Investigating Oil and Gas Production in the United Kingdom

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Sponsor: ExxonMobil

Introduction:

Exploring, extracting, and producing oil and gas in the North Sea requires licenses, which are offered in yearly application rounds by the U.K.'s Oil and Gas Authority (OGA). The North Sea is divided into a grid system of numerical quadrants that are further subdivided into blocks. In an application, companies apply for blocks and propose certain work obligations that detail the actions they plan to carry out in those particular blocks.

Purpose:

Our goals are to:
- Determine characteristics of successful oil and gas licenses in the North Sea
- Curate a single, tabular database of U.K. license history and work program information for licensing rounds 1-30
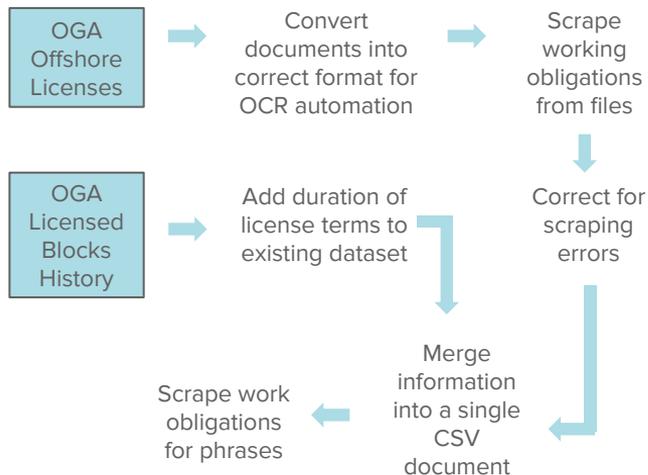
Data+

Method, Output Table, and Visualizations

Data➕

Acquire Data

Create Database

Data Visualizations

Method:

We used two separate datasets from OGA to curate our database:

OGA Offshore Licenses → Convert documents into correct format for OCR automation → Scrape working obligations from files ↓ Correct for scraping errors

OGA Licensed Blocks History → Add duration of license terms to existing dataset → Merge information into a single CSV document → Scrape work obligations for phrases

Output Table:

Table variables (53 in total) can be grouped:

- Location of oil/gas field in the North Sea
- Operators, partnering organizations
- Term length, start and end dates
- Obligation types

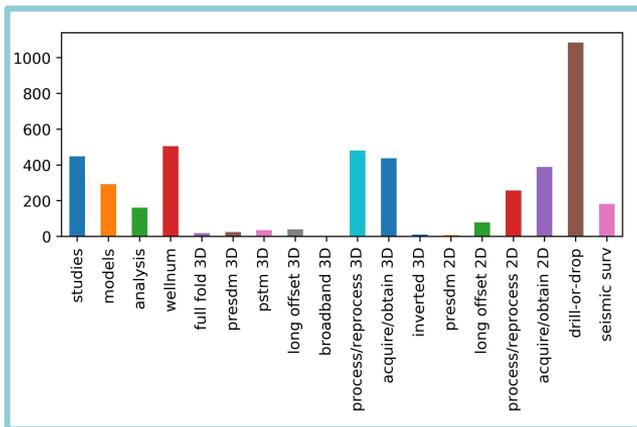Total number of observations: 5947

ArcGIS Application:

- Displays all historical licenses and licensed blocks from rounds 1-30
- Allows searching for individual licenses
- Pop-up feature for each license

OGA Licensed Blocks History
Round Number
> 25 – 30
> 18 – 25
> 11 – 18
> 5 – 11
0 – 5
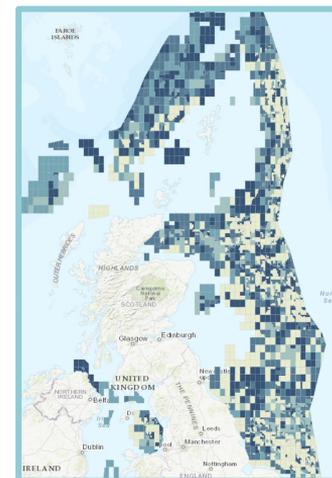
ArcGIS web mapping application

2

Regression Analysis:

Count of occurrences by obligation type

Obligation type	Coefficient	P-value
long offset 3D	2.96	0.087
acquire/obtain 3D	1.48	0.033
long offset 2D	-2.77	0.001
acquire/obtain 2D	1.68	0.013
drill-or-drop	3.74	0
seismic survey	2.31	0

Regression coefficients for all statistically significant variables

This regression shows the relationship between total number of licenses in each quadrant as a response variable and obligation types.

R^2 value: 0.95

Conclusions:

- Working obligation intensity does give a statistically significant indication about the number of prospective wells drilled in a quadrant.
- May indicate which proposed obligations are attractive to the OGA, which gives out the licenses based on qualifications

Results:

- Created a data set containing license information and work obligations
- Created tools for visualizing licenses and wells in the North Sea

Future Work:

- Continue with regressions between obligation intensity and production per well in each quadrant
- Consider additional variables:
  - Water depth
  - Working interest of licensees
  - Geospatial data

3