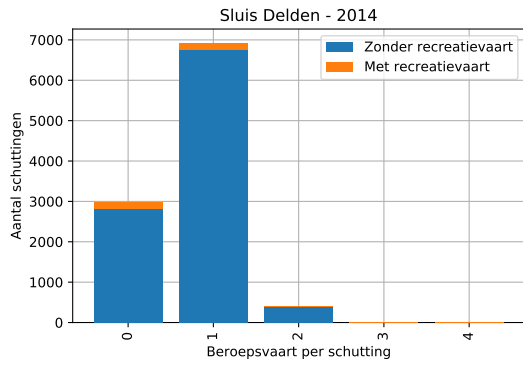
Opdeling overige vaart
Sluis Delden - Twentekanalen



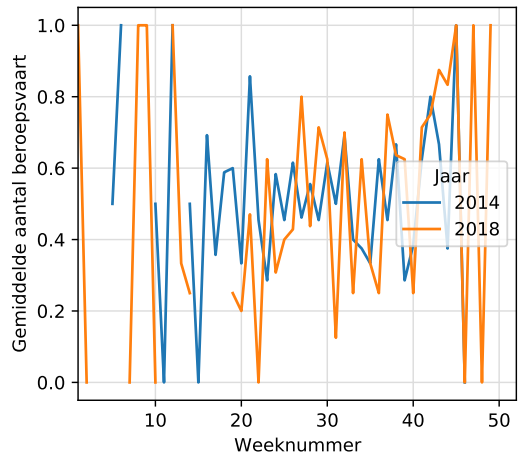
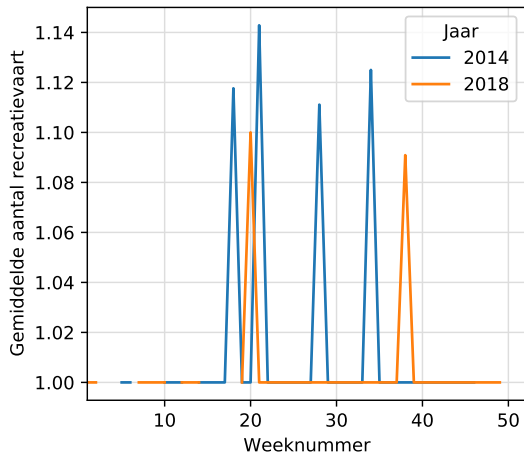
Sluis Delden - Twentekanalen - 2018





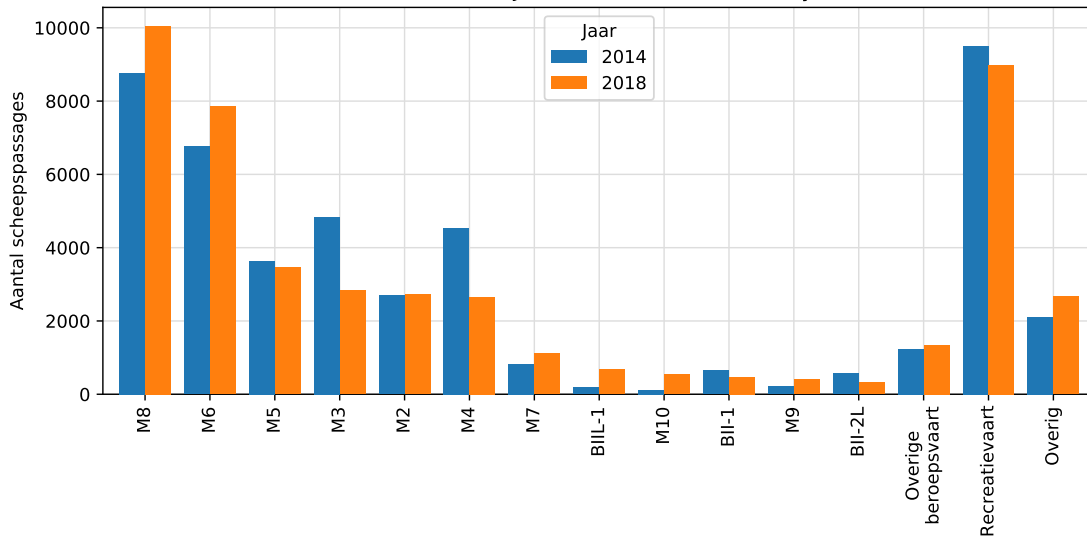


Sluis Delden - Kolkvulling bij schuttingen met recreatievaart

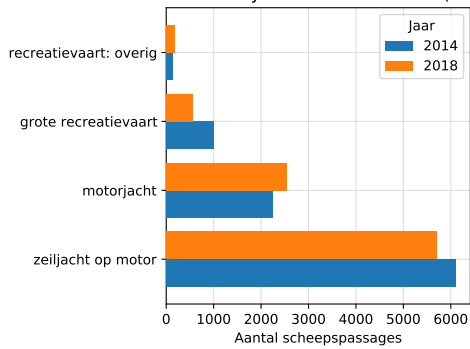


3.11 Houtribsluizen

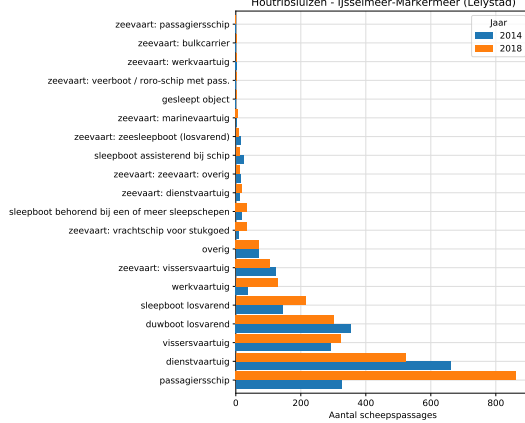
Houtribsluizen - IJsselmeer-Markermeer (Lelystad)



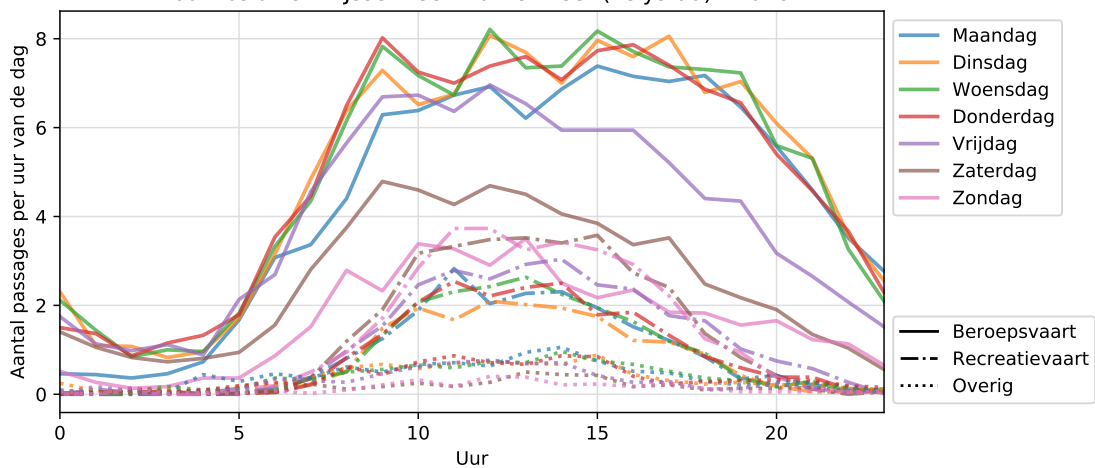
Opdeling recreatievaart
Houtribsluizen - IJsselmeer-Markermeer (Lelystad)

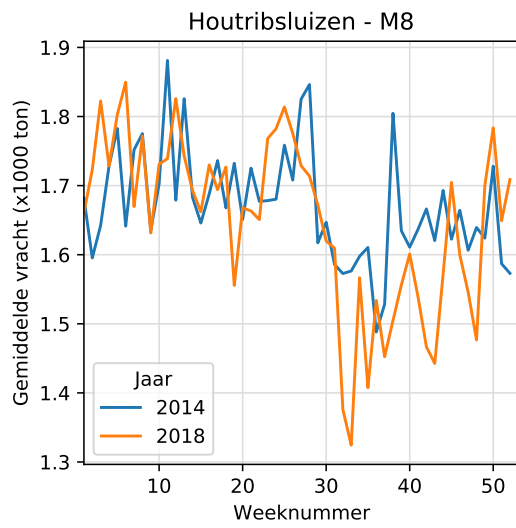
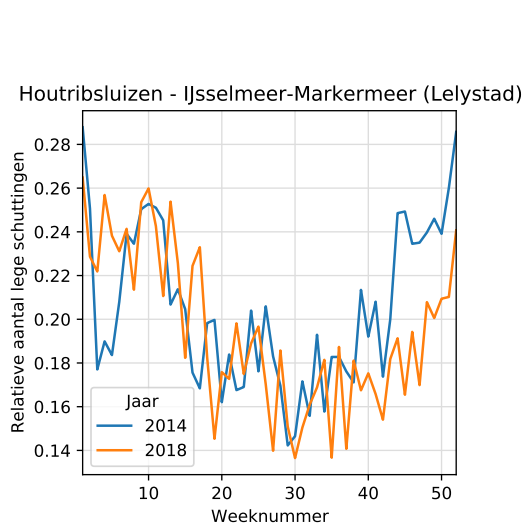
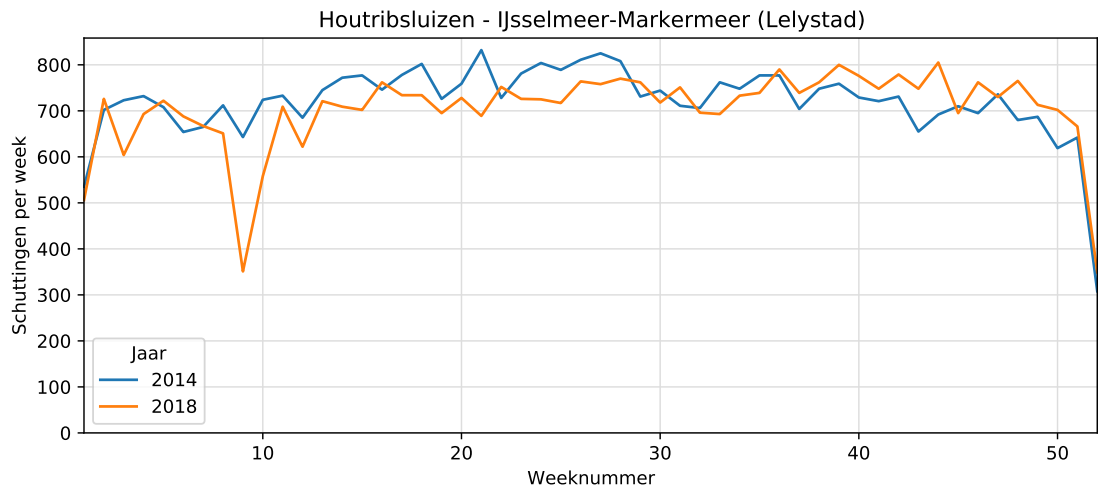
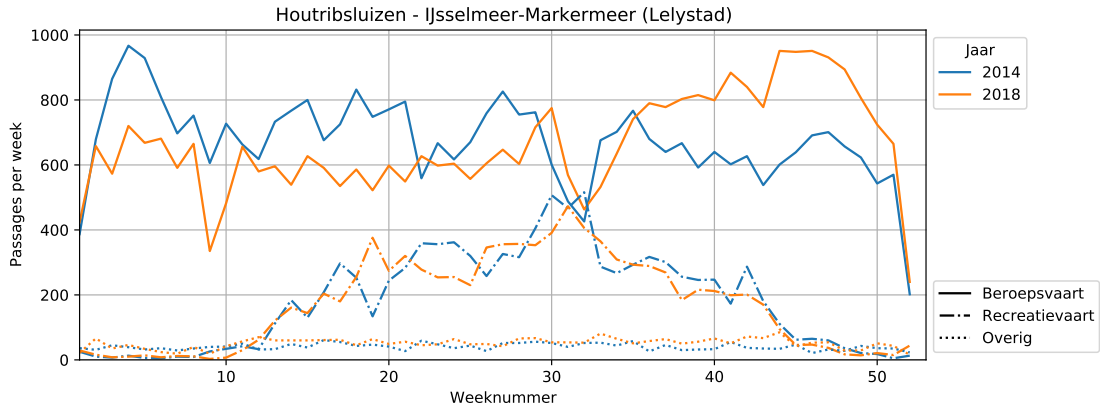


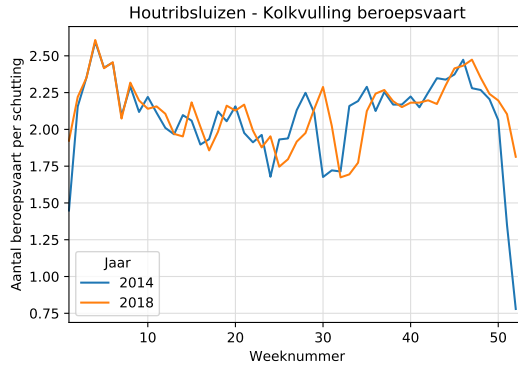
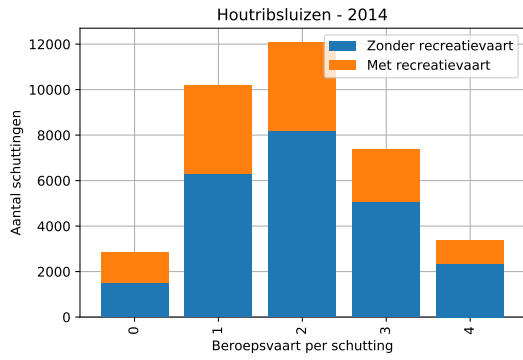
Opdeling overige vaart
Houtribsluizen - IJsselmeer-Markermeer (Lelystad)



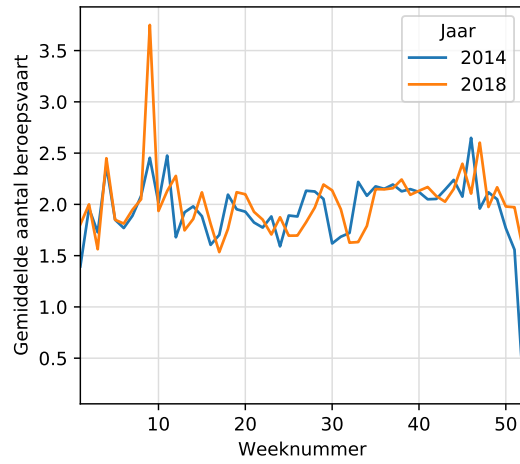
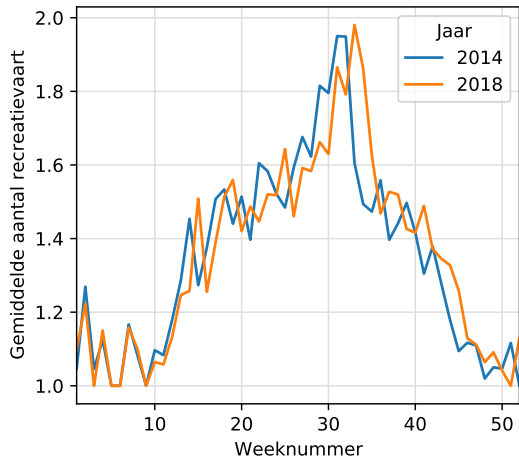
Houtribsluizen - IJsselmeer-Markermeer (Lelystad) - 2018

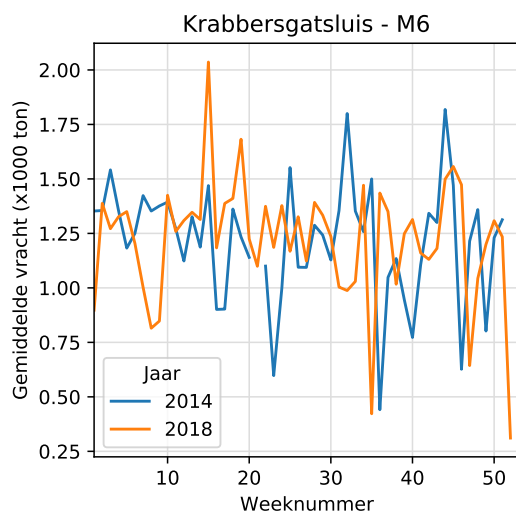
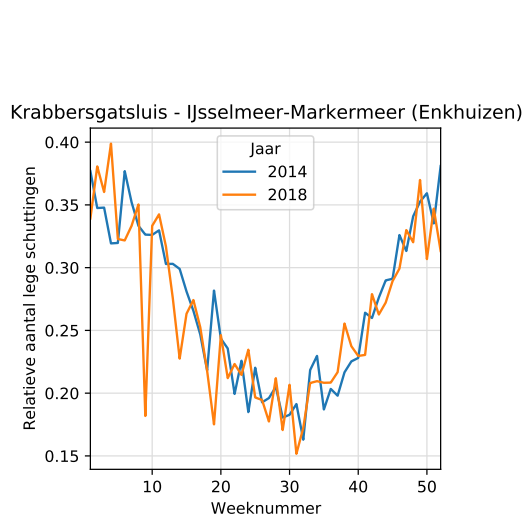
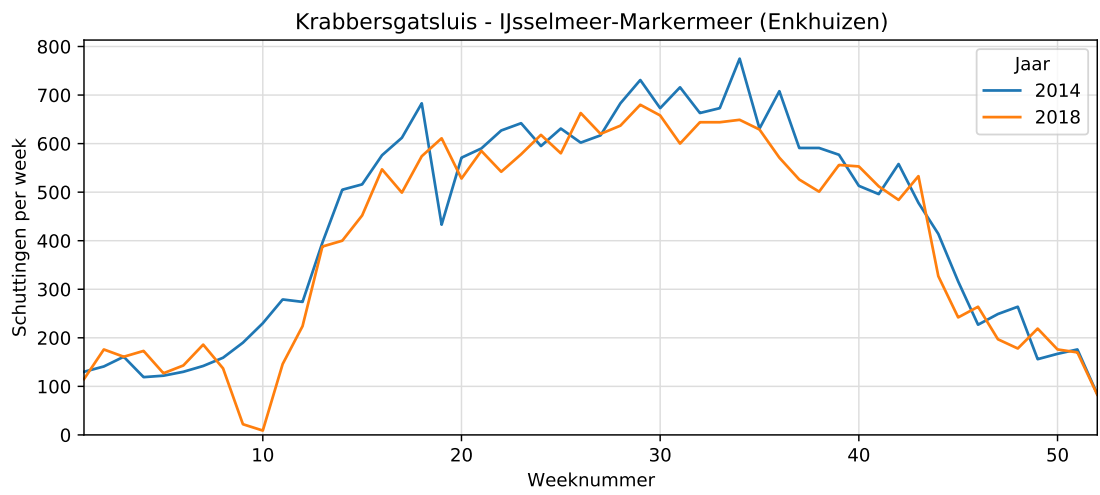
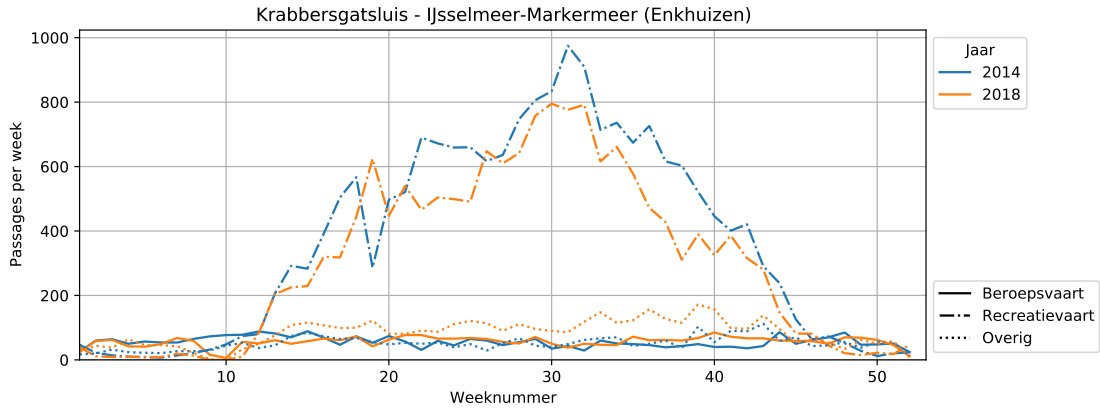


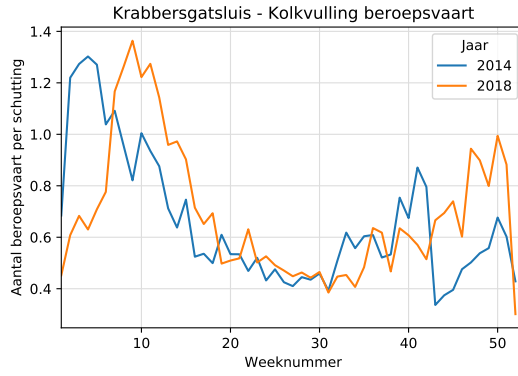
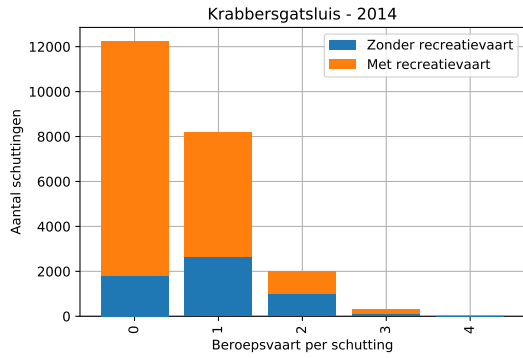




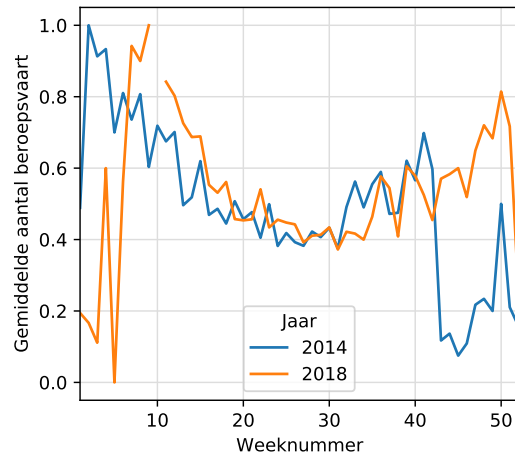
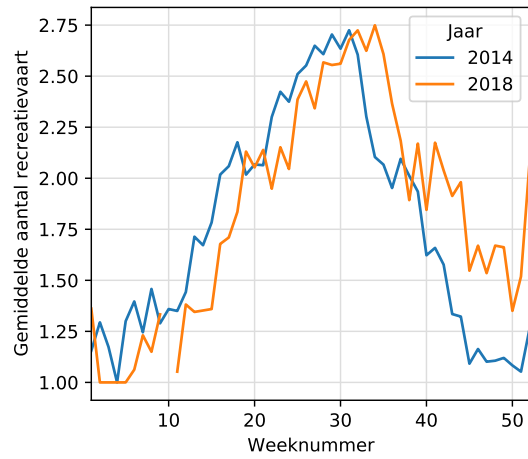
Houtribsluizen - Kolkvulling bij schuttingen met recreatievaart





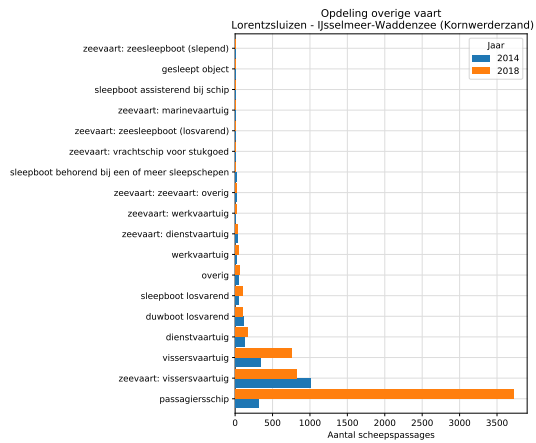
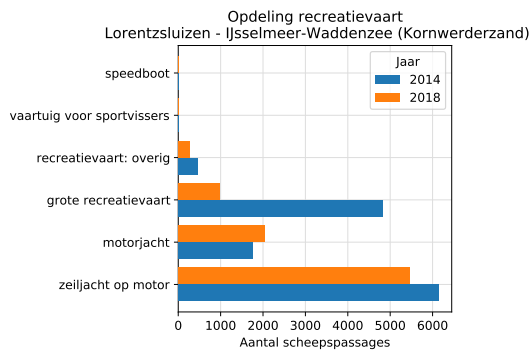
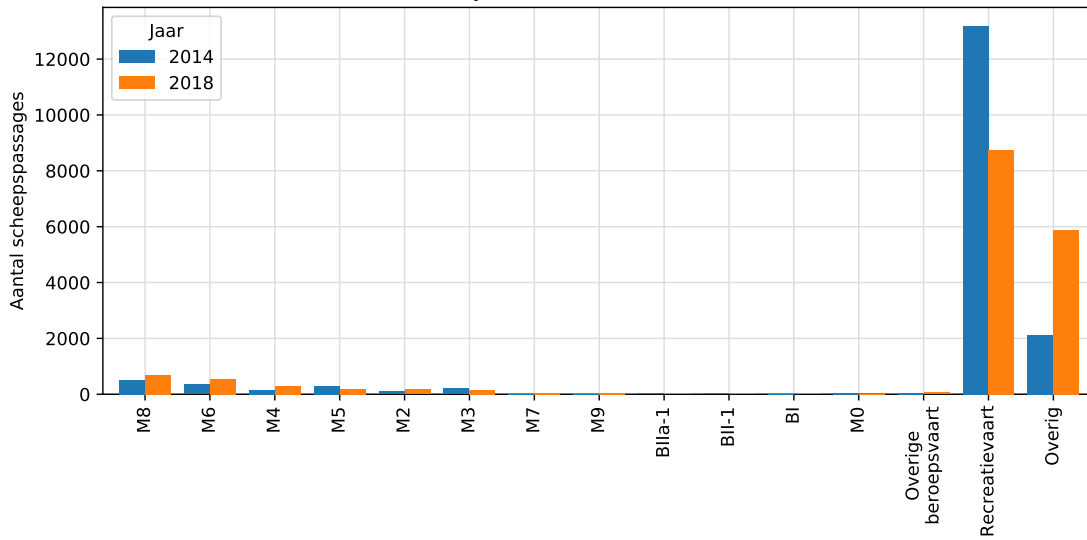


Krabbersgatsluis - Kolkvulling bij schuttingen met recreatievaart

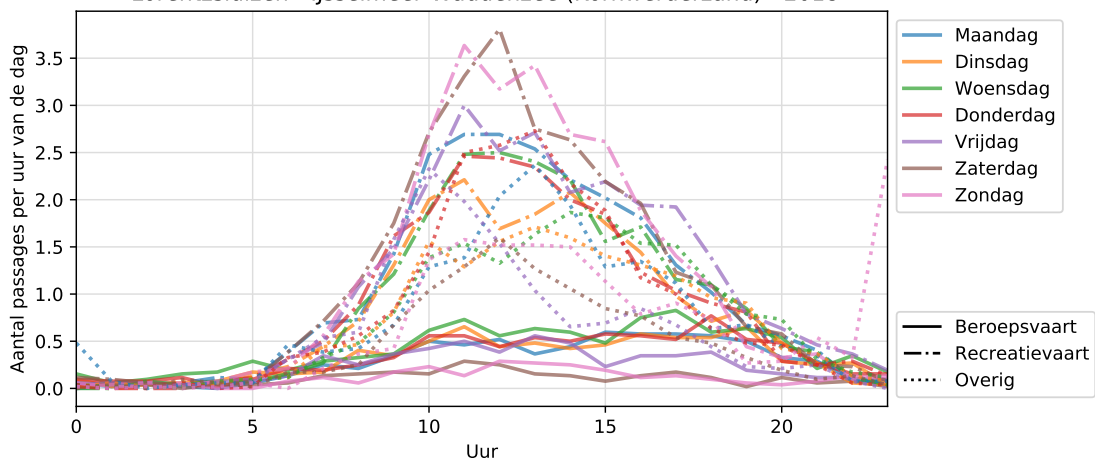


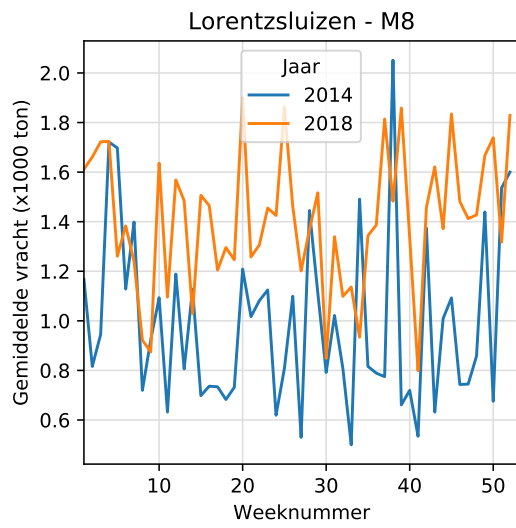
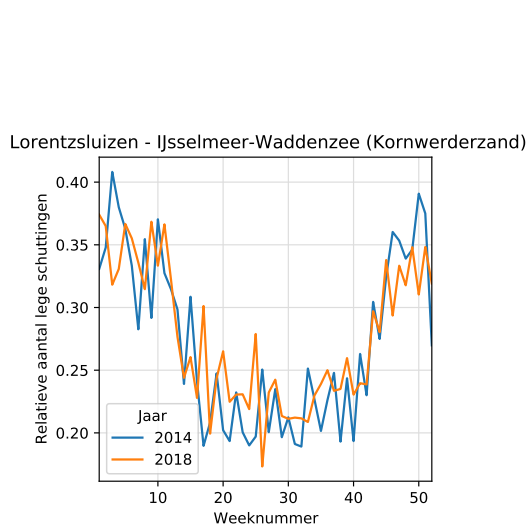
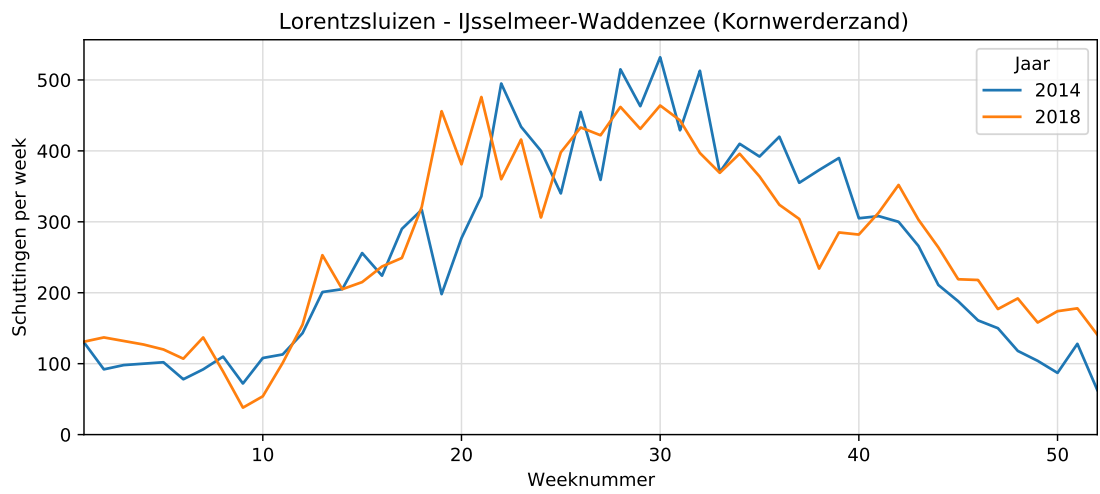
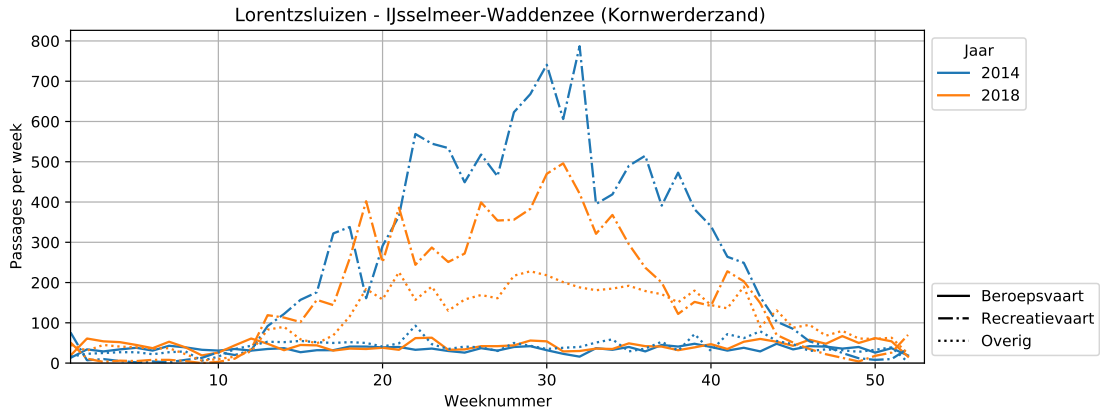
3.13 Lorentzsluizen

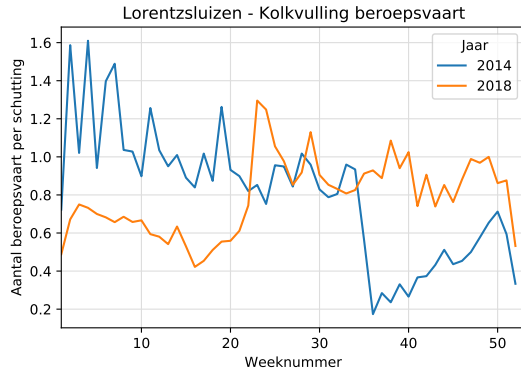
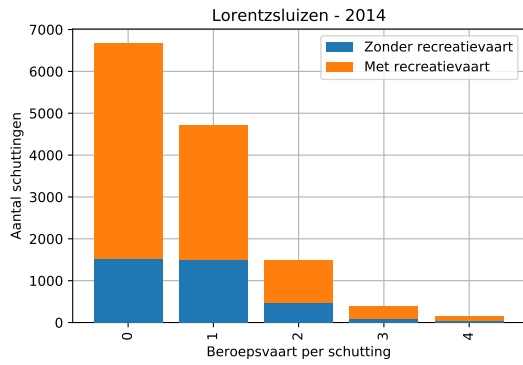
Lorentzsluizen - IJsselmeer-Waddenzee (Kornwerderzand)



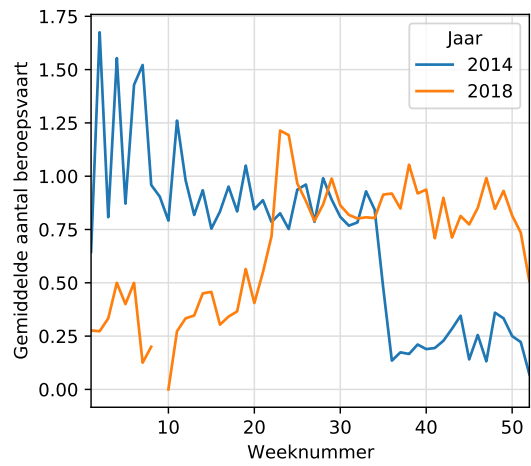
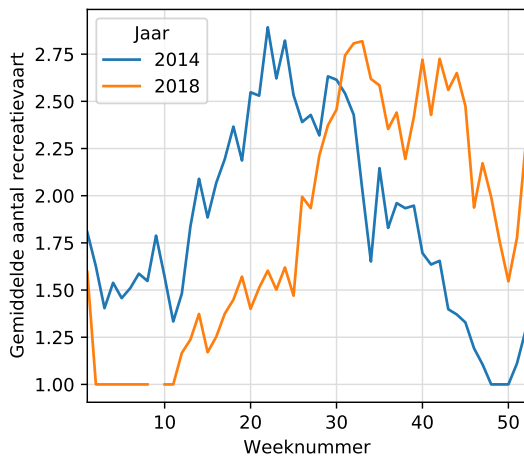
Lorentzsluizen - IJsselmeer-Waddenzee (Kornwerderzand) - 2018







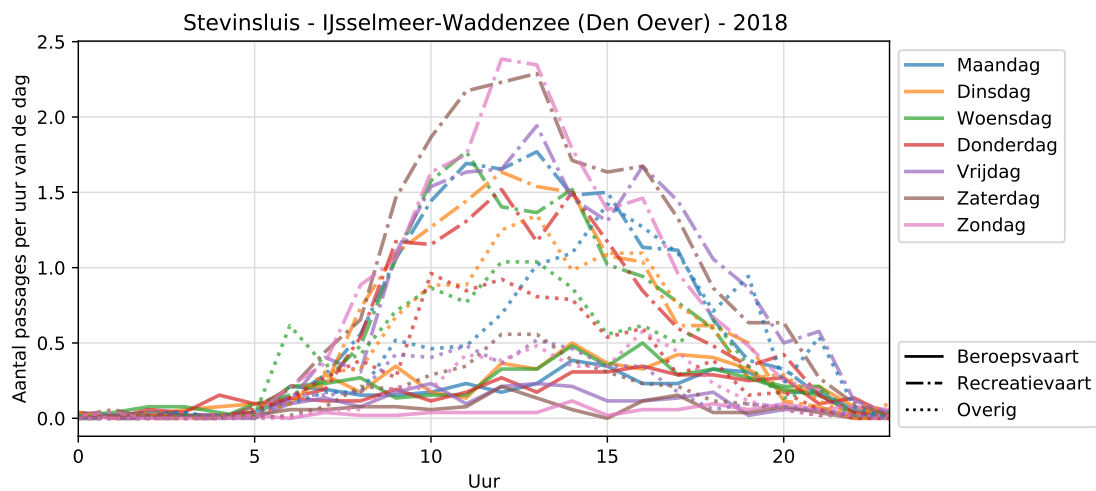
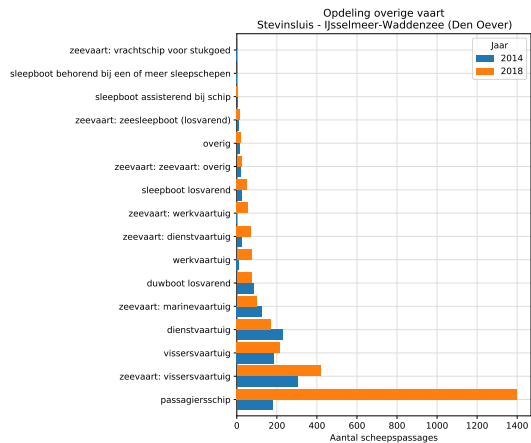
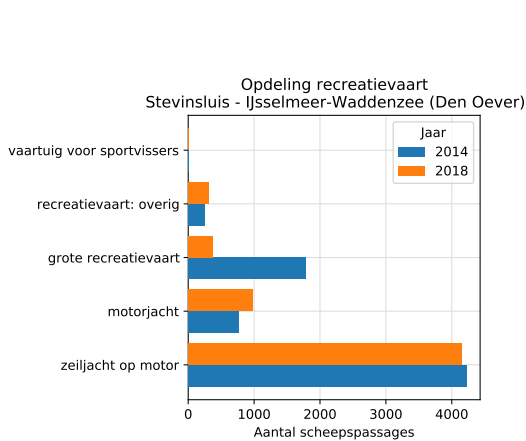
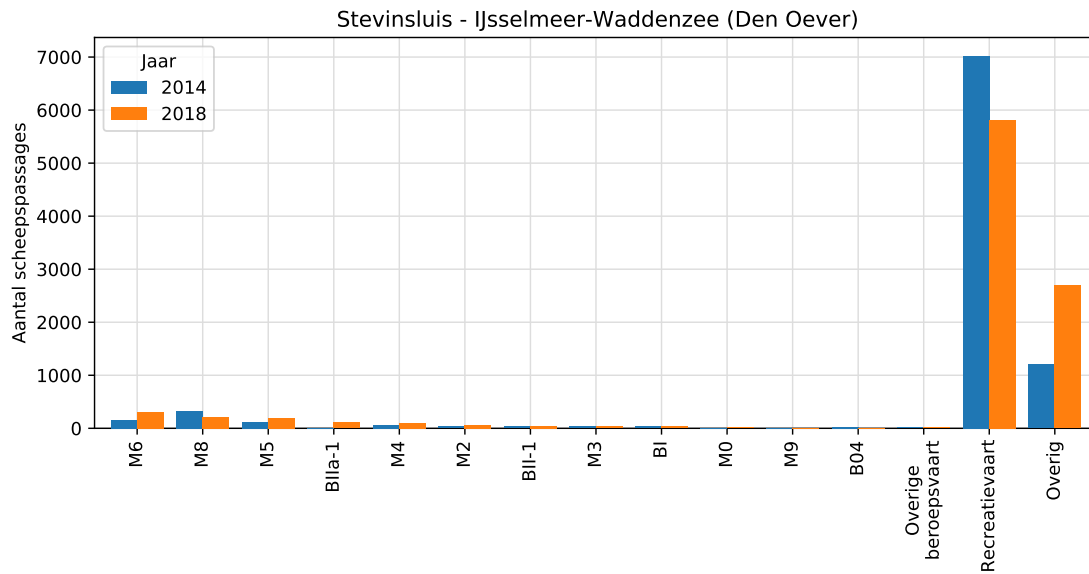
Lorentzsluizen - Kolkvulling bij schuttingen met recreatievaart

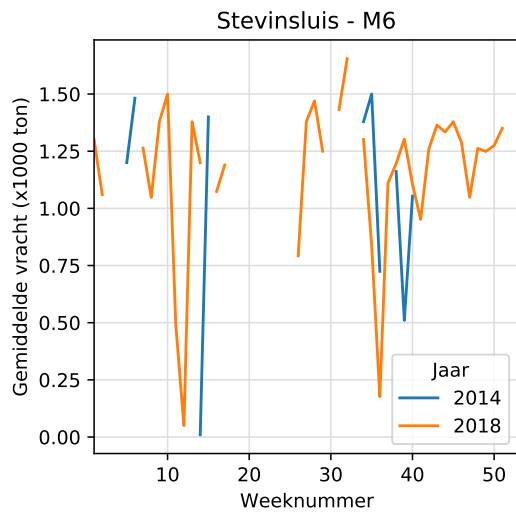
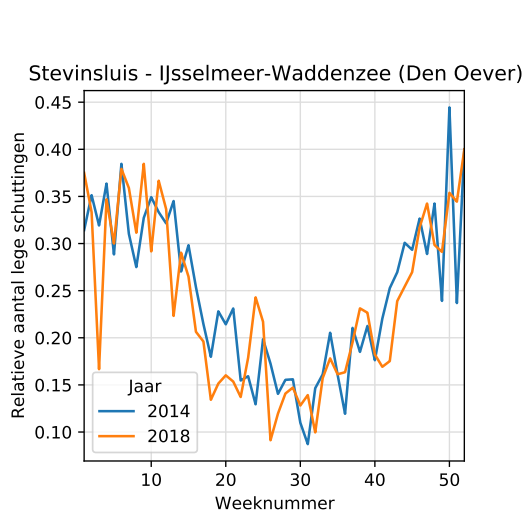
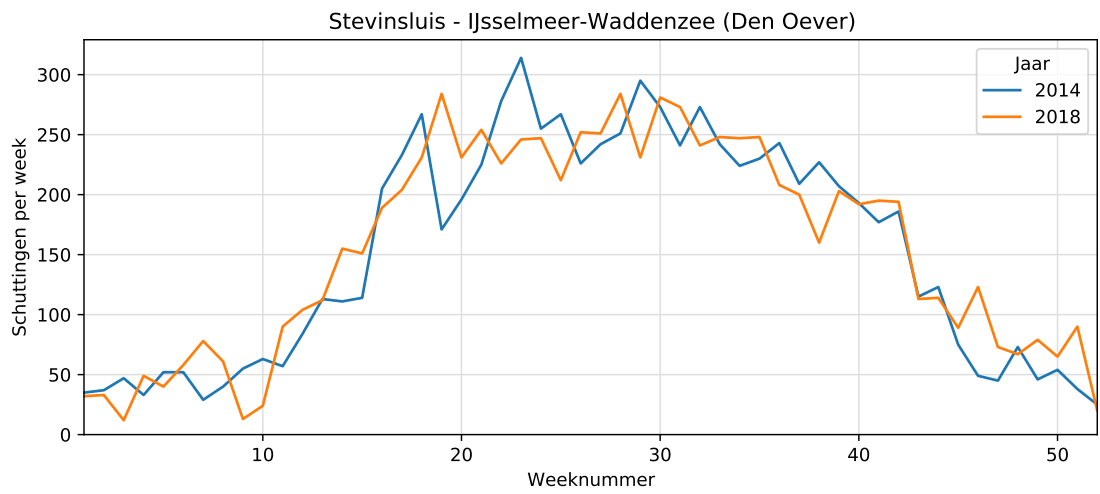
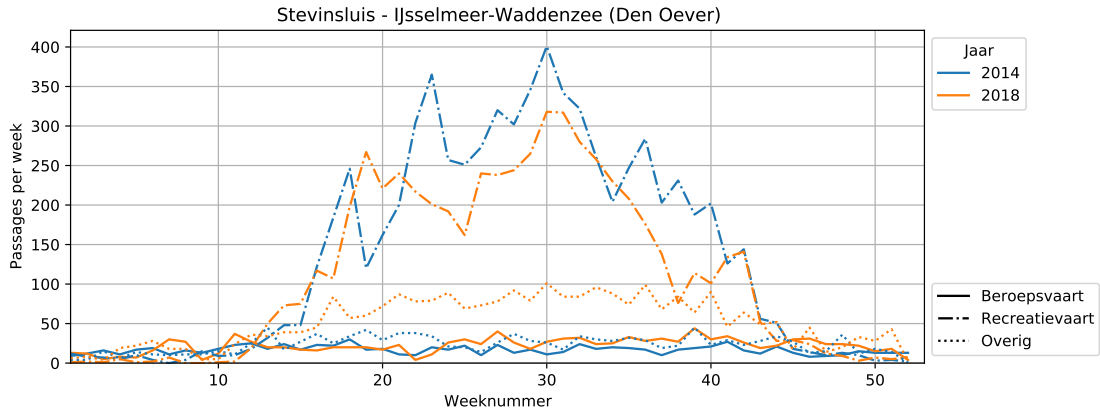


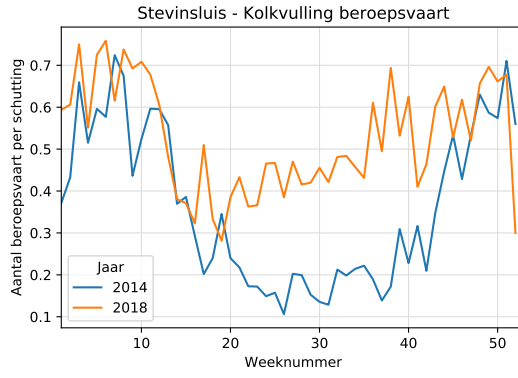
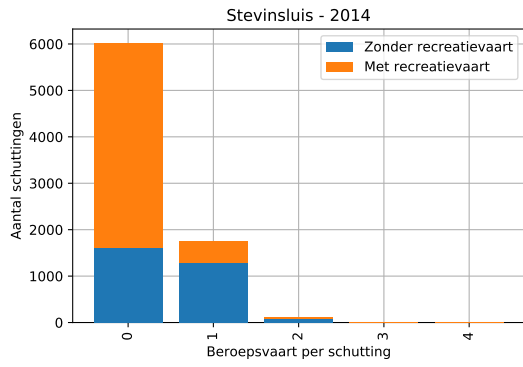
3.14 Stevinsluis

Op basis van de figuur wordt het volgende geconcludeerd:

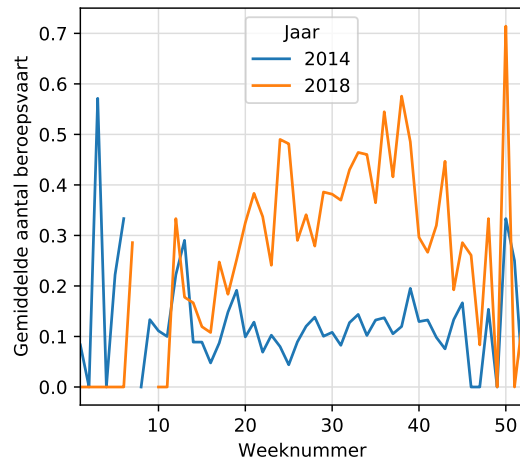
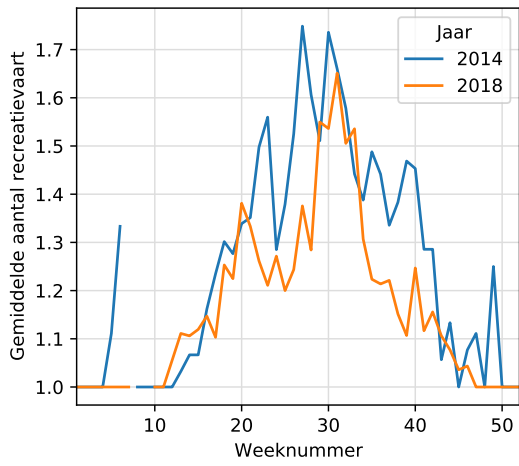
- Van 2014 naar 2018 is er een afname in grote recreatievaart, maar een toename van het aantal passagiersschepen (categorie 'overig'). Vermoedelijk is dit slechts een aanpassing in registratie.



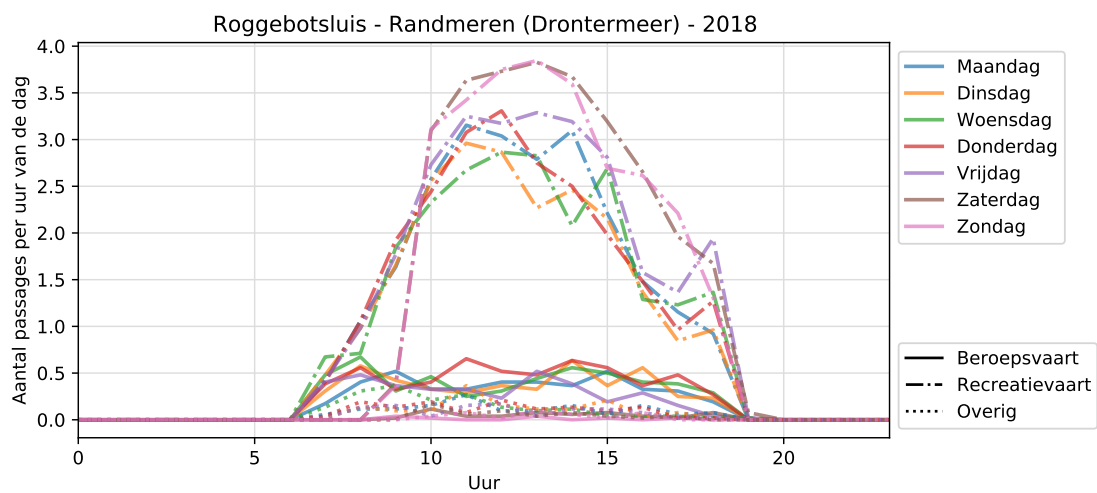
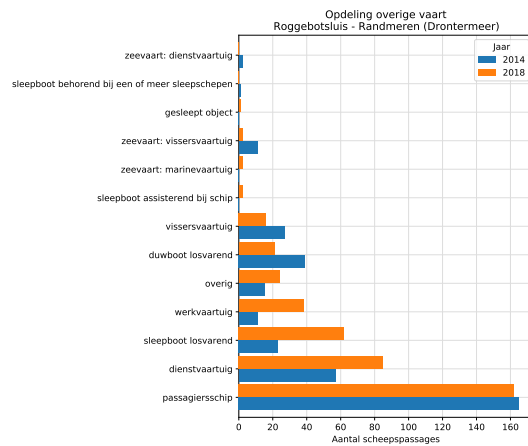
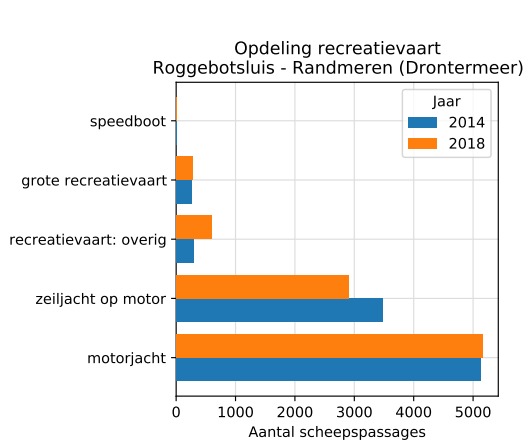
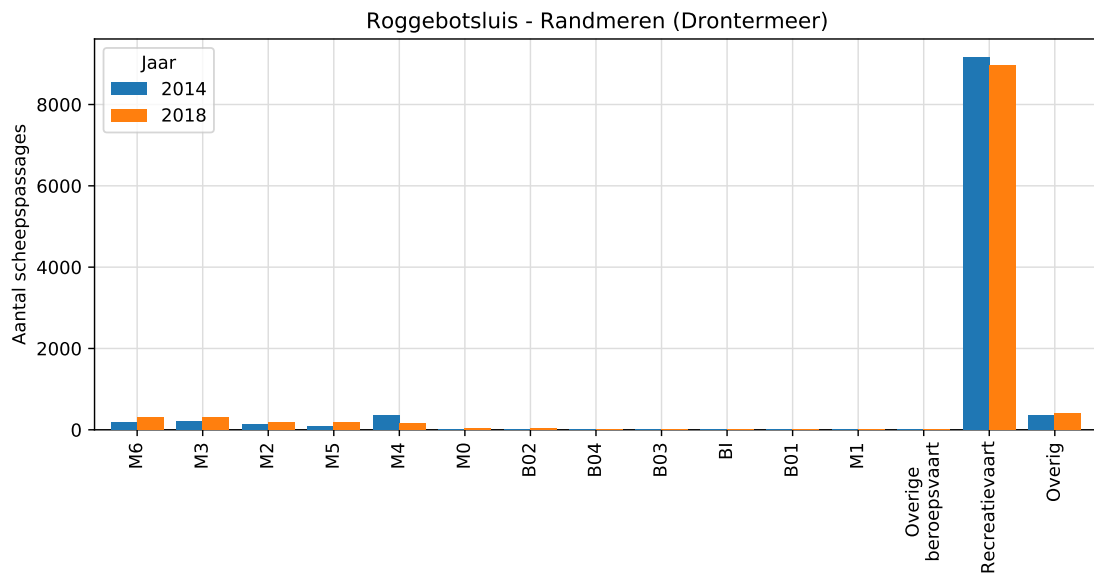


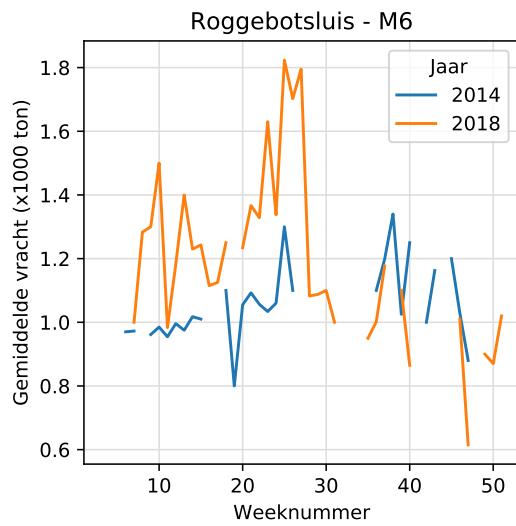
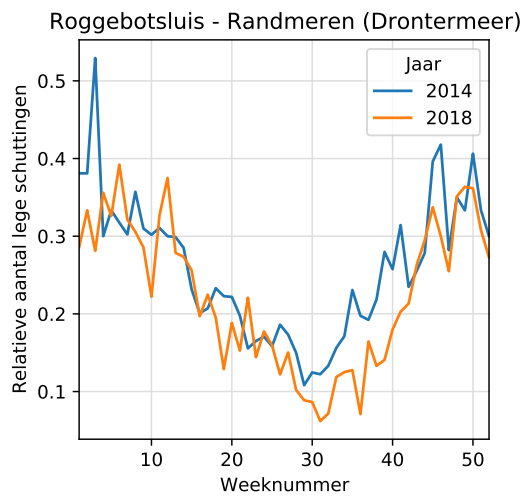
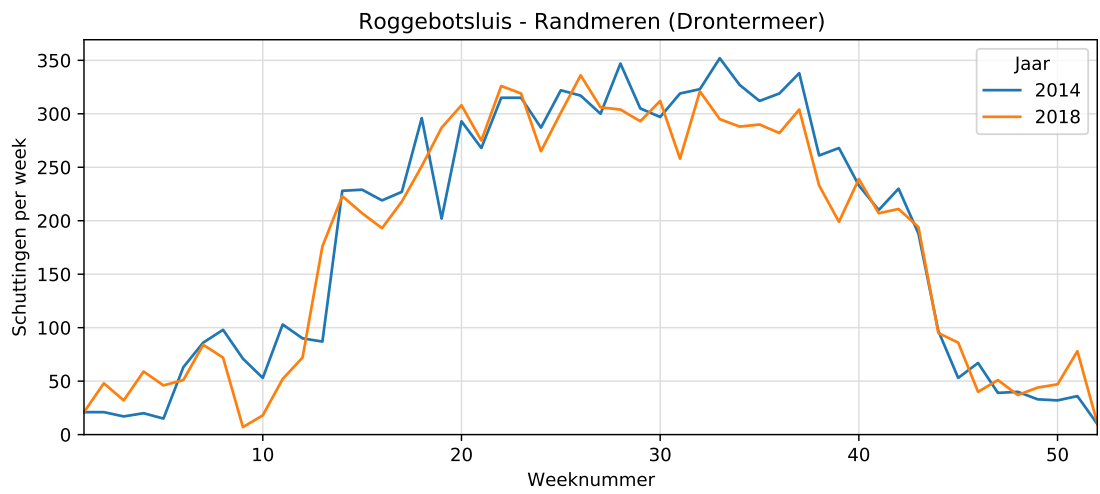
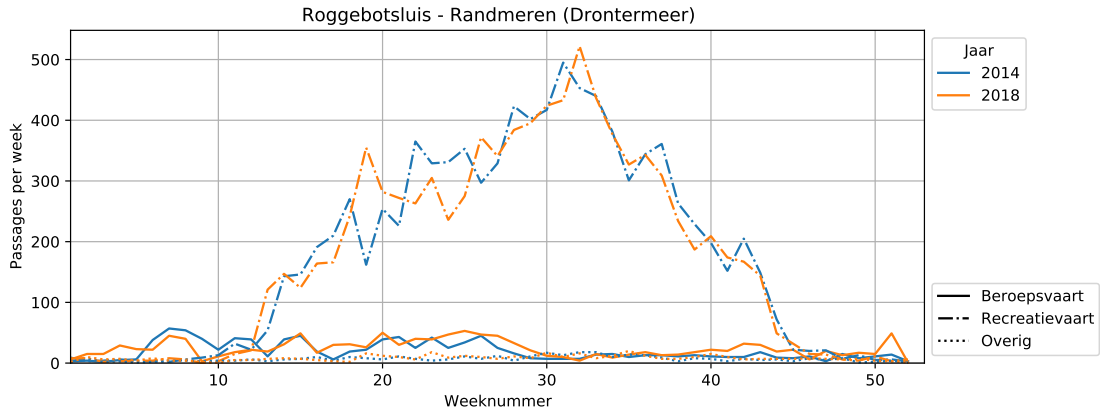


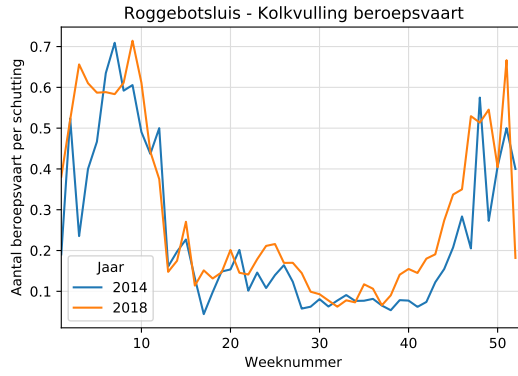
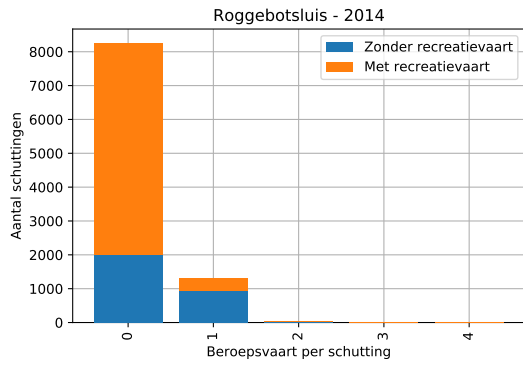
Stevinsluis - Kolkvulling bij schuttingen met recreatievaart



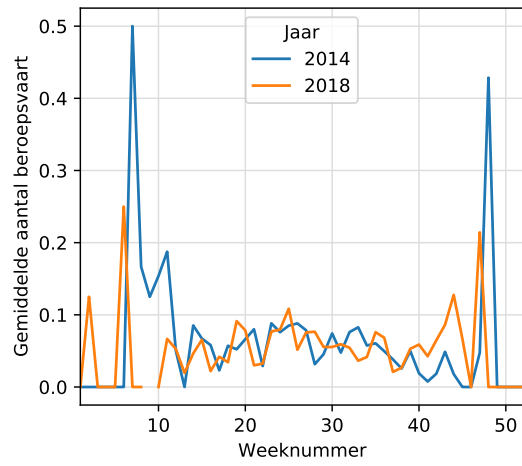
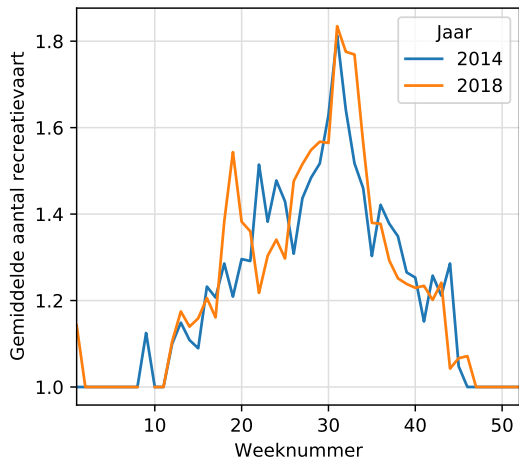
3.15 Roggebotsluis





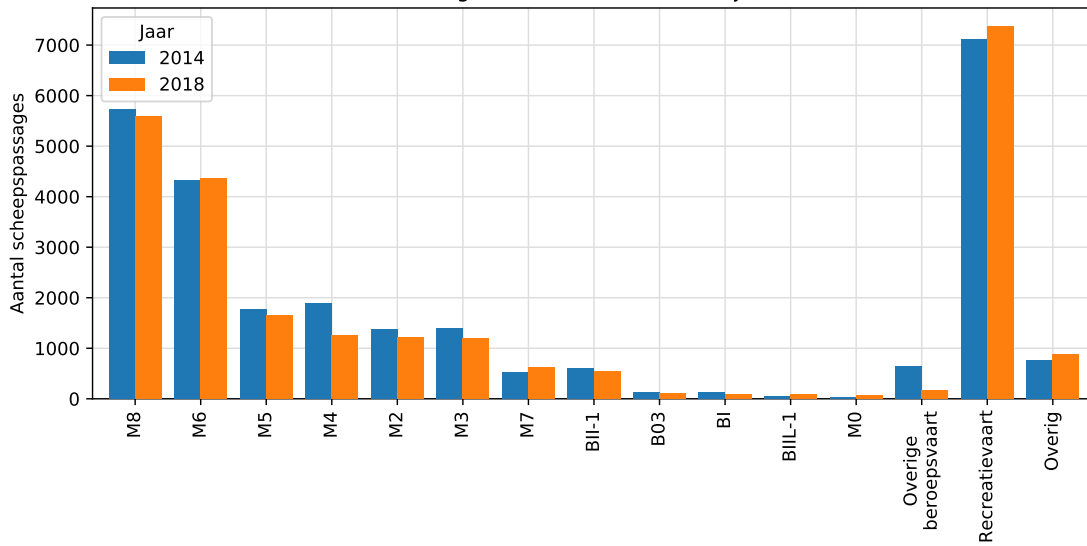


Roggebotsluis - Kolkvulling bij schuttingen met recreatievaart

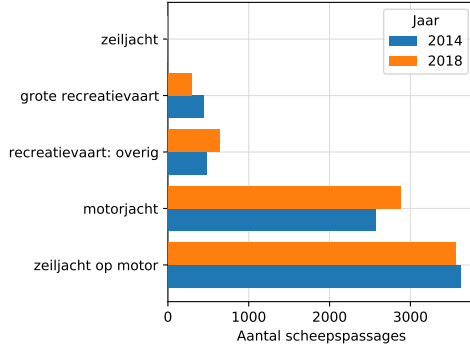


3.16 Prinses Margrietsluis

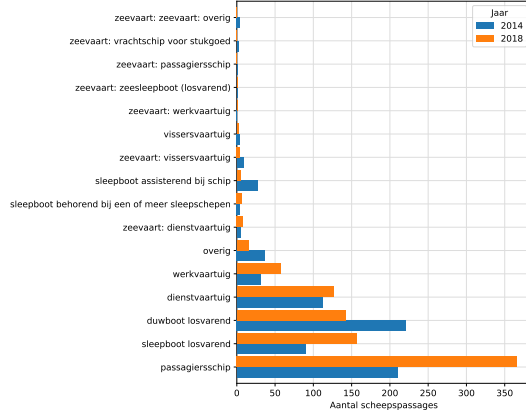
Prinses Margrietsluis - Lemmer-Delfzijl (Lemmer)



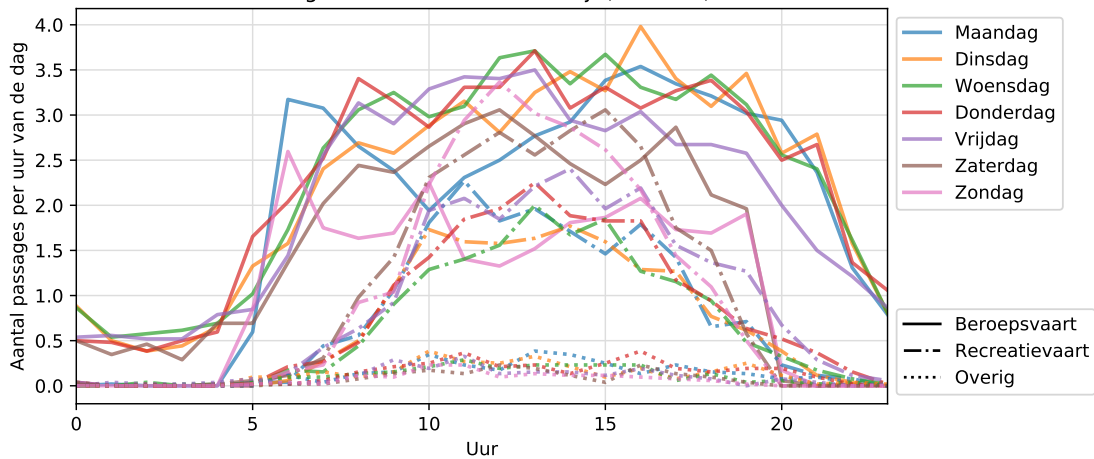
Opdeling recreatievaart
Prinses Margrietsluis - Lemmer-Delfzijl (Lemmer)

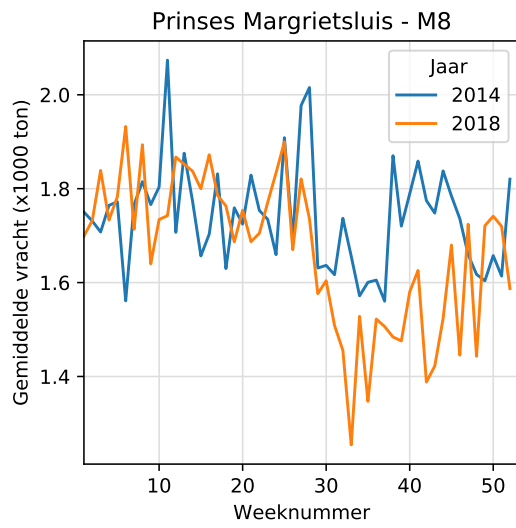
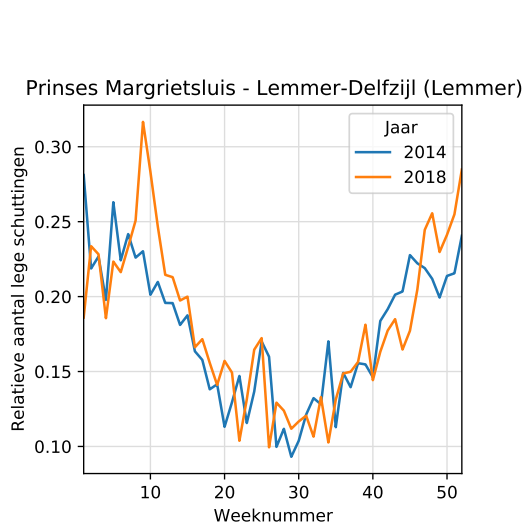
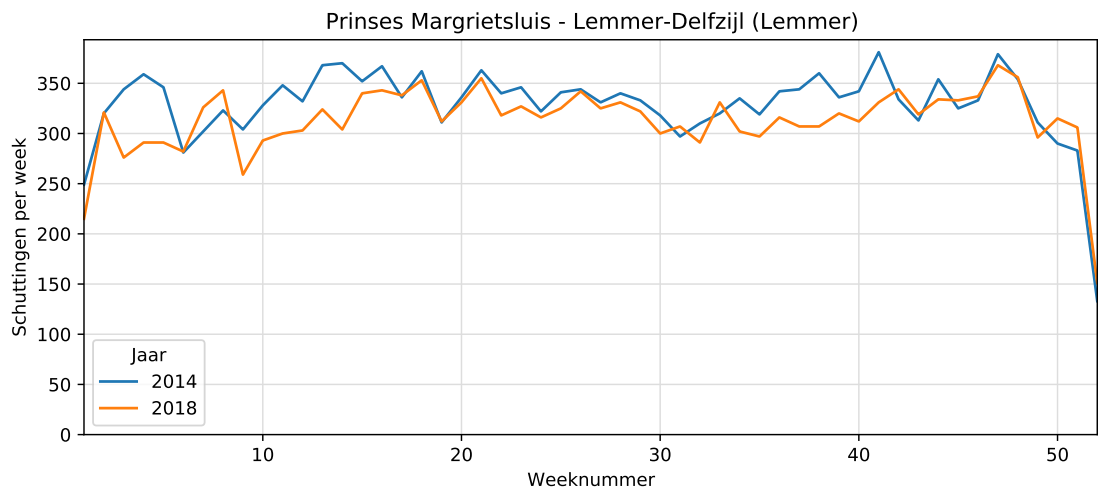
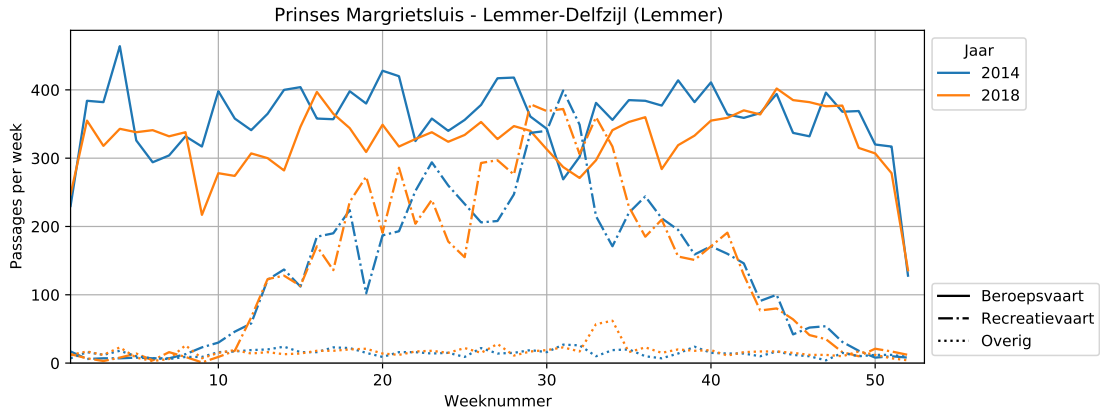


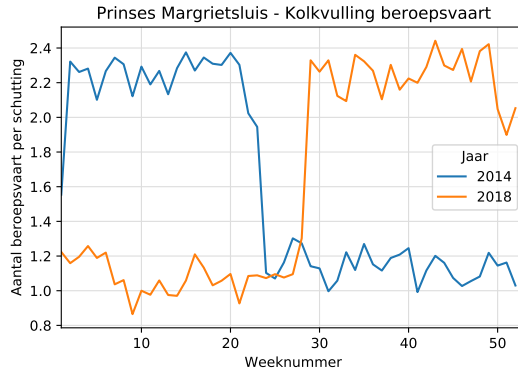
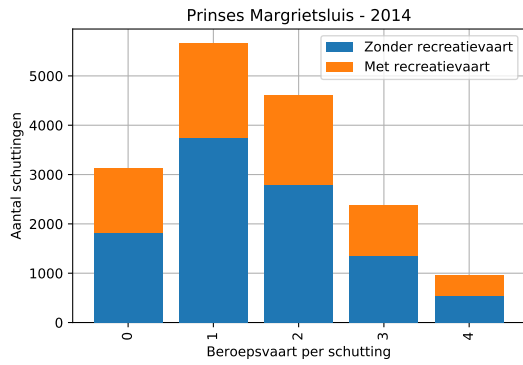
Opdeling overige vaart
Prinses Margrietsluis - Lemmer-Delfzijl (Lemmer)



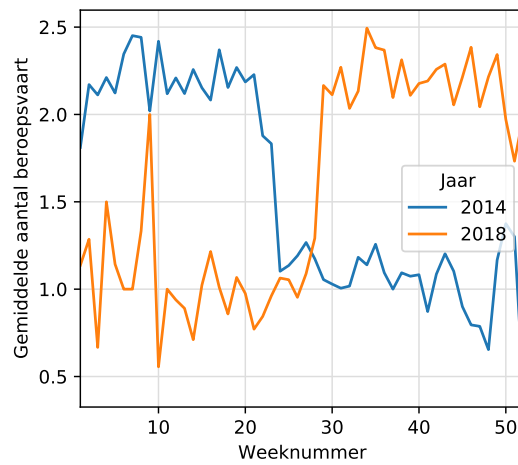
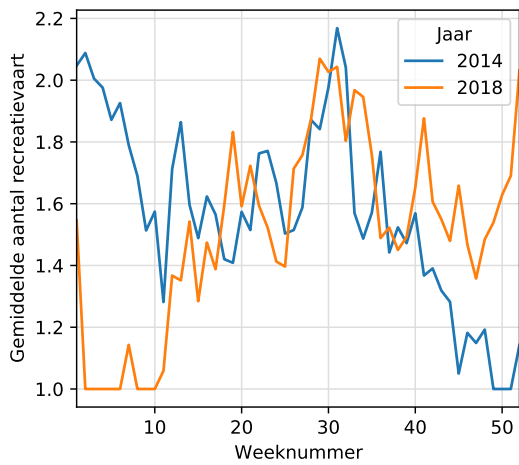
Prinses Margrietsluis - Lemmer-Delfzijl (Lemmer) - 2018





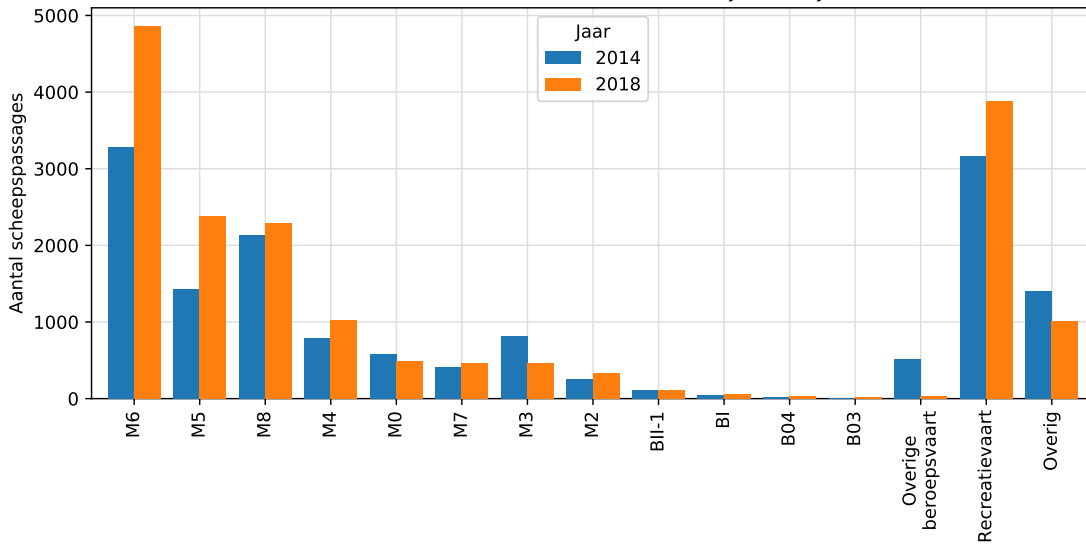


Prinses Margrietsluis - Kolkvulling bij schuttingen met recreatievaart

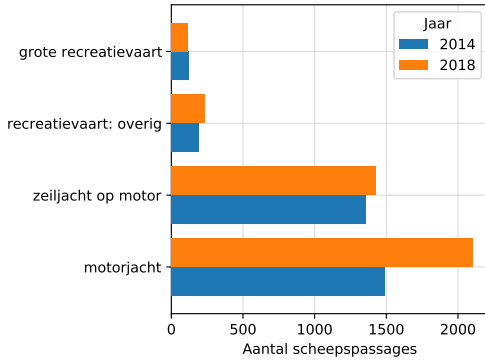


3.17 Zeesluis Farmsum

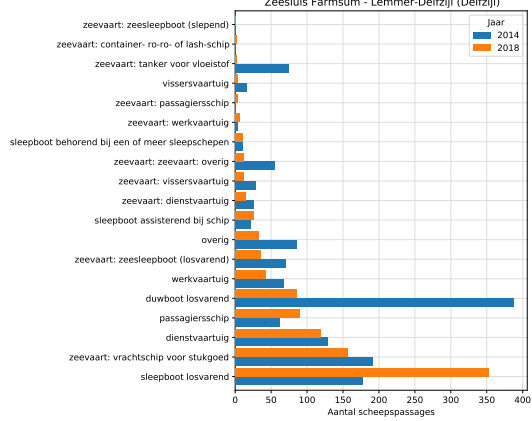
Zeesluis Farmsum - Lemmer-Delfzijl (Delfzijl)



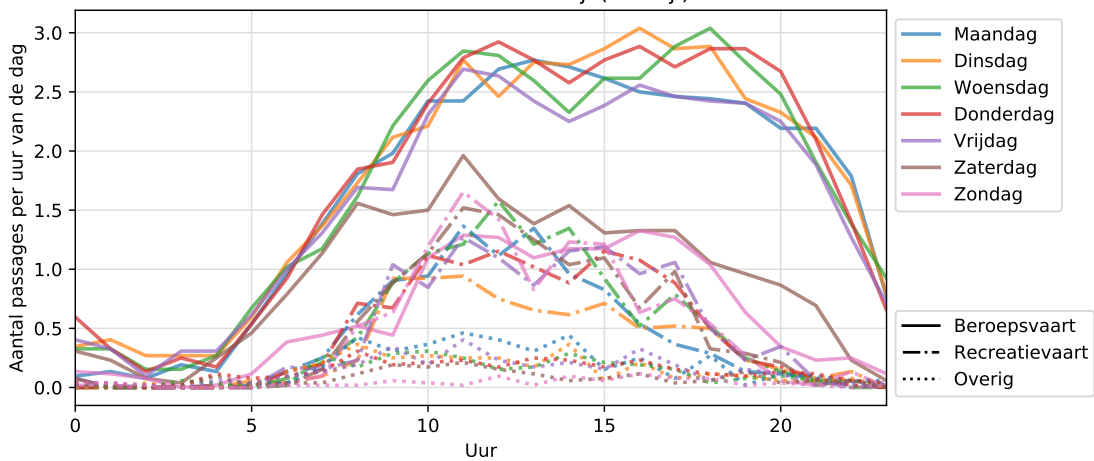
Opdeling recreatievaart
Zeesluis Farmsum - Lemmer-Delfzijl (Delfzijl)

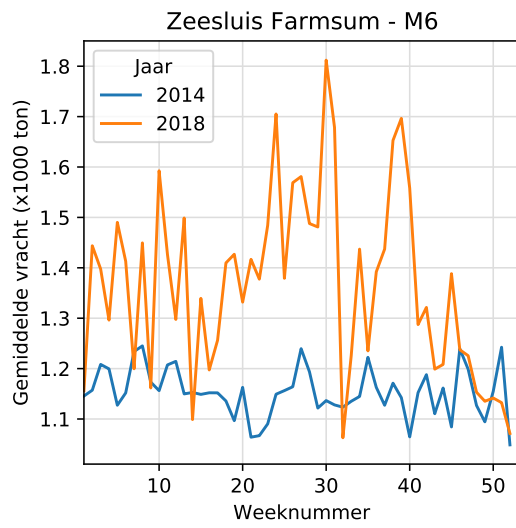
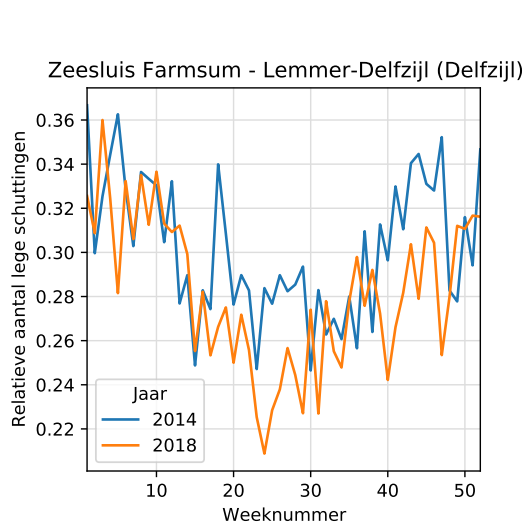
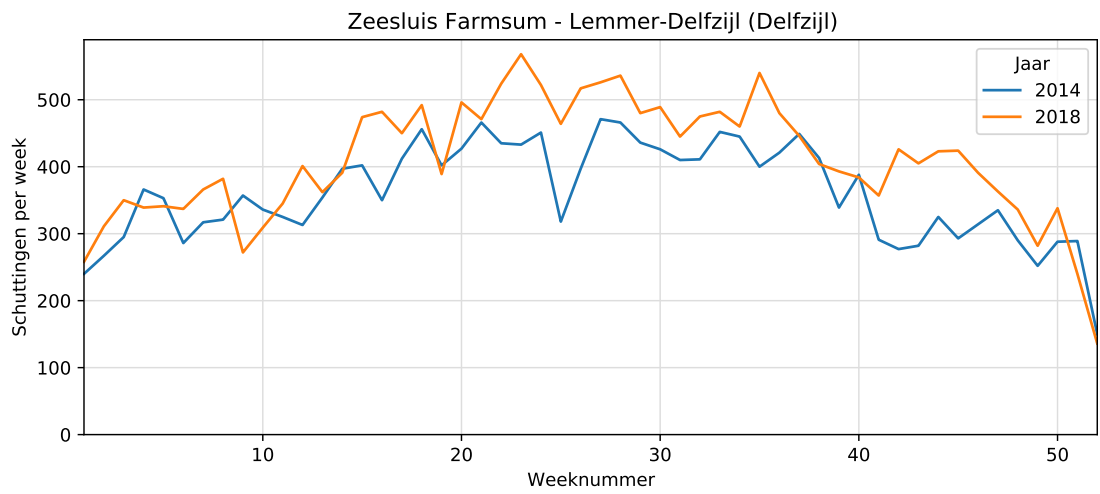
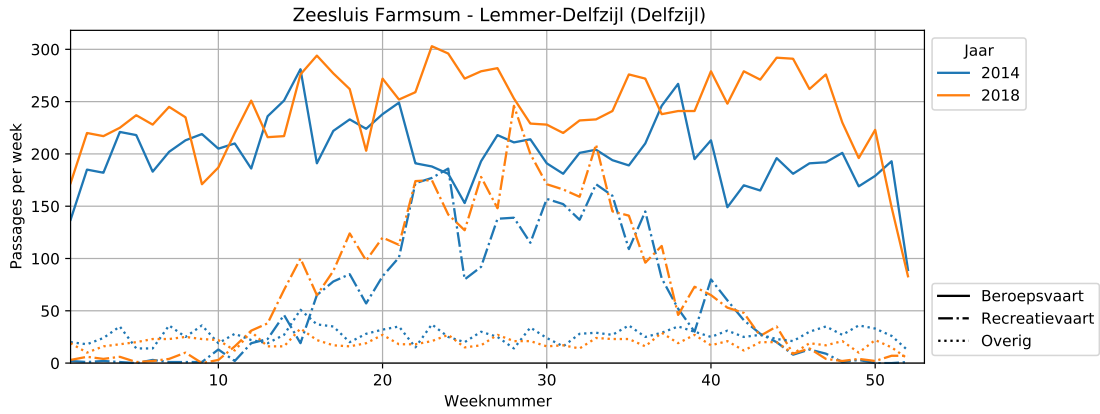


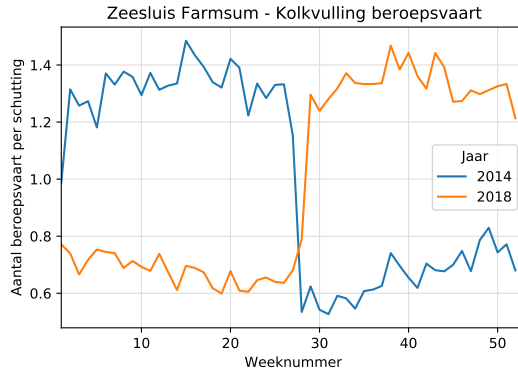
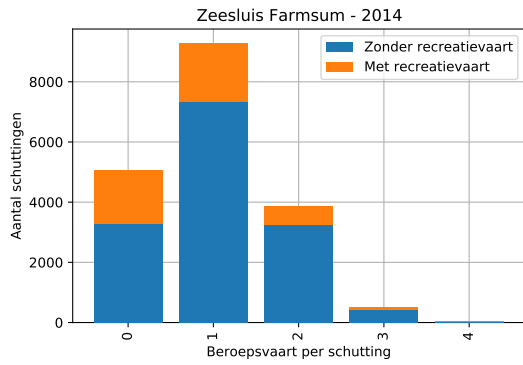
Opdeling overige vaart
Zeesluis Farmsum - Lemmer-Delfzijl (Delfzijl)



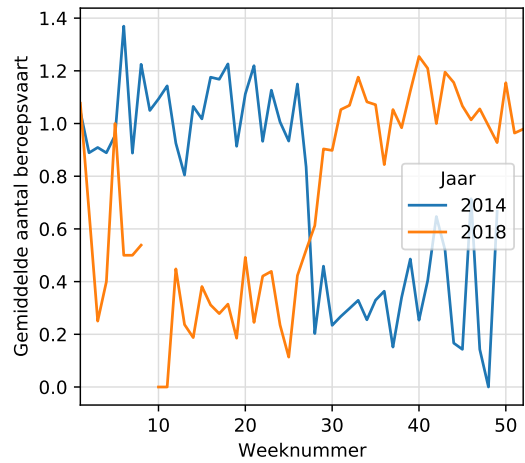
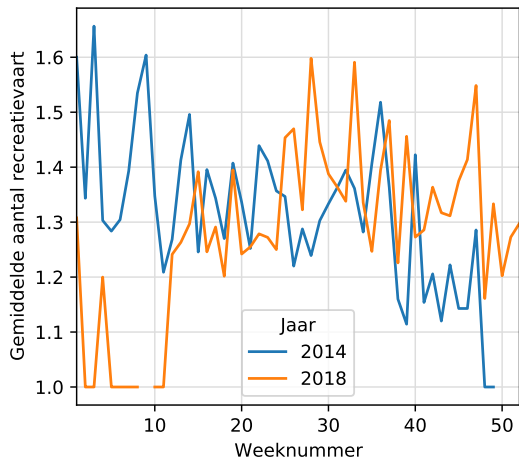
Zeesluis Farmsum - Lemmer-Delfzijl (Delfzijl) - 2018





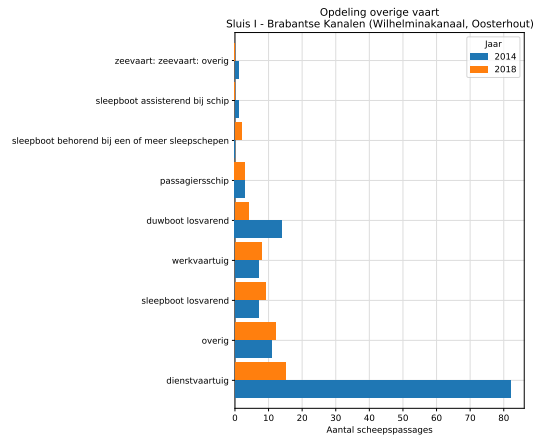
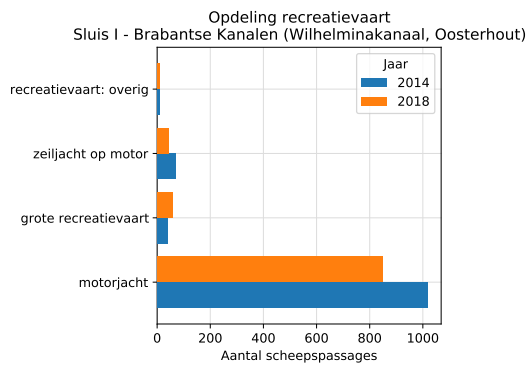
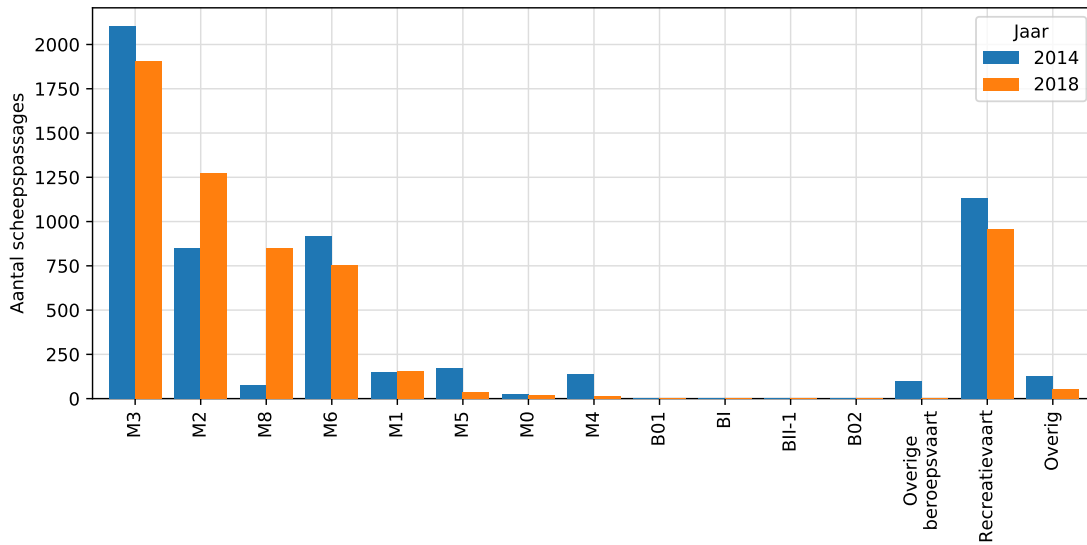


Zeesluis Farmsum - Kolkvulling bij schuttingen met recreatievaart

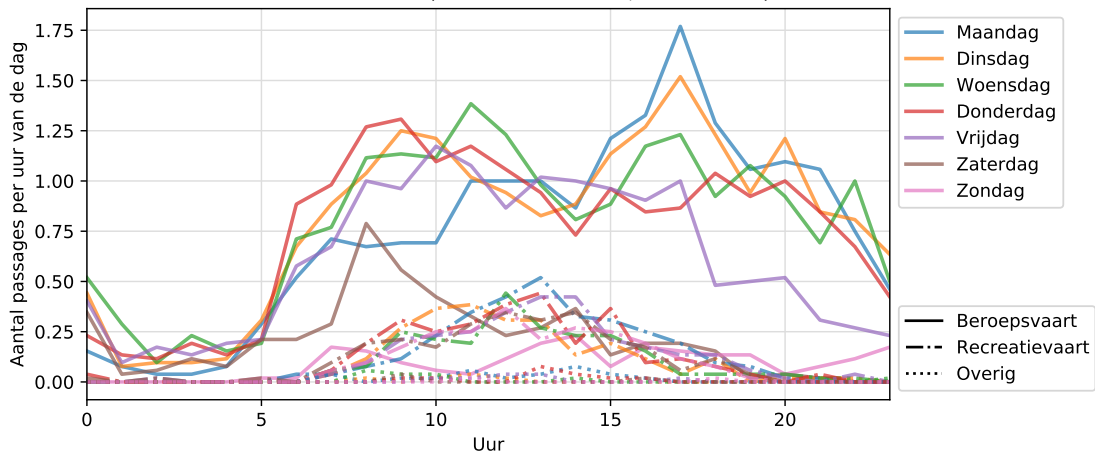


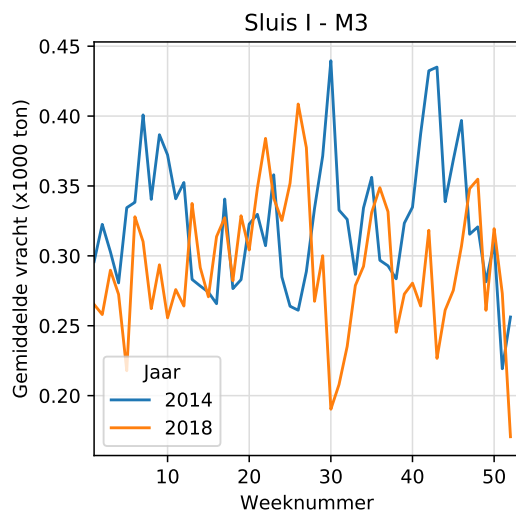
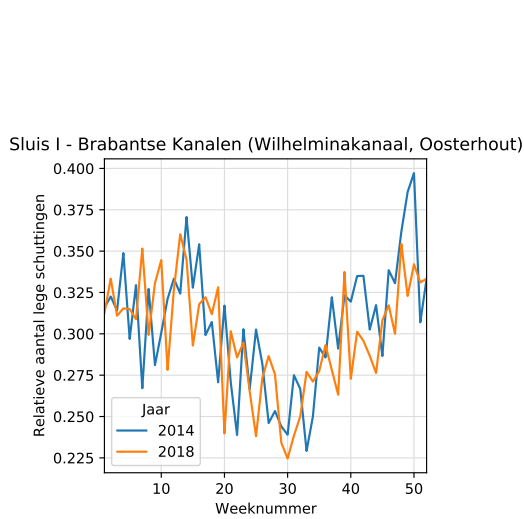
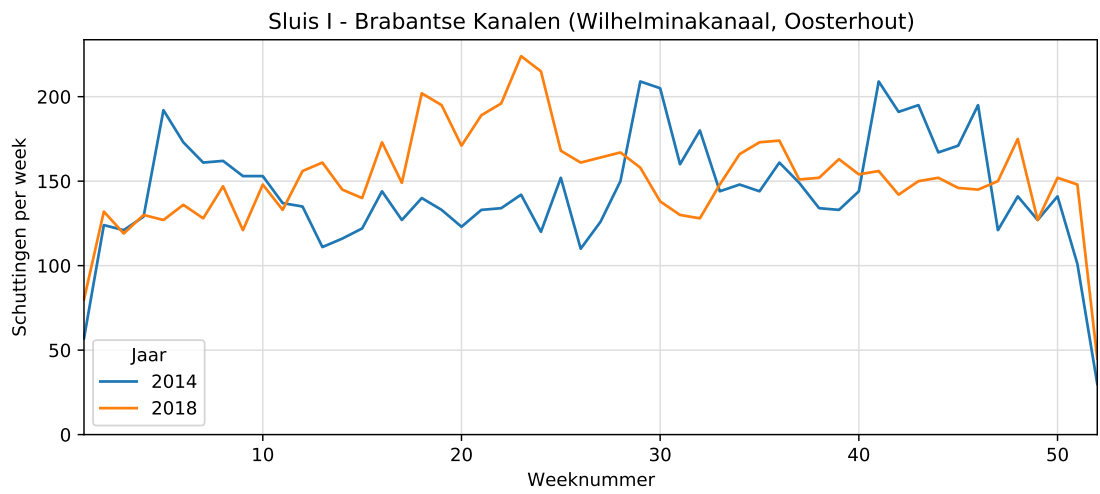
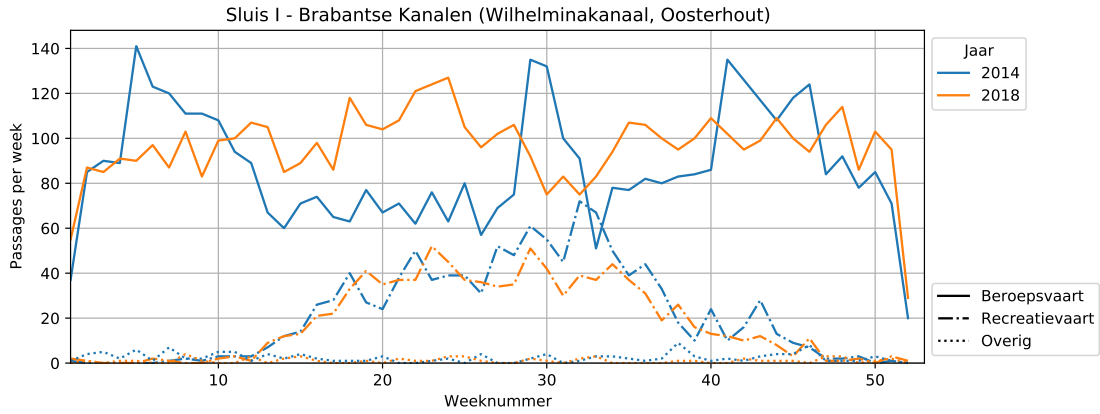
3.18 Sluis I

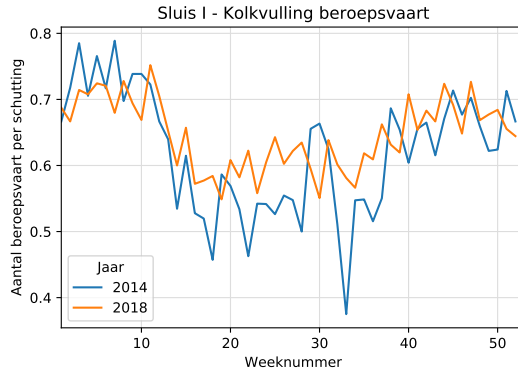
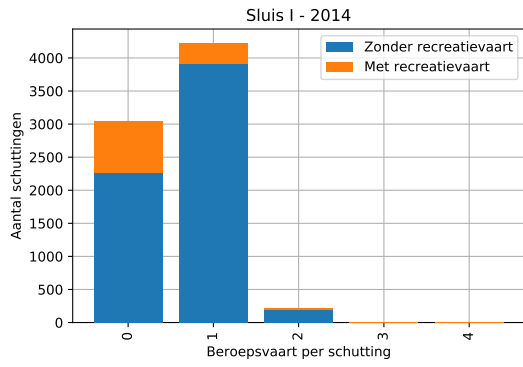
Sluis I - Brabantse Kanalen (Wilhelminakanaal, Oosterhout)



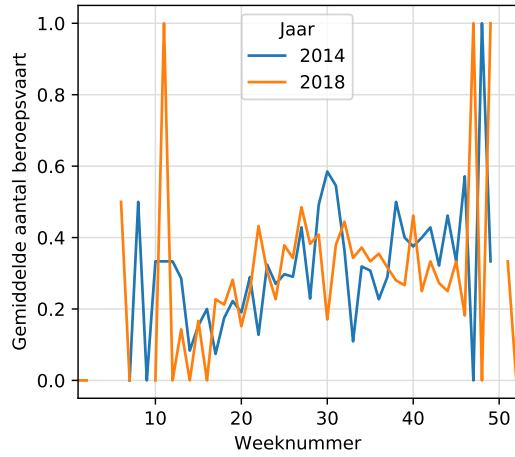
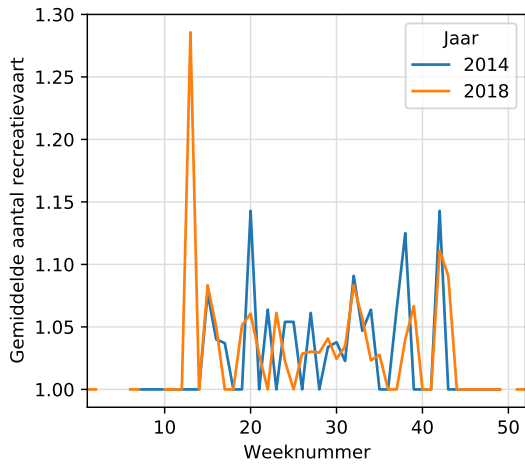
Sluis I - Brabantse Kanalen (Wilhelminakanaal, Oosterhout) - 2018





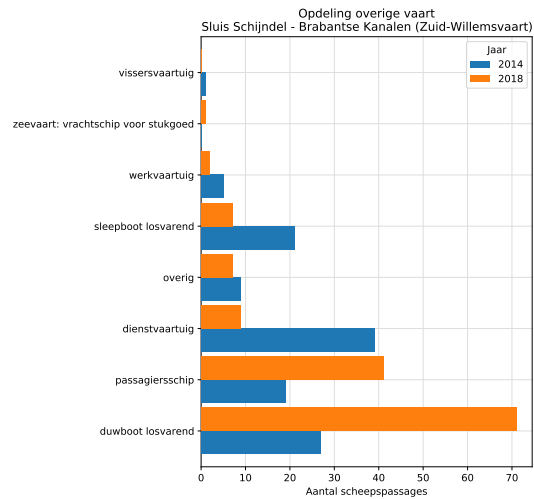
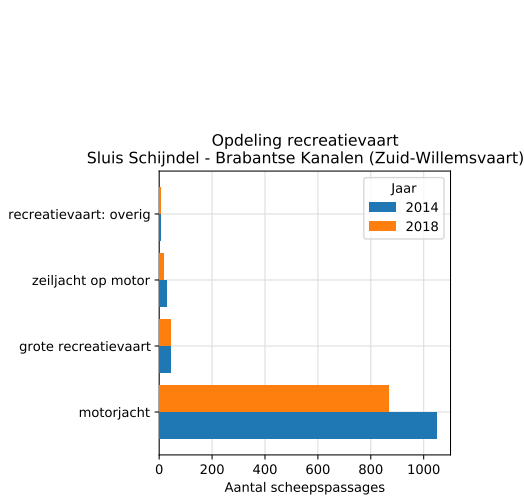
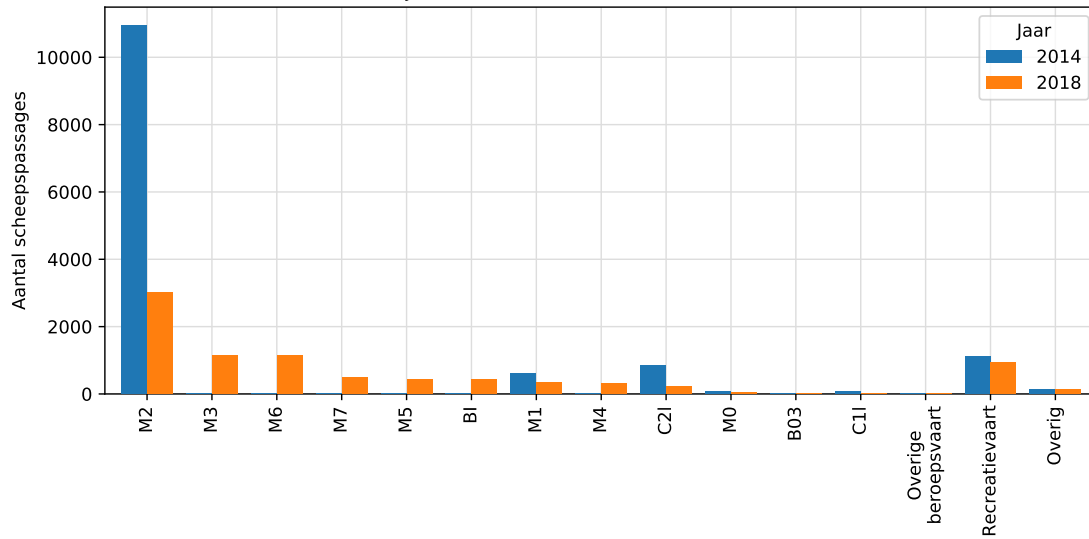


Sluis I - Kolkvulling bij schuttingen met recreatievaart

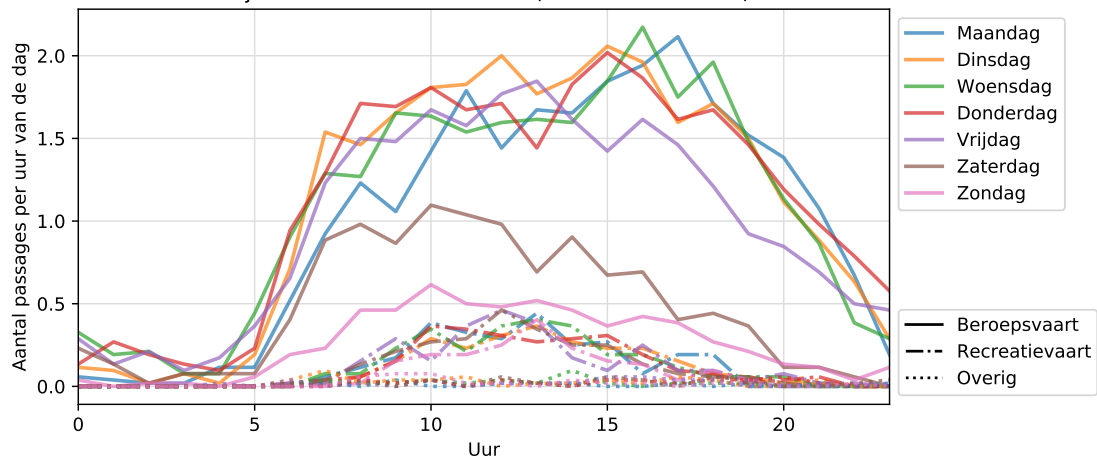


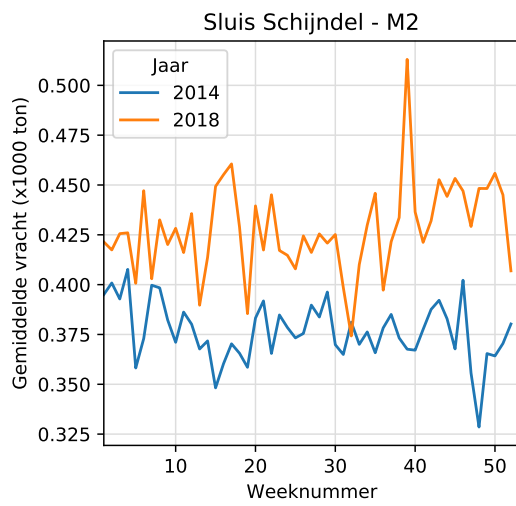
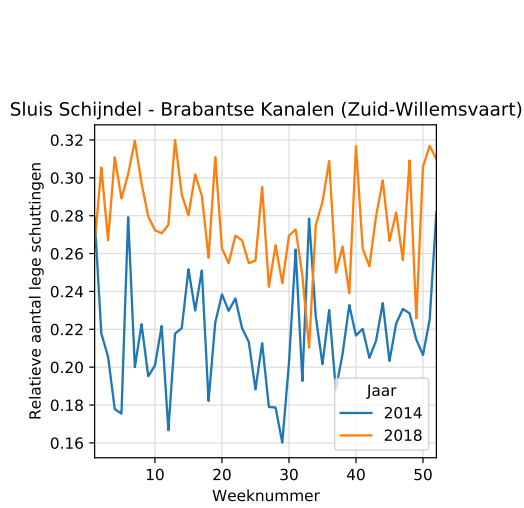
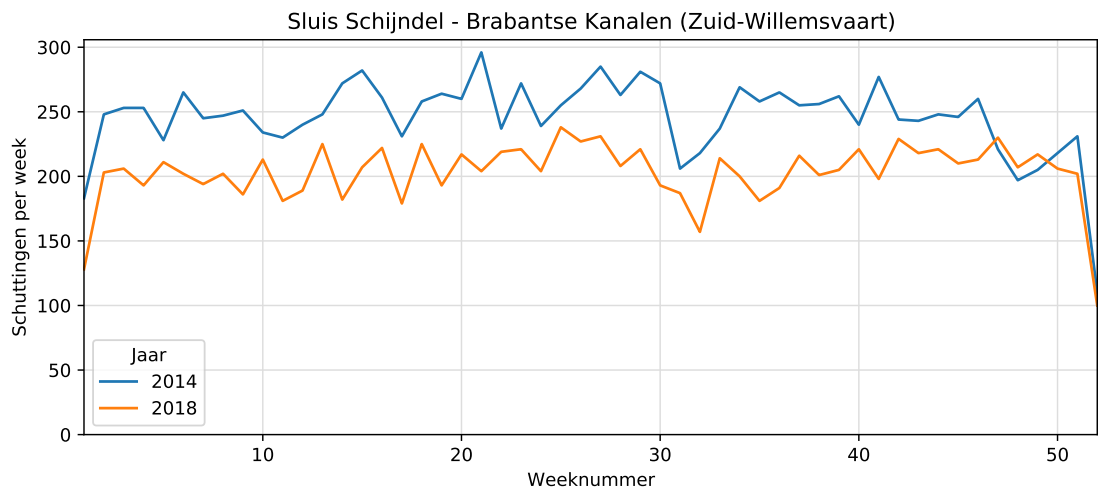
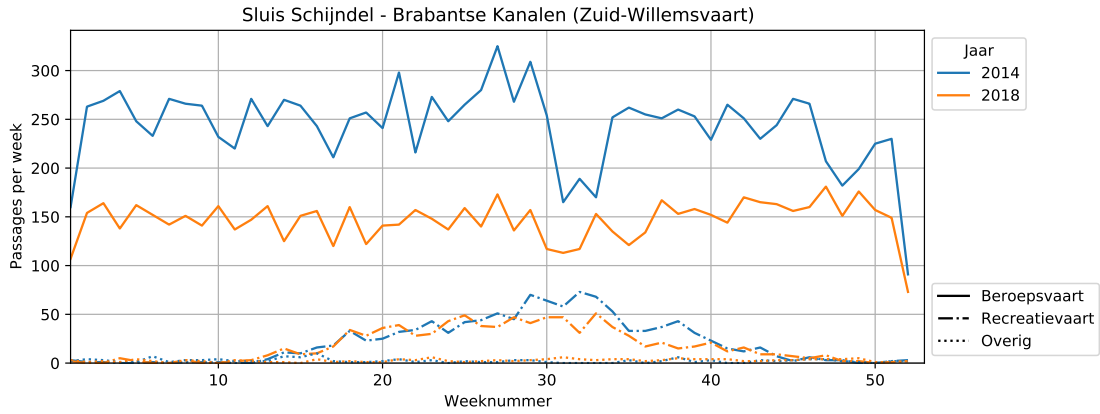
3.19 Sluis Schijndel

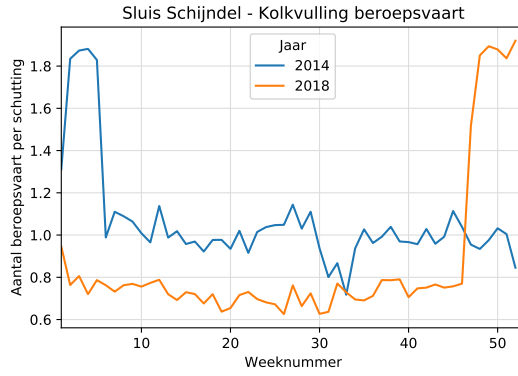
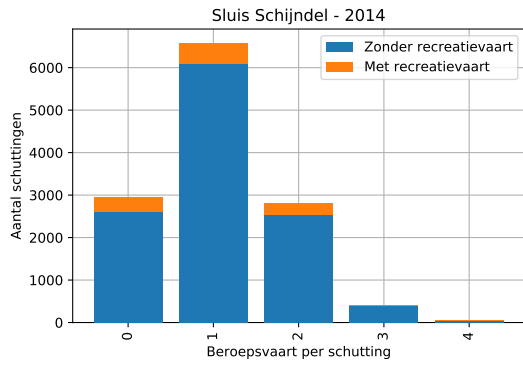
Sluis Schijndel - Brabantse Kanalen (Zuid-Willemsvaart)



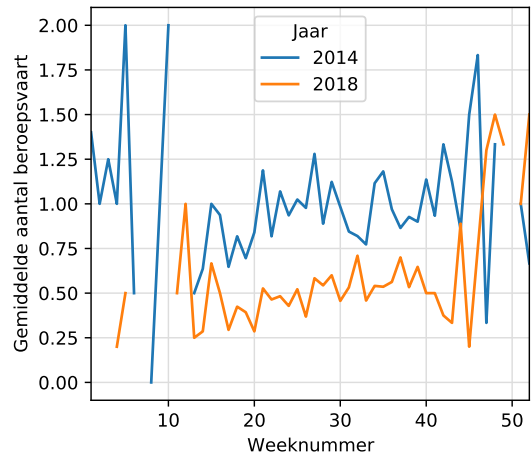
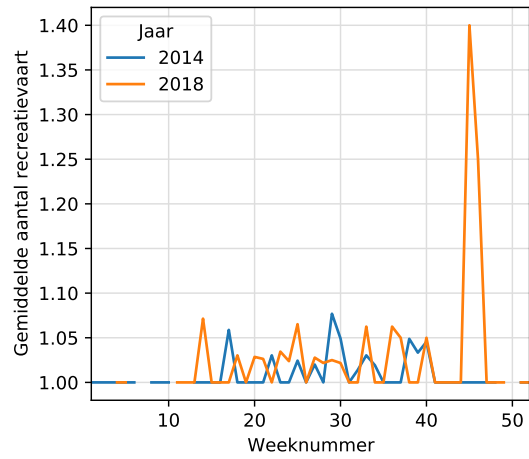
Sluis Schijndel - Brabantse Kanalen (Zuid-Willemsvaart) - 2018





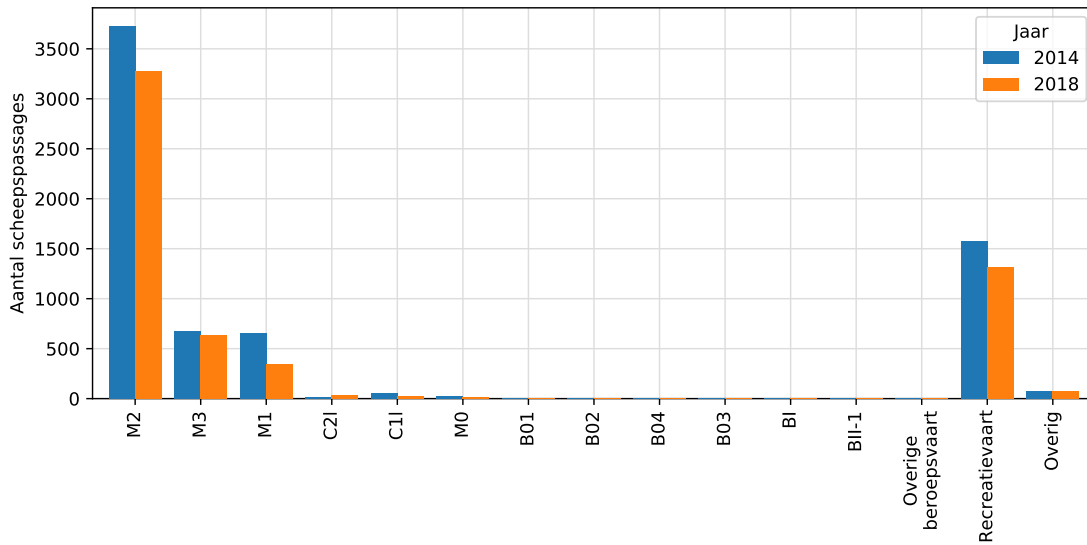


Sluis Schijndel - Kolkvulling bij schuttingen met recreatievaart

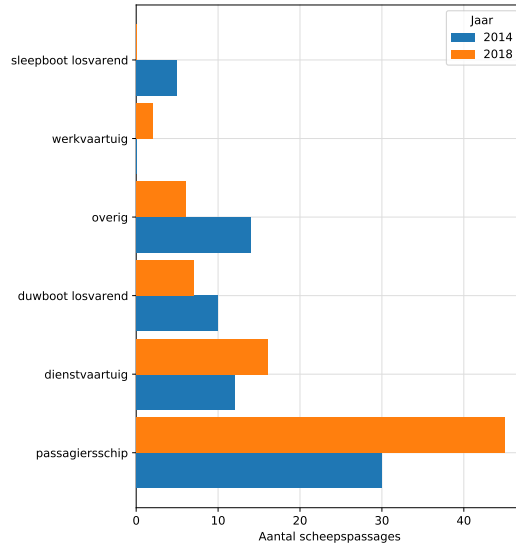


3.20 Sluis Panheel

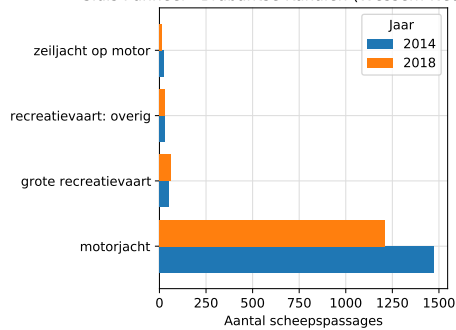
Sluis Panheel - Brabantse Kanalen (Wessem-Nederweert)



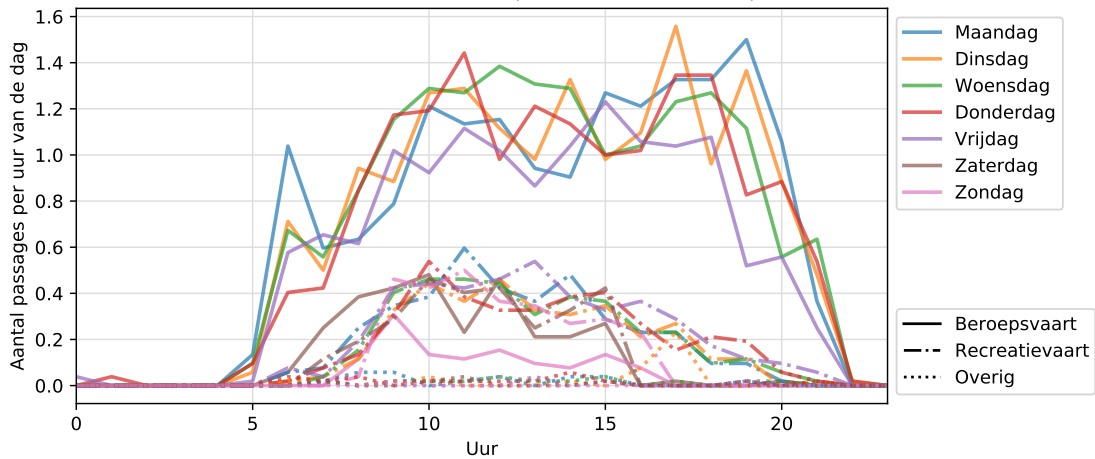
Opdeling overige vaart
Sluis Panheel - Brabantse Kanalen (Wessem-Nederweert)

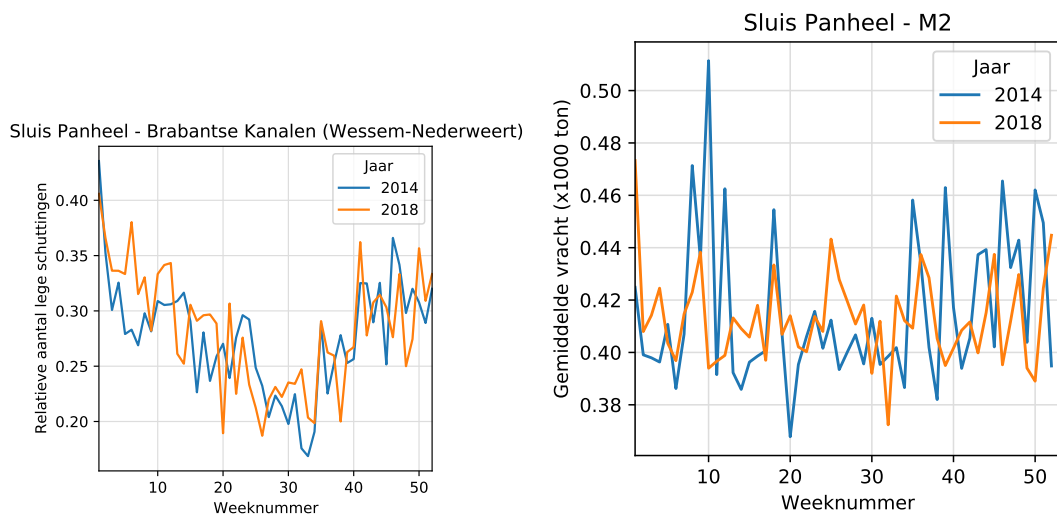
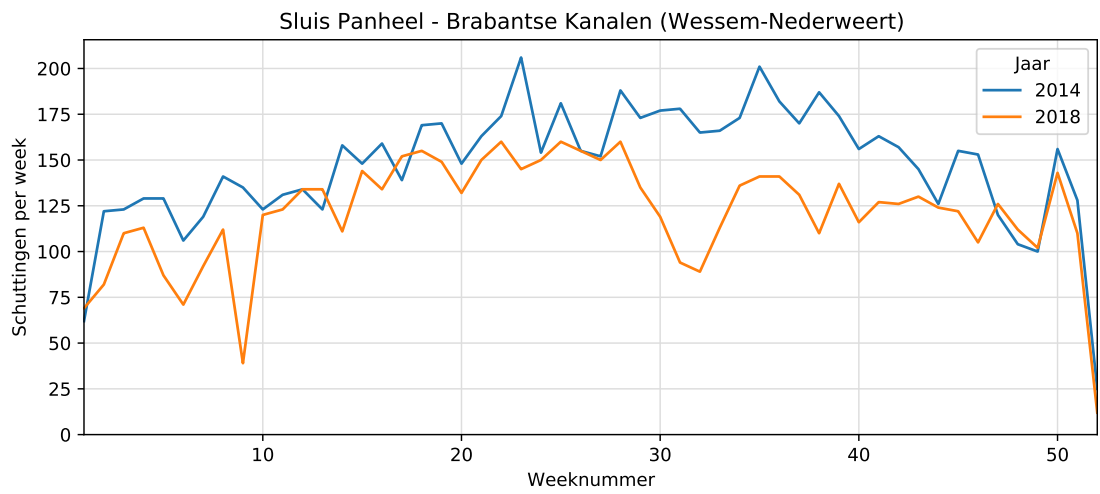
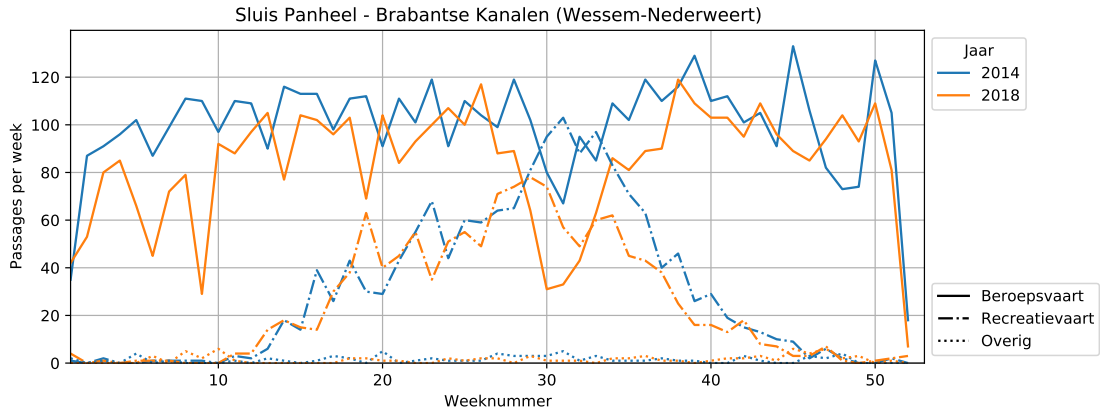


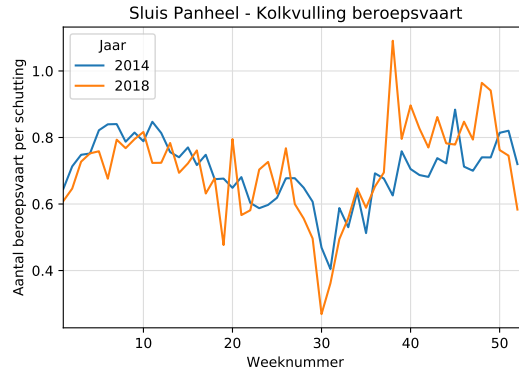
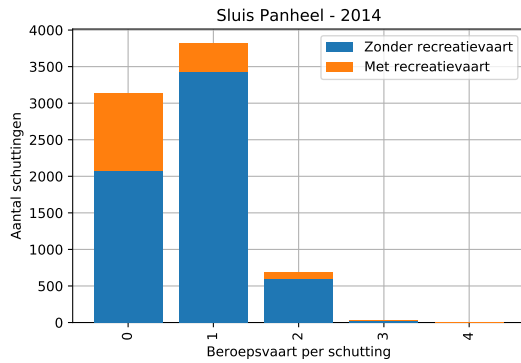
Opdeling recreatievaart
Sluis Panheel - Brabantse Kanalen (Wessem-Nederweert)



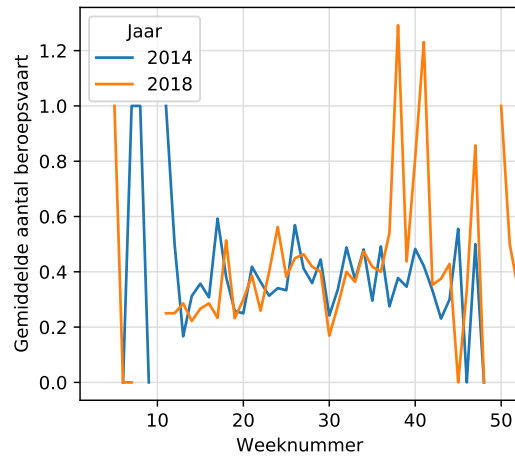
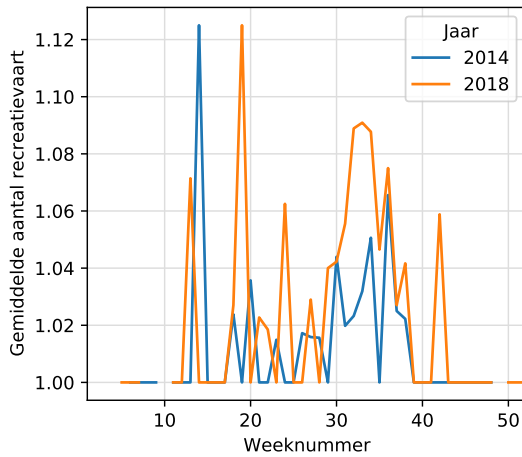
Sluis Panheel - Brabantse Kanalen (Wessem-Nederweert) - 2018







Sluis Panheel - Kolkvulling bij schuttingen met recreatievaart



4 Conclusies en aanbevelingen

Aanbevolen wordt om uitleveringen van IVS-data te uniformeren en mogelijk ook verder te automatiseren. Een consistente aanlevering van bestanden geeft de mogelijkheid om een API te ontwikkelen om de data te analyseren, waardoor de benodigde inspanning van een analyse significant reduceert. De automatisering wordt gesuggereerd omdat de aanvraag enige doorloop tijd had, terwijl een rechttoe-rechtaan aanvraag als deze weinig handwerk zou moeten vergen.

5 Referenties

De Jong & Boschetti, 2021