



Regionernes Videncenter for
Miljø og Ressourcer

Markedsanalyse for jordforureningsydelser i de nære markeder

**Teknik og Administration
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Bilag

Bilag 1

Market analyses Wroclaw, Stockholm and Hamburg

Bilag 2

Typical unit costs for investigation and remediation

Bilag 3

Relevante konklusioner og anbefalinger fra 2012-rapport: Brancheanalyse for jordforureningssektoren

1. Forord

COWI har gennemført nærværende markedsanalyse på vegne af styregruppen for Danish Soil Partnerships (DSP), som består af repræsentanter for Danske Regioner, Krüger, Geocon, Dansk Miljøteknologi, Biorem/Inno MT og Clean/Inno MT.

Markedsanalysen fokuserer på byområderne Stockholm (Sverige), Hamburg (Tyskland) og Wrocław (Polen).

Formålet med markedsanalysen er at give de danske virksomheder, som arbejder med jordforureningsyndelser (udviklere, rådgivere, entreprenører m.v.), der ønsker at internationalisere sig, et værktøj til at vælge, hvor det giver mest mening at søge hen: Hvad er den forventede efterspørgsel, og hvem er de potentielle partnere og konkurrenter?

Markedsanalysen fokuserer på urbanisering og dermed på tre ovennævnte byområder, som, udover at have en dokumenteret stor vækst inden for byudvikling, vurderes at være tilgængelige for danske virksomheder, som arbejder med jordforureningsyndelser og på håndteringen af forurenede jord i bygge- og anlægsopgaver.

2. Resumé

Formålet med denne markedsanalyse er at give de danske virksomheder, som arbejder med jordforureningsydelser (udviklere, rådgivere, entreprenører m.v.), der ønsker at internationalisere sig, et værktøj til at vælge, hvor det giver mest mening at søge hen: Hvad er den forventede efterspørgsel, og hvem er de potentielle partnere og konkurrenter?

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Markedsanalysen fokuserer på byområderne Stockholm, Hamburg og Wrocław, og fra markedsanalysen vil COWI fremhæve følgende konklusioner og anbefalinger:

1) Alle tre byer repræsenterer markeder i vækst

COWI anbefaler nøje at følge markedsmuligheder og -udviklingen via offentlige udbudsportaler, databaser over kategoriserede og prioriterede forurenede grunde, handlings- og udviklingsplaner, strategier mv. og ikke mindst lokale netværk. Særligt de lokale netværk bør udnyttes, da offentlige udbud ikke omfatter private initiativer, og da kvaliteten af de offentligt tilgængelige oplysninger kan variere. F.eks. er oplysningsniveauet i Stockholm (baseret på facts og indholdet af databaser) langt mere detaljeret og opdateret end i Wrocław.

2) Partnerskab med lokale partnere

Der er samtidig også en betydelig konkurrence fra lokale og internationale aktører. COWI anbefaler, at danske virksomheder overvejer partnerskaber med relevante lokale partnere for at drage fordel af lokalt kendskab og konsolidering af en markedsposition. Dette giver mulighed for at udnytte eksisterende viden og forankring. Det vil give indsigt og deltagelse i lokale netværk, det vil tillade løbende orientering om markedsmuligheder, og det vil give adgang til allerede veletableret viden og kontakter blandt kunder og partnere.

3) Partnerskab med de danske selskaber, som allerede har etableret sig i det pågældende område

COWI anbefaler at overveje partnerskab med de danske selskaber, som allerede har etableret sig i en eller flere af de tre byer.

4) Partnerskab mellem danske virksomheder

I konkrete tilfælde kan danske virksomheder i fællesskab styrke markedspositionen i det nære udland. Særligt for mindre og mellemstore virksomheder kan partnerskab være en realistisk mulighed for at stå sig i konkurrencen og samtidig imødegå de lokale udfordringer.

5) Lovgivning og administration

Trods EU-medlemskab, og trods lovgivning baseret på mange ligheder, er der tale om tre byer med forskellige regler og egen administration. Alle tre lande arbejder med undersøgelse, kategorisering og prioritering af forurenede grunde. Resultaterne er offentlige tilgængelige, men status er ikke altid ajour (se Polen).

For alle lande gælder, at ansvaret hviler på forureneren subsidiært på ejeren af ejendommen. Hvis ansvar ikke kan pålægges, eller betaling ikke opnås, hviler oprydning og betaling på det offentlige. Forvaltningen heraf er baseret på lokale regler og praksis og kan udgøre en risiko for danske virksomheder. Dette gælder også de tidskrævende processer, som kan være nødvendige for at fastslå forureningens omfang og ansvaret for at betale for oprydning eller afværge. Dette kan have betydning for betalinger, som kan blive væsentlige forsinkede eller i værst fald udeblive som følge af insolvens. Danske virksomheder bør derfor gennem gode aftaletekster, garantier og andet sikre sig mod denne betalingsusikkerhed.

6) En god markedsundersøgelse

COWI anbefaler, at danske virksomheder, som ønsker at internationalisere sig, foretager en grundig og specifik markedsundersøgelse for at sikre en passende vurdering af konkrete muligheder og de risici, som er forbundet med eventuel etablering og adgang til det pågældende marked. Denne markedsanalyse indeholder en foreløbig tjekliste med forhold, som bør overvejes. Tjeklisten er fordelt på *Lovgivning og myndigheder*, *Markedsadgang*, *Etablering af tilstedeværelse*, og *Risikoafvejning*.

7) Know-how og metode

Lokale krav og praksis vedrørende metoder og teknisk know-how svarer i store træk til den viden og erfaring, som danske virksomheder besidder. Dog skal de lokale geologiske forhold særligt i Stockholm (granit) og i Hamborg (højt grundvand) tages i betragtning.

3. Indledning

Formålet med denne markedsanalyse er at give virksomheder, der ønsker at internationalisere sig, et værktøj til at vælge, hvor det giver mest mening at søge hen i de nære markeder.

Markedsanalysen henvender sig bredt til entreprenører, rådgivere, teknologiudviklere og andre typer af virksomheder, som arbejder med jordforureningsydelser, og som har kommerciel interesse i håndteringen af forurenede jord i bygge- og anlægsopgaver på disse tre markeder.

Markedsanalysen kan læses i forlængelse af rapporten *Brancheanalyse for jordforureningssektoren*, som COWI og RGS90 i 2012 udarbejdede for Videnscentret for Jordforurening, Miljøstyrelsen, FRI og Dansk Miljøteknologi¹. To af brancheanalysens hovedkonklusioner peger på, at branchens vækstpotentiale særligt skal findes i udlandet, og at få danske virksomheder eksporterer sine ydelser. Rapportens relevante hovedkonklusioner og anbefalinger er vedlagt i Bilag 3.

Nærværende markedsanalyse beskriver nogle af de mest attraktive markeder i nabolandene på baggrund af den globale megatrend: Urbanisering.

Urbaniseringen og medfølgende byudvikling er en af de væsentligste faktorer i forbindelse med udvikling af markedet for undersøgelser og afværge på forurenede grunde. Urbanisering betyder, at gamle industrigrunde konverteres til bl.a. nye bolig- erhvervs- og rekreative områder. Desuden kræver urbaniseringen investeringer i ny infrastruktur. Konverteringen af gamle industrigrunde og udbygning af infrastruktur kræver, at forurenede jord og grundvand håndteres på en miljømæssig forsvarlig og bæredygtig måde. Samtidig vil der ofte være en offentlig indsats inden for jordforureningsområdet med henblik på beskyttelse af mennesker og miljø.

COWIs generelle erfaring er, at investeringer fra offentlige og private bygherrer inden for håndtering af forurenede jord og grundvand i forbindelse med bygge- og anlægsprojekter er langt højere end de offentlige investeringer til beskyttelse af grundvand, overfladevand og indeklima.

3.1 Geografisk fokus

Markedsanalysen bygger på tre landerapporter, som COWI's lokale eksperter har udarbejdet. Landerapporterne er vedlagt som Bilag 1. Landerapporterne bør læses selvstændigt for et detaljeret indblik i lokale markedsforhold.

¹ Se <https://www2.mst.dk/Udgiv/publikationer/2013/10/978-87-93026-39-1.pdf>

Hver landerapport fokuserer på et byområde, som udover at have en dokumenteret stor vækst inden for byudvikling, vurderes at være let tilgængelige for danske aktører inden for håndtering af jord- og grundvandsforurening.

Byområderne er valgt som eksempler, hvor der sker en urbanisering på tidligere industriområder, som kræver en håndtering af forurenede jord og grundvand. Dette giver en efterspørgsel på ydelser inden for jordforureningsområdet, som danske virksomheder kan drage nytte af.

De tre byområder er:

- Stockholm (Sverige)
- Hamborg (Tyskland)
- Wrocław (Polen)

Ved at vælge disse tre byer fravælges bevidst lande som Holland, Frankrig og England. COWI's vurdering er, at markedet vil være mindre tilgængeligt for danske virksomheder i disse tre lande samt at en spredning i de geografiske områder vil gøre det vanskeligt at gå tilstrækkeligt i dybden inden for rammerne af denne opgave.

I Sverige er det politisk vedtaget at bygge ca. 800.000 boliger de næste ti år. Det svarer i omfang til det såkaldte "millionprogram" i tresserne og halvfjerdserne. En stor del af de nye boliger skal bygges i *Stockholmsområdet*, og mange af dem skal bygges på tidligere industriarealer. Samtidig er der planlagt store investeringer i infrastruktur, for eksempel Östlinken, en vej og tunnel øst om Stockholm.

I Tyskland er der igennem en del år pågået en forvandling af gamle industriområder til nye byområder. En del af den byudvikling er foregået i *Hamborg*, som er på vej til at udvikle sig til en stærk international storby. Fremover vil byens overordnede udviklingsmål for byrum være "More City in the City". Målet er at styrke det eksisterende vækstmoment primært ved at finde plads inden for de allerede bebyggede områder. HafenCity er i øjeblikket Europas største havneudviklingsprojekt inden for byudvikling. På et område på 157 ha tager en livlig by med et maritimt islæt form, og HafenCity samler arbejdsplads- og boligansøgninger, kultur og fritid, turisme og detailforretninger - helt i modsætning til downtown der er domineret af kontorer og butikker.

I Polen aktiveres ligeledes store investeringer i byudvikling. I Warszawa har der de seneste år været et stort byggeboom, som ser ud til at fortsætte nogle år endnu med fokus på bolig og infrastruktur. Wrocław er Polens 4. største by, og byen vil opleve høj vækst de kommende år. I Wrocław bliver boliger, hoteller, liberalt erhverv og indkøbscentre udviklet på gamle jernbanelandområder i byens centrum, militære områder samt på ældre industriområder. Derfor forventer

COWI en voksende interesse i kost-effektive jord- og grundvandsoprensning-metoder i Wrocław.

Den forventede urbanisering i Stockholm, Hamburg og Wrocław og efterspørgslen efter jordforureningsyndelser adresserer COWI i forhold til markeds-tilgang, volumen og markedsbarrierer. Resultaterne vil kunne ekstrapoleres til andre tilsvarende byområder i vækst.

Man skal dog være opmærksom på, at markedsadgang, regler og tilgang kan variere inden for samme land. Tyskland er som bekendt en føderal forbundsstat, og derfor skal både føderale og statslig (land) relevante lovgivning og myndigheder inddrages i vurderingen.

3.2 Metode og afgræsning

Dataindsamlingen er baseret på et spørgeskema, som COWI's landeeksperter har udfyldt. Spørgeskemaet er udarbejdet med afsæt i erfaringer fra lignende studier og fra COWI's erfaringer fra tilstedeværelse på disse tre markeder. Spørgeskemaet og rapporteringsstrukturen er ens for hvert land (se Bilag 1).

COWI's lokale specialister har indsamlet information for de respektive byer. Alle informationer er indarbejdet i spørgeskemaet, som herefter kritisk er gennemgået af projektteamet. Hvor det er nødvendigt, er der indhentet supplerende information. Den tilgængelige information er herefter sammenskrevet i tre landerapporter.

Landerapporterne (Bilag 1) adresserer særligt:

- Præsentation af det pågældende lokale marked
- Oversigt over lovgivning og myndigheder i forbindelse med ansvar og oprensning af forurenede jord
- Udbud af projekter
- Finansiering af undersøgelser og oprensning
- Krav til metoder og fremgangsmåder for undersøgelse, risikovurdering og oprensning
- Slutbrugere og kunder
- Store markedsaktører – konkurrenter/partnermuligheder
- Lovgivningskrav til udenlandske virksomheder
- Vurdering af markedsudviklingen.

På baggrund af de lokale markedsanalyser vurderer COWI i markedsanalysen den potentielle markedsudvikling og mulighederne for, at danske virksomheder kan få reel markedsadgang. Desuden vurderer COWI fordele og ulemper ved at etablere ad hoc eller mere faste alliancer mellem danske virksomheder, f.eks.

entreprenør/rådgiver eller rådgiver/rådgiver. Endelig beskriver COWI, i hvilken grad, det vil være muligt at ekstrapolere resultaterne fra de tre nævnte byer til tilsvarende udviklingsområder i samme land, samt hvilke parametre der kan være kritiske i forhold til denne ekstrapolation. Sidstnævnte kan bruges som en tjekliste for andre markeder i det nære udland.

Danske virksomheder har forskellige interesser, når det kommer til at udnytte markedspotentialer i udlandet. Dette gælder også for medlemmerne af DSP. Enkelte virksomheder er allerede etableret i udlandet med lokalkontorer og gennem partnere. Andre danske virksomheder står overfor nye udfordringer. Det er håbet, at analysen bidrager til at give et ensartet billede af markedsmulighederne på tre lokale markeder.

Det skal afslutningsvist bemærkes, at rammerne for denne analyse ikke sigter mod en fuld markedsanalyse. Formålet er at præsentere markedsmuligheder og et tilhørende kortfattet overblik over de lokale markedsstrukturer og vilkår for at udøve virksomhed i det aktuelle land. På baggrund heraf vil det være muligt at foretage yderligere uddybning af udvalgte områder af interesse for danske virksomheder, som ønsker at drive forretning i udlandet.

4. Markedsadgang

4.1 Tendenser og udvikling

Markedsanalysen viser, at alle tre byer repræsenterer områder i vækst, og alle tre byområder er interessante markeder for danske virksomheder, der arbejder med jordforureningsyndelser.

Vækstpotentialet er ikke nødvendigvis ensbetydende med risikofrie investeringer og stabile vækstmarkeder. Alle tre byer repræsenterer lovende markeder, men der er tale om tre relativt forskellige markeder med egen særkender. Ethvert markedstiltag bør derfor nøje forudgående vurdere muligheder og risici for det pågældende marked.

- Markederne, markedsadgang og risikoprofilerne er ikke ens blot fordi byområder ligger i EU-lande, som er underlagt samme EU-lovgivning. EU-lovgivningen bliver implementeret vidt forskelligt i medlemslandene og suppleres af omfattende særegne nationale regler.
- Hertil kommer, at markedsbarrierer ikke nødvendigvis kan læses ud af lovgivning alene. Hvert land og byområde har egen administration og bureaukrati, og de pågældende markedsstrukturer og etablering/samarbejde med lokale partnere kan være væsentligt forskellige i forhold til det danske marked.
- Markedsmuligheder kræver en aktiv og vedvarende screening af markeder, projekter, partnere og markedstendenser. Dette kan gøres gennem lokale partnere eller egen tilstedeværelse, løbende kontakt med partnere og kunder, ved at kende lokale udviklingsplaner, strategier og prospekter, ved at følge den offentlige kortlægning af klassificerede forurenede grunde, som i nær fremtid står for prioriteret indsats, og ved at følge udbudsportaler. Udbudsportaler er tilgængelige på alle tre markeder. Det skal dog bemærkes, at udbudsportalerne alene indeholder offentlige udbud og ikke de mange private udviklingsprojekter.
- For at udnytte eksisterende viden kan det med fordel overvejes at indgå lokale partnerskaber. Det kan også overvejes at indgå partnerskab med de danske selskaber, som allerede har etableret sig i det pågældende område. Det vil give indsigt og deltagelse i lokale netværk fra første færd, det vil tillade løbende orientering om de mange markedsmuligheder, og det vil give adgang til allerede veletableret viden og kontakter blandt kunder og partnere.

4.2 Ansvar og lovgivning

Samtlige lande har omfattende og detaljeret lovgivning, som adresserer afværgeforanstaltninger over for jord- og grundvandsforurening. Lovgivningerne bygger på samme principper, men de skal læses selvstændigt, da detaljerne (se bilag 1) er forskellige.

For alle lande gælder, at ansvaret for afværgeforanstaltninger og finansiering af disse primært hviler på forureneren subsidiært på ejeren af ejendommen. Hvis ansvar ikke kan pålægges, eller betaling ikke opnås, hviler oprydning og betaling på det offentlige ud fra en prioritering, som er nærmere fastlagt i lovgivningen.

Det skal i den forbindelse tages i betragtning, at placering af ansvar kan tage lang tid og ofte baseres på omfattende forudgående retssager i flere instanser med betydelig procesrisiko for udfaldet. Dette kan være ganske komplekst, idet der kan være tale om flere parallelle retssager mellem den offentlige myndighed og forurener/ejer, men også mellem forureneren og ejeren indbyrdes. Dertil kommer efterfølgende en betydelige betalingsrisiko, da ejerens eller forurenerens betalingsevne/solvens ikke altid er tilstede.

Lovgivningen er typisk en del af miljøretten. Derfor vil afværgeforanstaltninger i mange tilfælde være betinget af godkendelser, som også omfatter andre tiltag for at beskytte vandmiljø, det nære miljø, affaldshåndtering, sikkerhed, støj/gener og lignende.

4.3 Finansiering af undersøgelser og oprensning

Finansiering af undersøgelse og afværge påhviler ejeren i alle tre markeder. Som ovenfor nævnt, er det dog den konkrete forurener, som skal betale, hvor denne kan identificeres.

Samtlige markeder indeholder også en afskærmning af ejerens ansvar, hvis forureningen er historisk (dvs. før en bestemt dato), og hvis den nuværende ejer af ejendommen kan påvise god tro med hensyn til den pågældende forurening.

Det offentlige foretager på alle tre markeder finansiering af undersøgelser og oprensning. Dette omfatter egen oprydning af grunde, herunder ”orphan” grunde.

Bilag 2 indeholder en oversigt over priser og omkostninger på de tre markeder i forbindelse med undersøgelser og oprensning, og er kommenteret i afsnit 3.8.

4.4 Krav til undersøgelser, risikovurdering og oprensning

De offentlige myndigheder kortlægger og kategoriserer forurenede ejendomme og prioriterer oprensning. Denne kortlægning er tilgængelig men ikke nødvendigvis komplet. Sverige synes at give det mest fuldendte overblik.

Private ejere er forpligtiget til at foretage en undersøgelse og risikovurdering af egen grund i henhold til lovgivningen i de situationer, hvor kommunen har hjemmel til at udstede et påbud herom. Udfaldet heraf har betydning for, hvorvidt oprensning skal iværksættes.

I alle tre markeder er det resortmyndigheden, som udsteder vilkår og tilladelse i forhold til den aktuelle oprensning. Oprensningen udføres ved in-situ teknikker og/eller standardafgravning og ekstern deponering/rensning af de forurenede materialer. Teknikvalg og eventuel kombinationen heraf afhænger af de konkrete forhold, herunder adgangsforhold i bymiljø, adgang til behandlingsfaciliteter, osv.

Geologien varierer mellem de udvalgte byer, og den er særligt anderledes i Stockholms området som er præget af grundfjeld og i de bynære områder store mængder af sprængsten.

Den typiske oprensningssag i forbindelse med byudviklingsprojekter er traditionel afgravning og afsenkning af grundvand eventuelt med efterfølgende rensning af læsevandet på lokaliteten. Afgravede materialer nyttiggøres i det omfang det er muligt i projektet. Det sker under hensyn til forureningskoncentrationer og -typer. Overskydende materialer transporteres til rensning/deponering hos godkendte modtagere.

Ved offentlige oprensningssager benyttes der en bred vifte af afværgeteknikker fra traditionelle graveløsninger over naturlig nedbrydning af organiske forureninger til mere teknisk krævende in-situ teknikker.

4.5 Udbud

Udbudsportaler er tilgængelige på alle tre markeder, dog typisk kun på eget sprog. Dette gælder for EU-udbud og også for nationale/lokale udbud. Udbudsportalerne indeholder alene offentlige udbud (og ikke de mange private udviklingsprojekter), og de giver kun en "last minut" oversigt over projekter, som skal iværksættes.

Udbudsprocesserne er i store stræk fælles i de tre lande, da reglerne følger af EU-retten. Det skal dog tages i betragtning, at der kan være store forskelle i den reelle administration og håndtering af processerne landene imellem. Dette kan blandt andet opleves som en forskel i den grundighed, som den enkelte myndighed udviser med hensyn til proces og indhold. Det kan også opleves

som forskel i klagekultur blandt de bydende, hvor for eksempel det svenske marked i forhold til det danske marked er kendetegnet ved en højere klagefrekvens. Dette kan betyde uforudsete forlængelser af udbudsprocessen og yderligere omkostninger for de bydende.

Links med forklaring til hovedudbudsportalerne fremgår af Bilag 1:

Polen:

- For de regionale myndigheder:
- Regionalna Dyrekcja Ochrony Środowiska we Wrocławiu (<http://wroclaw.rdos.gov.pl/szukaj/przetargi>)

med eksempler på udbud:

<http://wroclaw.rdos.gov.pl/zapewnienie-wlasciwego-stanu-ochrony-obszarow-chronionych-w-wojewodztwie-dolnoslaskim>, og

<http://wroclaw.rdos.gov.pl/zapewnienie-wlasciwego-stanu-ochrony-obszarow-cennych-przyrodniczo>

- For nationale myndigheder:

Biuletyn Informacji Publicznej (BIP) Generalna Dyrekcja Ochrony Środowiska

(<http://bip.gdos.gov.pl/zamowienia-publiczne>)

Sverige:

Alle offentlige udbud findes her:

OPIC - offentliga upphandlingar i hela Sverige (www.opic.com/upphandlingar/)

Hamborg:

Udbud findes her:

(Bund.de Verwaltung Online) <http://www.service.bund.de/Content/DE/Ausschreibungen>

EU:

- For EU udbud (for hele EU), findes her:

- EU Tenders Electronic Daily (<http://ted.europa.eu/TED/>)

At følge udbudsportalerne er nyttigt. Men en målrettet markedstilgang bør sigte mod at kende markedet inden udbud offentliggøres for derved at kunne præge udviklingen ved dialog med de potentielle offentlige kunder og også ved at danne konkrete partnerskab i god tid.

4.6 Aktører – kunder, partnere og konkurrenter

Alle tre markeder er kendetegnet ved, at kunderne kan være offentlige myndigheder, udviklings- og boligselskaber, private og offentlige ejere.

Den nærmere definition af ”kunde” skal naturligvis ses i lyset af den enkelte virksomhed, som ønsker at investere i det lokale marked. Ved underleverancer kan ”kunden” også være øvrige danske virksomheder eller andre konstellationer/konsortier. Hertil kommer at DSP’s medlemmer favner bredt, og at de fokuserer et specialiseret marked og ind i mellem indgår med specialiseret viden i konsortier.

For en del danske aktører vil direkte ejerskab, og dermed direkte ansvar for oprydning af forurenede grunde, ikke umiddelbart synes relevant. Det skal dog noteres, at danske virksomheder, som arbejder for lokale ejere med ansvar for oprydningen og betalingen herfor, også bør forstå de lokale regler for ansvar og oprydning, samt forstå omfanget heraf samt sikre sig mod disse ejeres insolvens eller manglende betalingsevne i tilfælde af påtvungen oprydning af forurenede jord.

Det fremgår også af de tre markedsanalyser, at der allerede er betydelige konkurrence på de tre markeder bestående af nationale og i mindre omfang internationale aktører. Konkurrencen kan på sigt derfor forventes at være betydelig, og det kan forventes at allerede veletablerede aktører kan have en betydelig fordel i den fortsatte konkurrence.

I Polen kan slutbrugerne opdeles på udviklere (TK Development, PROLOGIS, IK Development, UBS, og Panattoni), olieselskaber (Shell Polska, BP Poland, ARAL, ORLEN), og industri (LG Electronics, General Electric, ALSTOM, GK IMPEL, FagorMastercook, VOLVO). De større markedsaktører er Geoprojekt, Geotest, Geoko, Proxima.

I Sverige er slutbrugere typisk de offentlige instanser (Swedish Traffic Administration, City of Stockholm, Stockholm Hamn AB, og Stockholm Vatten AB), og private udviklingsselskaber, industri osv. De større markedsaktører er JM AB, Skanska, Sweco, ÅF, Tyréns, WSP, Ramböll, COWI, Projektengagemang, Norconsult, Golder, ArchaeaSolutions Inc. (Microbes), EkoTec AB (biological methods), Ezymex Miljöteknik AB (Enzymes and Bacteria), GeoServe (Air

sparging and bio sparging, chemical oxidation, thermal methods etc.), RGS Nordic AB.

Ifølge et markedsstudie fortaget af Bulwiengesa i 2017² omfatter de største tyske aktører Zech Group, CG Gruppe, Bonava, Formart, BPD, Groth Gruppe, Strabag, Büschi, Münchner Grund og Ten Brinke.

4.7 Forsikringsforhold og ansvarsbegrænsning

Ved en virksomheds projektorienterede aktiviteter uden for landets grænser er det særligt vigtigt at tage forholdsregler i forhold til en beskyttelse af virksomhedens kapital via forsikringer og begrænsning af ansvar. Desuden kan der være formelle krav til forsikring og ansvar afhængig af kundekrav og projekttyper. Her skal specielt nævnes, at ved offentlige udbud i Polen, kan ansvaret ikke begrænses ifølge udbudsloven. I Tyskland har domstolene en praksis om ikke at anerkende standardklausuler i aftaler, som begrænser ansvaret.

4.8 Priser

I bilag 2 er vist typiske priser for rådgivningsydelser, udførelse af borer, kemiske analyser samt afværge ved opgravning og deponering eller behandling. Disse priser skal naturligvis tages med forbehold, da forureningsgrad, opgaveomfang, tidsfaktor med mere har indflydelse på enhedspriserne. De kan dog give en indikation af prisniveauerne.

Således koster polske rådgivningstimer omkring det halve af tyske og svenske, som i øvrigt ligger på linje med de danske. Kemiske analyser er væsentlige dyrere i Sverige end i Polen, mens de i Tyskland er billigst og på linje med, hvad de koster i Danmark. Borearbejde er væsentligt billigere i Polen end i Sverige. Tysklands prisniveau ligger cirka mellem Polen og Sverige. Afværgeforanstaltninger ligger på samme niveau i Polen og Tyskland, mens omkostningerne i Sverige er væsentlig højere.

Samlet set vil prisniveauet for undersøgelser og oprensning være højest i Sverige, herefter kommer Tyskland, som ligger på nogenlunde samme niveau som Danmark. Prisniveauet er lavest i Polen.

² Se mere her: <http://www.bulwiengesa.de/de/publikationen/studien/projektentwicklerstudie-2017>

5. Adgang til markeder

Markedsmulighederne hænger sammen med adgangen til markederne. I det følgende beskrives den formelle og den reelle adgang baseret på beskrivelserne i Bilag 1.

5.1 Etableringsfrihed

Alle tre markeder er i princippet åbne for danske virksomheder og aktiviteter. Dette følger naturligt af EU-retten om fri etablering. Det skal dog påpeges, at der typisk kan være en række barriere, som kræver nøje overvejelse (se dette kapitel og tjekliste til sidst).

Etableringsfriheden gælder både for virksomheder, som ønsker at etablere sig permanent ved oprettelse af en lokal juridiske enhed og for virksomheder, som udøver ad-hoc virksomhed ud fra Danmark. I begge tilfælde skal national lovgivning vedrørende etablering og/eller udøvelse af erhvervsvirksomhed overholdes på lige fod med nationale selskaber. Der må ikke foretages diskrimination af udenlandske (i dette tilfælde danske) virksomheder. Dette betyder i praksis, at danske virksomheder skal opfylde lokale krav til opnåelse af eventuelle registreringer og godkendelser af udstyr, processer og arbejder. Det skal typisk også foregå på det lokale sprog.

I den forbindelse bør det forudgående undersøges, hvorvidt disse krav realistisk kan opnås inden for tidsrammen af et ønsket projekt. Krav til og regulering af eventuel start- og egenkapital, ledelsens sammensætning og ansvarsbegrænsninger bør ligeledes undersøges. Da EU-retten sikrer fri etablering og bevægelsesfrihed for arbejdskraft er dette typisk ikke et stort problem, men lokale/nationale regler og praksis kan variere og være særdeles tidskrævende.

Oprettelse af en juridisk selvstændig lokal filial kan være nyttig for at allokere forretningsrisikoen lokalt. Hermed kan ansvaret begrænses til den lokale filial, så ansvaret ikke yderligere påvirker den danske forretning.

5.2 Reel adgang og barrierer

Den formelle adgang kan være omgivet af en række reelle markedsbarrierer, som bør tages i betragtning. Dette omhandler primært de såkaldte kulturelle barrierer.

5.2.1 Sprog og lokal praksis

Sprog kan være en barriere. EU-retten anerkender fuldt ud, at hvert medlemsstat arbejder på eget sprog. Forretningspartnere og kunder kan udbyde markedsmuligheder på engelsk eller andet sprog for bevidst at søge internationale

aktører. Selv i disse situationer bør man udvise forsigtighed, da parterne ikke nødvendigvis mestrer f.eks. engelskkundskaber på tilstrækkeligt niveau.

Det anbefales derfor at søge partnerskab med lokale partnere eller ansatte, som taler det lokale sprog, og som forstår at "tale" med myndighederne, lokale partnere og kunder. Dette giver også mulighed for at udnytte eksisterende viden og forankring. Det vil give indsigt og deltagelse i lokale netværk fra første færd, det vil tillade løbende orientering om de mange markedsmuligheder, og det vil give adgang til allerede veletableret viden og kontakter blandt kunder og partnere.

5.2.2 Forståelse for lovgivning, administration og domstole

EU-retten anerkender fuldt ud, at landene selv bestemmer, hvordan EU-retten implementeres, herunder egne regler for administration og domstolsudøvelse.

Naturligvis skal EU-rettens rammer overholdes, men der er et væsentligt råderum for de nationale myndigheder i fortolkning og administration af EU-reglerne. Hertil kommer, at EU-retten ikke fuldt ud regulerer de samlede juridiske aspekter, som skal tage i betragtning. Der er således overladt en række juridiske regler og afvejninger til de nationale myndigheder.

Hertil kommer, at markedsbarrierer ikke nødvendigvis kan læses ud af lovgivning alene. Hvert land og større byområde har egen administration og bureaukrati, og de pågældende markedsstrukturer og samarbejde med lokale partnere er oftest forskellige fra det hjemlige marked. Dette gælder både private og offentlige kunder. Her kan sidstnævnte være større bureaukratiske komplekser, så som de offentlige jernbaner og forsvaret/militæret.

Det skal i den forbindelse tages i betragtning, at placering af ansvar kan tage lang tid typisk baseret på omfattende forudgående retssager i flere instanser med betydelig procesrisiko for udfaldet. Dette kan være ganske komplekst, idet der kan være tale om flere parallelle retssager mellem den offentlige myndighed og forurenere/ejer, og også mellem forurenere og ejeren indbyrdes.

5.2.3 Finansiering og prioritering

Der kan være forskelle på de reelle finansieringsmuligheder, navnlig baseret på offentlige midler. Til trods for stort set samme udgangspunkt i lovgivningen, er det f.eks. ikke sikkert, at de polske offentlige midler reelt er til rådighed på samme måde som i for eksempel Sverige, eller at administrationen heraf og udbetalingen reelt sker gennem samme kanaler og på samme betingelser i de to lande.

Denne virkelighed kan stå i kontrast til krav, ønsker og visioner i lovgivning, strategier og planlægning. Det kan desuden forsinke den reelle gennemførelse af afsagte domme eller kendelser.

Samme usikkerhed gælder for udfaldet af prioriteringen (og opfølgningen herpå) af oprydning af forurenede grunde. Heller ikke her kan der tegnes et entydigt billede til trods for klare udmeldinger i lovgivningen. Her viser praksis efter markedsanalyserne i Bilag 1, at forholdene i Polen er mere uklare end i Sverige og Tyskland.

Hertil kommer, at det offentlige typisk er sidste instans til at betale, hvis og såfremt alle forsøg er udtømte for at få forureneren, brugeren eller ejeren til at betale for oprydningen. Det offentlige vil derfor gå langt for at søge ansvaret og oprydningen placeret hos private, og det offentlige vil alene nødtvunget indvilge i at betale for oprydningen. En dansk aktør bør have i tankerne, at en offentlig samarbejdspartner ikke nødvendigvis deltager af egne vilje, men mere af nødvendighed. Dette kan være en udfordring, hvor offentlige midler i forvejen er få og kan varierer årligt i henhold til offentlige budgetter, som skal dække oprydningen af flere forurenede grunde end pengene reelt strækker til.

5.2.4 Risiko for betaling og ansvar

Som tidligere nævnt bør danske aktører nøje sikre sig, at betalingen for leverede ydelser ikke reelt hindres som følge af insolvens eller manglende betalingssevne hos en partner, som er/bliver ansvarlig for oprensning af forurenede jord.

Tilsvarende bør den danske aktør undgå at blive inddraget i et betalingsarrangement, hvor betaling forudsætter, at partneren forinden opnår sin betaling fra f.eks. kunden. Der er betydelige interesser på spil, og procesforhaling og forsinkelser ved domstolene er ikke ualmindelige.

Dertil kommer at selve fuldbyrdelsen af eventuelle domme kan tage tid. I denne proces kan der betydelige risiko for at én eller flere forretningspartnere (dvs. partnere som har et større ubetalt tilgodehavende eller partnere som idømmes ansvar) erklæres insolvente med konkurs og opløsning til følge. Alt afhængig af den valgte partnerstruktur og den interne hæftelse kan dette have alvorlige forretningsmæssige og økonomiske konsekvenser.

I den forbindelse kan et ejerskifte (over en forurenede ejendom) have tilsvarende konsekvenser. Polen tillader f.eks. oprydning af forurenede grunde svarende til ejendommens benyttelse. Hvis denne benyttelse ændres midt i projektet uden at være fyldestgørende reguleret, kan det i princippet også ændre oprydningens karakter. Det er muligt, at en dansk samarbejdspartner kan trække sig fra en sådan halvfuldendt opgave, men dette kan have negative betydning for virksomhedens omdømme for fremtidige opgaver.

Risikoen er naturligvis mindre, hvis ansvar og betalingsevnen forudgående er afklaret og accepteret.

5.3 Markedsadgang - tjekliste

Enhver virksomhed, som overvejer at investere i ét af de pågældende markeder, bør indledningsvist foretage en række undersøgelser. Dette vedrører fast etablering eller den konkrete projektmulighed. Dette vil afklare både muligheder og risici involveret og bør som minimum indeholde følgende betragtninger:

Lovgivning og myndigheder

- Lovgivning vedrørende undersøgelser og oprensning
- Lovgivning vedrørende etablering og/eller udøvelse af virksomhed
- Relevante kompetente myndigheder
- Forståelse for national, føderal eller anden relevant lovgivning.

Markedsadgang

- Konsultér planlægning på by, regional og statsniveau, udviklingsplaner, strategier, udbudsportaler, offentlige lister over klassificerede forurenede grunde, udnyt netværk inden for branchen
- Konsultér allerede etablerede danske selskaber
- Hvilken type intervention, f.eks. køb af ejendom, rådgivning, udviklingsprojekter?
- Egen indsats og/eller brug af partnerskab?
- Investeringsbehov og muligheder.
- Profit og afkast
- Business case/selling-point – hvad er den unikke tilgang på et marked med stærke konkurrenter?
- Geologiske udfordringer.
- Metodemæssige udfordringer.

Etablering af tilstedeværelse

- Ad-hoc eller permanent tilstedeværelse
- Samarbejde med lokale partnere

- Udnyttelse af allerede etablerede danske selskaber
- Overvejelse af partnerskab mellem danske virksomheder
- Finansieringsmuligheder – hjemmefra, lokalt?
- Forsikringsforhold
- Skatteforhold/konsekvenser
- Omkostninger og ressourcer – arbejds løn: Lokal eller dansk arbejdskraft
- Omkostninger og ressourcer – etablering: Tid, bureaukrati, økonomi.
- Lokale regler – etablering af virksomheder, arbejdsmiljø, miljøregler, sikkerhedsforanstaltninger, godkendelser osv.

Projekt Risikoafvejning

- Betalingsikkerhed fra partnere, kunder osv.
- Betydning af ”back-to-back” aftaler.
- Partner screening
- Procesrisiko, hvor ansvar og betalingsevne skal etableres.
- Ansvarsbegrænsninger – lokalt, i forhold til danske modervirksomhed og partnerne imellem.
- Reel tilstedeværelse af offentlige midler for oprydning som matcher offentlig prioritering.
- Tjek historisk udvikling/sammenligning mellem prioriterede grunde og faktisk gennemførelse.
- Indhent erfaringer fra tidligere projekter – indikation om forventet forløb.
- ”Kulturel” forståelse af lokal lovgivning og administration.

Bilag 1

Market analyses Wroclaw, Stockholm og Hamburg

Conclusion and recommendations

Wroclaw, Poland

In Wroclaw city the market for investigation and remediation of contaminated sites is still rather immature and mainly focused on the private sector, especially foreign companies established in the city or in a process of acquisition or divestiture. However, it is expected that the market is rapidly growing due to the planned urban development. The methods used for remediation are mainly excavation and disposal, but there is a great interest for advanced in situ methods. Contaminants in main focus is oil components and metals, but it is expected that chlorinated compounds may be a priority within a few years.

There are few and small local companies working as consultants, contractors, technology developers or suppliers specialised in investigation and remediation of contaminated sites.

The unit price level for services, equipment and contractor work in Poland is well below the Danish price level, which has to be taken into account during the considerations regarding if and how to be present in this market. All communication with authorities will be in Polish, and it is of utmost importance to know the administrative procedures for management and approval of a remediation project.

A partnership with a local consultant or contractor will probably be the most feasible way to get a foothold in the Polish market. It should be noticed that many consultants in Poland also work as contractors and subcontract specific work. To be attractive for a Polish consultant/contractor it is important to be able to deliver a specific and innovative technology, whether it is equipment, methods or knowledge, which can make the Danish party attractive and justify the higher costs.

An issue to be aware of as a Danish company is the contractual conditions, especially the lack of limitation of liability, which is standard at public clients, but also seen frequently at private clients. In these cases, the contractual negotiations may be extensive and detailed risk assessments be necessary, and in some cases a contract may not be concluded.

Stockholm, Sweden

In Stockholm the market for investigation and remediation of contaminated sites is rapidly increasing both in the private and the public sector, and it is expected to continue for many years ahead. The most interesting potential clients are private developers and contractors (e.g. JM and Skanska), and public companies like Swedish Traffic Administration, City of Stockholm and Stockholm Hamn AB. The type of remediation projects includes both excavation with off site disposal/treatment and advanced in situ methods, where applicable. A few years ago the main contaminants in focus were oil components and metals, but chlorinated compounds are now also being given high priority.

In Stockholm many strong players within contaminated sites management have been established since years ago, and the competition is tough. Most of the large consultants and contractors known from Denmark are also strong in Stockholm.

The price level for services, equipment and contractor work in Sweden is similar or even higher than in Denmark, which makes the Danish players competitive, and the market attractive.

All communication with authorities will be in Swedish, and it is important to know the administrative procedures for management and approval of a remediation project.

Although the culture, language and business environment in Sweden is very similar to Denmark, it is still recommended to seek partnership with a local player, alternatively establish a branch office staffed with local representatives. Whether a potential partnership shall be established with a local consultant, contractor, technology developer or supplier will depend on the specific service/technology/product the Danish company intends to market, and the specific conditions under which the Danish player plans to enter the market. A first round of meetings with local consultants will often be an efficient entrance to clarify which type of partners to focus on. Obviously, a Danish partner already established in Stockholm may be the first entrance to a survey of market possibilities for a specific service/technology/product.

Apart of the above mentioned recommendations for getting a share of the market in Stockholm and Sweden, there are a couple of issues to be aware of as they may be somewhat different from the way we work in Denmark. An issue is the often used bidding procedure and selection criteria at least in the public sector. The tenders will often be open, i.e. there is no limitation of the number of bidders. Furthermore, the selection criteria is based on a two stage evaluation, first stage selects the firms fulfilling a number of technical criteria, e.g. a project manager with "x" years of experience and completed "y" similar projects, etc. In the second stage, it is only the price, which is decisive for the selection of the winning party among the companies passing first stage. Another

issue is the frequent use of complaint from one or more of the non-awarded parties. Such complaints will delay the start-up of the project and sometime cancel or change the original award.

Finally, the rocky underground may give challenges for companies used to work in clay and sand.

Hamburg, Germany

In Hamburg there is a steady and high volume market for investigation and remediation of contaminated sites, especially in the private sector, but also the city of Hamburg dispose of a certain budget, and high volume market is expected to continue for many years ahead. The most interesting potential clients are private developers and contractors (e.g. FREO Financial & Real Estate Operations GmbH, Lindner Gruppe, Garbe Immobilien-Projekte GmbH and many other), and the City of Hamburg. In Hamburg very large remediation projects have been performed and may still be expected, and combinations of excavation/disposal and advanced in situ methods have been applied. All types contaminants can be expected including dioxins and the more traditional contaminants as chlorinated compounds, oil components and metals.

The market for consultants and contractors to provide site investigation and remediation services is dominated by small and medium size companies based in the region of Hamburg. Larger remediation projects more often are being tendered to larger consultants/contractors with offices in Germany.

The price level for services, equipment and contractor work in Germany is similar to the level in Denmark.

All communication with authorities will be in German, and it is important to know the administrative procedures for management and approval of a remediation project.

Due to the language and the lack of knowledge and experience regarding negotiations and communication with local authorities, it is recommended to seek partnership with a local company, in case of being a Danish player seeking expansion of business activities to Hamburg and maybe further into Germany. Whether a potential partnership shall be established with a local consultant, contractor, technology developer or supplier will depend on the specific service/technology/product the Danish company intends to market, and the specific conditions under which the Danish player plans to enter the market. A first round of meetings with local consultants will often be an efficient entrance to clarify which type of partners to focus on. Obviously, a Danish partner already established in Hamburg may be the first entrance to a survey of market possibilities for a specific service/technology/product.

By operating in the German market one should be aware of the restrictions on limitation of liability. German courts are generally very restrictive in relation to contractual limitations. Therefore, any contractual limitation of liability should be carefully considered and should be individually negotiated, expressly agreed and legally assessed for each project.

Wroclaw, Poland

Introduction

In Poland, we see major investments in urban development. Warsaw has in recent years, experienced a large construction boom, which seems to continue for some years with focus on housing and infrastructure. Wroclaw is a smaller city, but major growth is expected in the coming years. Development of houses, hotels, liberal professions and shopping centres in the old railway area in the centre of the city, military areas and older industrial areas are expected. In Wroclaw and neighbouring municipalities, a dynamic housing infrastructure and industrial construction boom is observed, but investments are at present being prioritised in areas less impacted by soil and groundwater contamination. It is foreseen that further urban development will also focus on contaminated areas in the city centre, and a growing interest in cost-effective soil and groundwater remediation methods are therefore expected.

Legislative framework and liability

In Poland remediation efforts for protection of human health and environment are addressed in the Environmental Protection Law and the related regulations.

Historical contamination and environmental damage

Soil contamination is called either a “historical contamination” or an “environmental damage”. Contamination is called a “historical contamination” when originated before April 30, 2007 or is a result of activity completed before April 30, 2007 or caused by an emission and event that has occurred more than 30 years ago. In contrast, contamination which is called "environmental damage" is the contamination that has occurred after April 30, 2007. This date is not accidental, but determined based on the implementation of the EU Law in Poland.

Industrial Emission Directive

The Industrial Emission Directive is since 2014 implemented in Poland, which imposes obligations to IPPC (Integrated Pollution Prevention and Control) industries to perform baseline soil and groundwater contamination investigations, and subsequently remediation.

Identification of contaminated sites

In Poland there is a unified system for identification of contaminated sites, followed by intrusive investigation and remedial action. The system is presented in the “Regulation of the Minister of the Environment on the method of conducting assessment of surface contamination” date September 1, 2016. According to the Regulation contaminated sites are identified and investigated in the following five stages.

- Stage 1 – Identification of activities that could be harmful, causing soil contamination in a given area in the past or currently.

- Stage 2 – Drafting of a list of substances causing risk of soil contamination expected in a given area.
- Stage 3 – Collection, analysis of up-to-date sources of information that will help to assess the risk of soil contamination in a given area and collection of the up-to-date soil tests results from the list established in the Stage 2.
- Stage 4 - Collection of information necessary for the initial intrusive soil investigation, including identification of land use for a given area.
- Stage 5 – Intrusive soil investigation. The objective of the intrusive investigation is to delineate soil contamination and to determine the potential remedial measures. The remedial measures are to be reflected in the Soil Remediation Plan Report, including scope and time plan for the remedial measures. The Soil Remediation Plan is subject of approval by the Regional Directorate for Environmental Protection (RDEP), which is a State Environmental Authority.

If soil contamination is excluded at a given stage, further stages may be omitted.

Substances that represent significant risk of contamination of soil surface, their limit values in soil, relevant for the particular soil properties and land use are set out in Annex 1 of the “Regulation of the Minister of the Environment on the method of conducting assessment of surface contamination”, of September 1, 2016.

The land use is grouped according to the land and buildings register, taking into account the indications specified in the Article 26, Section 2 of the Law of May 17, 1989 - Geodetic and Cartographic Law (cf. Official Journal of Laws of 2015, item 520, as amended), and are as follows:

- Land use, Group I - are mainly residential, built-up, urbanized and recreation-recreational areas.
- Land use, Group II: are mainly areas of gardens, orchards, meadows and pastures.
- Land use, Group III: are primarily forests, wooded and pruned areas, historic sites or ecological areas.
- Land use, Group IV: are mainly industrial areas, fossil mines and communication areas.

If a local spatial development plan has been developed for a given area, the land use in the area is determined according to the intended use of the area indicated in the above document.

The Regulation of the Minister of the Environment on the method of conducting land surface contamination assessment”, of September 1, 2016 does not refer to the issue of groundwater quality and remediation and this aspect is not yet clearly regulated in the Polish Law.

In Poland it is assumed that soil contamination is the primarily media to be addressed and it is assumed that groundwater contamination is considered in parallel with soil contamination. This means that groundwater remediation is also planned while soil is remediated, but there are no overall State regulated limit values for groundwater to be accomplished as a the result of the remediation. The target groundwater limit values are set on case to case basis by the State Environmental Authorities, namely the Regional Directorate for Environmental Protection (RDEP) in the administrative decision approving the remediation plan.

Contaminated sites liability

According to the Polish Environmental Regulatory Framework the liability for soil contamination and soil clean up in case of *environmental damage* rests with polluter. However, if polluter is not known, the liability rests with the landowner. If the private owner is not capable to pay the costs of soil remediation, and the risk is imminent, the costs are to be paid by the State. This is also the case, if it is an orphan site.

In the case of *historical* contamination, the liability rests with the State and the remediation is performed by the Regional Directorate of Environmental Protection (RDEP) and costs are paid by the State when:

- execution of a remedial action against a land owner may not be initiated or execution has been rendered ineffective;
- land owner will demonstrate that contamination was caused after the date of his possession of land. And contamination has been caused by another entity, who cannot be brought in to force to execute remedial action, or the execution has been rendered ineffective;
- land owner filed a notification pursuant to an Art. 12 of the Law of July 27, 2001 on the introduction of the Law on Environmental Protection, the Law on Waste and amending certain Acts (cf. Official Journal of Laws, No. 1085, as amended), and the State filed the application in the official register containing information on land on which quality of soil or soil standards were violated;

- it is necessary to carry out remediation immediately due to the risk to human health or the possibility of irreversible damage to the environment.

Inventory of contaminated sites

According to the Environmental Law (dated April 27, 2001, Official Journal 2017) the Starosta office (the State Authority, at Powiat Level) is obliged to make screening of potential contaminated sites e.g. based on notifications from other institutions, private bodies, or own screening. The Starosta Office is obliged to hand over the results to the RDEP. The first reporting is to be completed and filed to the RDEP in October 2018. Therefore, today the Starosta office may still not be in the position of a complete list of contaminated sites. Based on the list the RDEP will select suspects and will set priorities for remediation. Subsequently, the RDEP will request the owner to undertake investigation and remediation.

It has to be noted that each legal entity is obliged by the Environmental Law to report soil contamination to the Starosta office.

It is the responsibility of the RDEP to request remediation in all known cases.

As stated above execution of soil investigation and remediation rests with the owner of a site. In case, the owner of the site is the State, the RDEP applies to the State Authorities i.e. the Voivodeship Fund for Environmental Protection or the National Fund for Environmental Protection for funding of soil investigation and remediation.

In case when the private owner is not in the position to cover the costs of investigation, the RDEP also applies for funding to the Voivodeship or the National Fund for Environmental Protection.

Tendering of contaminated sites projects

The public financed remediation projects are tendered in public tenders. Once the funding for soil investigation and remediation is granted, the RDEP prepares Tender Documents and calls for a tender. The RDEP selects in the tender procedure a contractor for the investigation and remedial works, and subsequently supervises implementation of soil investigation and remediation. The tenders are published on the RDEP website:

<http://wroclaw.rdos.gov.pl/szukaj/przetargi>

An example of tender can be found under link below:

<http://wroclaw.rdos.gov.pl/zapewnienie-wlasciwego-stanu-ochrony-obszarow-chronionych-w-wojewodztwie-dolnoslaskim>.

The General Directorate of Environmental Protection (GDEP) in Warsaw publishes their Tenders on their web site presented below:

<http://bip.gdos.gov.pl/zamowienia-publiczne>

Once the soil remediation is completed by the contractor, it is subject for check and approval by the RDEP.

It should however also be stressed that the prevailing practice in Poland is that the RDEP focuses on having the private sector, undertaking soil remediation. The soil remediation on orphan sites are executed on a limited scale as the RDEP rather avoids engagement of the State funds.

Therefore, there are not too many projects on orphan sites, consequently not too many tenders.

According to the information obtained from the GDEP in Warsaw, in Wrocław, there are at present 10 environmental damage sites identified that are planned for remediation. However, it is not known, when these sites will be remediated.

Financing of investigation and remediation of contaminated sites

As mentioned earlier the liability for soil contamination and obligation for soil remediation rests with the polluter of soil contamination, but if polluter is not known, it rests with the owner (i.e. private or the State owner). So, the cost of remedial actions is either to be paid by a private or the State owner. If the owner (other than the State owner) is not capable to cover the cost of soil remediation of an orphan site, the cost is to be covered by the State.

In case of soil contamination on orphan sites, funding for soil investigation and remedial actions can be raised by: a) Regional Fund for Environmental Protection (RFEP) and b) National Fund for Environmental Protection (NFEP).

As mentioned earlier, the RDEP based on their knowledge about orphan sites with soil contamination makes the priority list, prepares tender documents, calls for tender, selects and engages contractor and supervises the remediation project. The RDEP is using the State funding. As mentioned earlier the RDEP has the right to apply for to both the RFEP and the NFEP.

However, in case of an orphan site, where cost of remediation charges the State budget, the State follows the policy that soil remediation is to be implemented at the cost of the State only in cases with a real threat and need for soil remediation. This policy is determined based on the limited funding available for such purposes.

The examples of cases when remediation can be omitted are the following: no direct risk to human health and environment, no risk for migration of contaminants.

In Wrocław City there is a number of contaminated sites both private owned (e.g. industries, oil companies) and State owned (e.g. military, railways, airports). However, neither the Wrocław City, nor the Starosta Office nor the RDEP has a complete list of the contaminated sites. The RDEP has not disclosed any info about the contaminated sites in Wrocław City and surroundings and any potential tenders.

However, COWI has also applied with a letter to GDEP in Warsaw for information and obtained a list of contaminated sites and soil remediation projects in the Wrocław City and surroundings.

According to the information obtained from the GDEP in Warsaw, in Wrocław, there are 10 environmental damage or contamination sites identified. These sites are not yet remediated or are under remediation. Main contaminants are petroleum products and / or heavy metals, see a brief characterization of the sites:

- 1 Damage (Reg. No. 130), which consists of soil contamination with mineral oils exceeding soil and ground quality standards up to a depth of 0.3 m on an area of 0.0031 ha. The beneficiary of the environment is obliged to carry out remediation activities.
- 2 Damage (Reg. No 282), which is a threat to natural habitats and habitats for protected species.
- 3 Damage (Ref. No. 712) consisting of soil contamination with heavy metals (Pb, Zn, Sn, Cu and Hg) on an area of 0.086 ha. Due to the lack of information on the initial condition of the site, it was assumed that the contamination occurred before 30 April 2007. The foreseen remedial actions will comprise - removal of contaminated soil by ex-situ method. The beneficiary of the environment is obliged to carry out activities.
- 4 Damage (Reg. No. 922) - leakage of thermal oil in the amount of about 200 liters on an area of about 0.002 ha. Remedial actions - removal of soil contamination at least up to the permissible content in soil causing the risk. The beneficiary of the environment is obliged to carry out activities.
- 5 Damage (Ref. No. 986) – Soil contamination due to a fire in a warehouse where chemicals were stored (administrative proceedings in progress). The beneficiary of the environment is obliged to carry out activities.

- 6 Damage (Reg. No. 991) - Leakage from the local boiler room during flood event. Soil contamination occurred in an area of about 0.005 ha. The environmental protection body is required to carry out remediation activities (ex-situ method).
- 7 Acknowledged historical soil contamination (on plots No. 16a and 16b) with metals (Cu, Pb and Zn) and aromatic hydrocarbons on an area of 0.14 ha - land. Responsible is the owner of the land.
- 8 Confirmed historical soil remediation (Reg. No. 211) of an area of 0.116 ha, where no remediation was undertaken. Responsible is the owner of the site.
- 9 Confirmed historical soil contamination (Reg. No. 234a and 234b) of 0.3 ha - during soil remediation. Contamination with hydrocarbons. Responsible is the owner of the land.
- 10 Confirmed historical land surface contamination (Reg. No 274) of an area of 0.048 ha - during remediation. Responsible is the owner of the land.

The above data does not include land /site earlier remediated.

COWI applied with a letter to Wrocław City for information with regards to past, ongoing or possible future soil investigation and remediation projects financed by the City. The Wrocław City replied that no soil remediation projects have been executed by the City at the cost of the Wrocław City. Wrocław City informed that identification and screening of potential contaminated sites are done by Environmental Department of the City and at a low scale and cost.

However, according to RDEP there are currently two ongoing soil remediation projects in Wrocław City and the surroundings. However, no detailed information was disclosed.

Methodology and requirements for investigation, risk assessment and remediation

Types of sites

Generally, in Poland the remediation is focused on old industrial sites, which due to urban development shall be developed to residential area, offices and light industry. This is also the case in Wrocław, which in addition has old railway areas attractively located in the centre of the city, as well as large military areas, which are expected to be closed down and used for other purposes.

Main contaminants

In Poland there are no specific contaminants, which have special attention by the Environmental Authorities. The most common pollutants are originating from petroleum derivatives (e.g. TPH, PAH) and heavy metals. Most of the

identified contaminated sites are contaminated with those substances. The other commonly encountered contaminants are benzene, toluene, ethylbenzene and xylene (BTEX). However, these substances as they are more volatile, are less frequently identified, and subsequently there are less remedial projects implemented. The problematic with chlorinated compounds is not (yet) so much in focus as in Denmark.

Authority requirements

The requirements for environmental screening, risk analyses, soil and groundwater investigation and remediation targets are set and presented on case by case basis in an Administrative Decision requesting remedial actions issued by the RDEP. The Administrative Decision defines objectives, scope, soil quality targets and time plan for execution of remediation. This procedure is valid whether it is a private or public financed remediation project. For example, in case the results of a soil investigation call for the need of soil remediation, the owner of the contaminated site is obliged to present, along with the reported results of investigations, a plan for soil remediation. This plan shall include a description of current soil contamination, target soil conditions, presented in the Regulation of Minister of Environment, dated September 16, 2016, (cf. in Polish <http://www.dziennikustaw.gov.pl/du/2016/1395/1>), scope of the remedial actions and implementation time schedule. Such reports and plans shall be prepared by the contractor who executed the investigation. The report and plan is subject to approval by the RDEP.

The Regulation of the Minister of the Environment on the method of conducting land surface contamination assessment, September 1, 2016 does not refer to the issue of groundwater quality in remediation, as previously mentioned.

Currently, the State Authorities take into consideration that the objective of any remediation is not to fully remove the contamination, but to limit the risk of the negative impact on people and the environment.

The soil contamination discovered by private entities is primarily related to construction on brownfield sites (either private or State owned) and site transactions (i.e. ownership change).

Investigation

The intrusive soil and groundwater investigation techniques are selected dependably on the needs. The most common techniques applied comprise soil and groundwater sampling with mechanical drilling (e.g. auger drilling rig) preferably with casing, soil sampling, filter installations and groundwater sampling. Accredited analysis in laboratory are commonly applied to have the results officially recognized.

Risk assessment

The commonly applied risk assessment method is the Source-Pathway-Receptor risk assessment. Risk assessment has to be performed as a basis for soil remedial actions approved by RDEP. The risk assessment and subsequent remedial actions include protection of the indoor climate from volatile contaminants, eliminating the contact risk and avoiding contamination of the groundwater.

Remediation

Implementation of soil remediation project depends on type and extent of contamination and risk assessment. The purpose of soil remediation or groundwater remediation is to either eliminate or reduce the amount of substances causing risk or environmental damage or harm to human health. The other purpose of soil or groundwater remediation is controlling migration of contamination by limiting cross border contamination i.e. spread of contamination so that the contaminated area no longer poses a threat to human health or environment. When defining the scope of the soil remediation the present and, if possible, the future use of the land, has to be taken into account. The remediation techniques can involve in situ solutions or natural attenuation, if those are the most optimal solutions taking into consideration the environmental benefits and the cost. The most common remediation methods are excavation and landfilling, although in situ methods may be preferred on larger sites located outside the city centre and not subject to an immediate change of land use.

End users and buyers of contaminated sites management solutions

Real estate developers

The most important group of end users and buyers of contaminated sites management solutions are real estate developers e.g. TK Development, PROLOGIS, IK Development, UBS, Panattoni acquiring and investing in brownfield sites for subsequent development.

Oil companies

The second group are oil companies acquiring and investing in brownfield sites for gasoline stations e.g. Shell Polska, BP Poland, ARAL, ORLEN.

In case of these two groups the preferred remediation solution is “ex-situ” remediation due to the time factor related to a quick return of investment, and the fact that these sites are usually medium or small size and located in the centres of the cities.

Industries

The third group of important end users are industries expanding their business or large industries, subject to the Integrated Permit e.g. LG Electronics, General Electric, ALSTOM, GK IMPEL, FagorMastercook, VOLVO, which by Law (Industrial Emission Directive) are obliged to carry out soil investigation.

Once a soil investigation discloses soil contamination, the official proceedings upon liability and soil remediation are launched and executed.

Military and railways

The fourth group of important end users are the Polish Military, Department of Fixed Assets and the Polish State Railway, Fixed Assets Enterprise owning land mostly located outside the City centre. However, the Polish State Railways owns sites in the Centre of Wrocław City, which are in most cases contaminated.

Many of these State owned sites are for sale and in case the potential investors are found, there is no doubt that these sites become potential soil remediation sites, as it is banned by the Environmental Law to invest and to develop on a contaminated land.

In case of these two groups the preferred remediation solution is “in-situ” due to the fact that usually these sites are large, located outside the City centre, the contamination is usually more extensive making ex-situ soil remediation economically less feasible.

Danish end users

Doing business abroad with your country men is often an advantage. In Wrocław City TK Development works as developer, and there is a number of Danish Companies and investors (e.g. Danfoss, Sauer Danfoss, Carlsberg, Aluwind) who carry out their operations primarily on leased premises in the Economic Zones or on New Industrial Zones which however, were established primarily on green site. The industrial and business activities on these sites most likely have not resulted in any major soil contamination subject to potential soil remediation.

Dominating market players

In Wrocław City there are only a few companies offering soil investigation services e.g. Geoprojekt, Geotest, Geoko and only 1-2 companies offering soil remediation services applying ex-situ and in-situ soil remediation (e.g. Proxima).

The local Polish companies operating from Wrocław are of a small to medium size, employing from few to several dozen employees. The technical capacity (e.g. drilling rigs, remediation equipment) is limited usually representing one to several vehicles, while remediation equipment is very limited. The applied solutions depends on the specific remediation project, and the relevant equipment and technology is procured or leased from the third party. There are no international companies dealing with soil investigation and remediation, seated in Wrocław.

Occasionally, traditional in-situ techniques like pump and treat, air sparging, skimming, biological soil remediation are designed and implemented by the Technical University in Wrocław and Agriculture University in Wrocław. These institutions offer their services not only in Wrocław City but in Poland

as any other Institutions/companies from outside Wroclaw City offer their services in potential projects in Wroclaw City.

Legal requirements to foreign contractors and contract holders

In Poland the environmental regulatory framework is the same for all entities, regardless of the origin of a contractor, supplier or consultant. There are no requirements with regards to any specific licenses to be possessed by the companies carrying out soil investigation or remediation. However, it has to be noted that the proposed remedial techniques implying use of specific remediation equipment, this remediation equipment must be approved for use in Poland i.e. have Safety Certificates for use in Poland e.g. Conformity Certificate and CE Certificate.

For any specific remediation project, the proposed soil remediation techniques and solutions must be subject to approval by the State Authorities (the RDEP) reflected in the relevant Administrative Decisions (e.g. Water Permit, Waste Permit, Air Emission Permit, Environmental Decision, Integrated Permit). In order to obtain an Administrative Decision an environmental/geological/hydrogeological study has to be elaborated presenting objectives, scope of activities and time line. For instance in case of „ex-situ” soil remediation a Waste Permit needs to be obtained, based on a Waste Study. In case of groundwater remediation a Water Study needs to be elaborated in order to obtain a Water Permit for execution of groundwater remediation. Companies collecting and disposing contaminated soil must have a Waste Permit allowing them to perform these activities.

Finally, a foreign company establishing itself in Poland must pass the general procedures regarding settlement, registration, taxes etc. and observe the legislation, labour agreements etc.

Insurance and liability limitation

In connection with public tenders the regular tender requirement is that a bidder has to provide a performance guarantee for the project usually equal to the value of the fee, which is released by 70% once the project is completed and released with the remaining 30% after 12 months of performance guarantee period. In case of projects financed from private funds the requirements are individual. Insurance to cover professional liability will normally be required.

In Poland in case of public tenders the liability cannot be limited according to the Public Procurement Law. For private tenders the limitation is a matter of negotiations and agreement.

Language/local administrative procedure barriers

In Poland all the administrative proceedings have to be executed in Polish language, this means that all the documentation has to be prepared in Polish language in order to be recognised by the State Authorities. The administrative procedures are also executed in Polish language.

As any remediation project is subject to approval by the State Authorities (the RDEP) based on reports and plans prepared by the contractor, experience with format and content of such reports and plans is necessary.

Assessment of market development

According to the current trends, each investor prior to acquisition of a site that has not been previously examined for contamination, first chooses to carry out intrusive investigation and to take samples of soil and groundwater for testing.

Wrocław City and surroundings is a region with a dynamic growth of investment in industrial activities. This is primarily due to a very attractive location of Wrocław, very well developed road infrastructure, i.e. A4 motorway leading to the West to Germany, A8 motorway leading to the Central part of Poland, Highway S3 leading to the South to the Czech Republic, to the North to Szczecin and Baltic Sea. In Wrocław and in the surrounding municipalities there are free economic zones offering attractive investment conditions, which attract investors seeking for land and lease of land for development of their activities.

Moreover, development of houses, hotels, liberal professions and shopping centres in the old railway area in the centre of the city, military areas and older industrial areas are expected. In Wrocław and neighbouring municipalities, a dynamic housing infrastructure and industrial construction boom is observed, but investments are for the moment being prioritised in areas less impacted by soil and groundwater contamination.

Therefore, it is assessed that in the coming years the Wrocław City and the surroundings will be an attractive area for investors what implies opportunities for soil investigations, laboratory tests and soil remediation projects. The City of Wrocław Multi-Year Investment Plan 2015-2019 assumes investment for more than EUR 70,000,000 in infrastructure, real estate etc. (cf. <http://bip.um.wroc.pl/artykul/326/16892/wieloletni-plan-inwestycyjny-na-lata-2015-2019>). A growing interest in cost-effective soil and groundwater remediation methods are expected.

Stockholm, Sweden

Introduction

The Municipality of Stockholm has 933,917 inhabitants (30/09/16). The dense populated area (tätort), generally considered as Stockholm, consists of Stockholm municipality and parts of the 10 municipalities surrounding the city with a total of approx. 1,373,000 inhabitants.

Greater Stockholm, Stockholm and the 25 other municipalities in Stockholm län, has 2,260,800 inhabitants. The prognosis for the municipality of Stockholm is 1,061,000 inhabitants in 2024, but right now the growth rate is higher. According to the forecast, there must be housing for at least 137,000 new residents.

Greater Stockholm will, according to SLL (Stockholm Läns Lansting, Tillväxt och regionplaneförvaltningen) and SCB (Statistiska Central Byrån) with the current growth rate at 38,400 inhabitants per year, have 2,582,000 inhabitants in 2024. In 2050 Greater Stockholm will have 3,100,000 inhabitants.

In RUF 2010 (Regional Utvecklingsplan För Stockholmsregionen) a regional development plan for Greater Stockholm the prognosis for construction of new housing is 66,500 dwellings before 2024, only in Stockholm. 40,000 of those has to be built before 2020. The city's transport system is not developed to cope with this growth, and both Arlanda Airport, Stockholm Central (Railway) and the public transportation must be rebuild and extended.

An increased population will not only lead to increased demand for housing, it also drives the demands for offices, commercial buildings and infrastructure investments. Stockholm Business Region (City of Stockholm) has in a new analysis assessed the investment potential in the region concerning housing, infrastructure and innovation. Until 2030, about 900 billion SEK (95 billion Euro) is needed to be invested in new housing and infrastructure. Analysis claims that 340,000 homes will be built in Greater Stockholm, and that alone requires an investment level of 500 billion SEK (Euro 53 billion). Other mayor projects underway or will begin over the years to come is the expanded metro system (EUR 2.7 billion), Ostkustlinjen – railway (EUR 2.6 billion) and Förbifart Stockholm – highway tunnel – (EUR 1.5 billion).

Stockholm has experienced steady economic growth since the turn of the millennium. Also in connection with the financial crisis, when growth slowed in many other European countries, Stockholm continued to generate positive GDP.

Investments of 900 billion SEK can provide an estimated turnover of consulting services of 90 - 135 billion SEK for architectural, consultancy and planning services. If it is distributed per year, it becomes SEK 7 – 10 billion per year,

and recalculated to consulting hours with an expected hourly rate of 800 SEK, it will be 8.75 – 12.5 million hours. Converted to Full Time Employees (FTE) (2080 hours per year) these investments will generate a demand of 4,200 – 6,000 FTE consultants per year.

Legislative framework and liability

Identifying, investigating and remediate areas polluted by existing or historical operations is an important work to reduce the risk that humans and environment are exposed to dangerous substances.

The Environmental Law (Miljöbalken) and the Swedish Parliament environmental quality objectives govern the work on remediation.

Responsibility for contaminated areas

In the first place, the polluter is responsible for paying for investigations, investigations and possible actions. Alternatively, the property owner may be responsible. If there is no person in charge, government contributions may apply. Who is responsible for a contaminated area is determined by rules in the Environmental Law. If a contamination is encountered, it is required to report this to the supervisory authority, municipality or county administrative board. The polluter is the one who, through its activity (operator), has caused pollution to spread on site or in the environment. The polluter should primarily investigate if there are contaminants. The polluter should do the necessary actions. This usually applies only if the operation has been operational after July 1, 1969. Anyone who carries or digs in a contaminated area, which leads to contamination spread, can also be considered as an operator.

If there is no responsible operator, in some cases, the property owner may be made responsible for any pollution present on his or her own property. However, for the property owner to be responsible, he/she should know or should have known that the property was contaminated upon acquisition. In addition, the acquisition must have been made after 31 December 1998. A property owner may also be required to dispose of chemicals and waste that a former operator has left behind on the property. Civil law issues, such as the contractual relationship between buyers and sellers of real estate, are not covered by the County Administrative Board's work.

If there is no responsible operator or property owner, in certain cases, investigations and actions of nationally prioritized areas can be carried out using government grants. Contributions are sought from the municipalities of the County Administrative Board. An assessment is made at national level of the areas that are relevant for contributions in the country by the Swedish Environmental Protection Agency. Currently, only areas with risk class 1 (highest risk class, see later) may be eligible to receive contributions.

The supervisory authority is the county administrative board, the Inspector of health and environment (armed forces) or the municipality's environmental management. In most of the municipalities in Stockholm, the municipalities are the supervisory authority for discontinued operations. The Inspector of health and environment within the armed forces is always the supervisor of the facilities owned or managed by the armed forces. In other cases, the supervisory authority is determined depending on the type of activity that has caused the pollution and the extent to which a municipality has taken over the supervision of the County Administrative Board.

It is the duty of the supervisory authority to impose requirements on responsible entrepreneurs or property owners to conduct investigations and / or actions. Who is responsible is based on a liability investigation, as required by the supervisory authority.

The owner of a property or operator on a property is required to inform the supervisory authority immediately if contamination is discovered on the property. Therefore, attention should always be paid to strange odours and divergent colour changes by doing excavation work. Any excavation work or remedial action in an area that may be contaminated, is required to be reported to the supervisory authority, as such measures may increase the spread and exposure of pollutants. In some cases, permission may be required to perform this.

A number of authorities, industrial operators and exploiters are involved in the work with remediation and restoring contaminated sites. If no one is responsible for a contamination at a site, government appropriations could sometimes finance the remediation depending on the risks for health and environment. It is the municipality, which applies for funding from its' county administrative board. The County Administrative Board makes a regional priority and assesses the municipality's application, and can then apply for contributions from the state national allocation managed by the Swedish Environmental Protection Agency (Swedish EPA).

The Swedish EPA is the overall authority responsible for the management of soil and groundwater pollution at national level. The responsibility includes coordinating, prioritizing and following up work at a national level. The Swedish EPA also administers the contributions that may be given to county administrative boards for remediation and evaluates the effects of the completion of the projects.

The Swedish EPA allocates the money to the work of polluted areas. The municipalities seek funding from county administrative boards. The county boards in turn apply for a contribution from the Swedish EPA.

Most of the appropriations for contaminated areas go to remediation.

It is the county boards in each county that make inventories of contaminated areas and do the risk assessments and classification. With the help of the risk classification, the county administrative boards make prioritization of the management of the contaminated sites. It is primarily sites in Classes 1 and 2 that are further prioritized for investigations and, if necessary, remedial actions. Information on both identified potentially polluted areas and (risk-class) areas found in the inventory are collected in a national database.

The county administrative boards' work on inventory of contaminated sites ended on 31 December 2015. However, most of Sweden's suspected contaminated areas are now known. The continued work aims at collecting more information about the suspected contaminated areas.

Other institutions carrying out inventories of contaminated areas, are the Swedish Armed Forces, Swedish Transport Administration, and the Swedish Geological Survey (SGU).

Identification

The first step is to identify potentially contaminated areas. Identification means finding areas where there has been an activity that could contaminate the area. The areas are placed in an industry class (industry class 1-4). Industry classification is a group risk classification based on general assessments based on the activity / industry that has been operating on the site.

Together with the county councils, the Swedish EPA has developed a list of sectors that will be prioritized in inventory of areas.

Risk classification

The inventory begins with classification of areas based on the industry classification. The inventory is made according to the MIFO methodology (Methodology for Inventory of Contaminated Areas). Phase 1 comprises an orientation study and results in a risk assessment. Phase 2 includes a review and a new risk assessment.

The risk classification includes an overall assessment of the risks to human health and the environment, which the contaminated area can imply today and in the future. There are four different risk classes:

- Class 1, very high risk,
- Class 2, high risk,
- Class 3, moderate risk and
- Class 4, small risk.

The basis for a risk classification usually consists of review of historical material, interviews and site visits. In many cases, no soil or water tests are taken in the area. Risk classification is a first step in determining which areas to prioritise.

Investigation

Those areas with the highest risk to be contaminated are prioritised for intrusive investigations. The operator (industry), real estate owner or the Swedish EPA (through the county administrative board and the municipality) pays for the investigations. Who pays depends on whether someone is responsible for the pollution. The County Administrative Board does not conduct its own investigations but performs supervision and supervision. In the supervisory work, it is investigated, among others, who is responsible.

Remedial activities

If the studies show that the area is contaminated and that it poses a risk to the environment and human health, some form of action is required. Remedial activities may, for example, imply that the contamination is excavated, treated on site or it is assessed that the contamination spread is limited. The remedial activities are normally performed by contractors supervised by a consulting firm.

Stockholm County/Greater Stockholm

Stockholm County has a long industrial history. Here, there have been many different activities for a long time that may have left pollution. Previously, there were often industries in the urban areas, but today they have moved out to accommodate housing, among other things. The County Administrative Board prioritizes the areas in the county, which need to be addressed.

In Stockholm County there are approx. 11,300 identified sites where there could be contaminations in the ground and/or groundwater.

Financing of investigation and remediation of contaminated sites

Orphan sites are remediated when the municipality or the county administrative board have found a site to be hazardous to human health and/or environment. These sites are classified in class 1 and 2 (see above). The municipality then seeks funding from the County Administrative Board, which obtains funding from the Swedish EPA.

On a national level, approximately SEK 372 million will be allocated for remediation and approximately SEK 22 million for investigations in 2017.

Stockholm County i.e. Greater Stockholm will receive approximately SEK 25.5 million in 2017, SEK 22 million 2018 and SEK 50.5 million for operations in 2019.

From 2016, it is possible for municipalities to seek funding for financing remediation on sites where it is possible to build residential areas. In 2016 and 2017 the government through Swedish EPA supporting the municipalities with 300 million SEK annually. From 2018 and forward the amount is set to 200 million SEK annually.

In Stockholm County, private investors primarily finance remediation projects, but some few are funded by money from Swedish EPA. Today approximately 1,300 sites in Stockholm County have been investigated and classified according to Swedish EPA MIFO-method. Public efforts is primarily targeted to remedial actions on contaminated sites classified as very high risk (risk class 1) and high risk (risk class 2). Included in risk class 1 and 2 are industrial activities as landfills, dry cleaners, nurseries, wood impregnating, sediment in lakes and sea, and engineering industry.

Tendering of contaminated sites projects

Wisma Opic is the largest and most complete tender portal in Sweden, and they advertises all public inquiries (LOU).

www.opic.com/upphandlingar/

Almost every municipality and County administrative board in Sweden has an own site for tendering but everything ends up at Wisma Opic anyway.

Some public tenders in Stockholm regarding investigation and/or remediation of contaminated soil are:

- Jernhusen AB (a public real estate company), Environmental investigation in Liljeholmen Stockholm
- City of Stockholm, Exploateringskontoret, Remediation design Kolkajen and more sites in Norra Djurgårdsstaden
- City of Stockholm, Blanket procurement – contaminated soil and groundwater
- Municipality of Nacka, soil and groundwater investigation at Sickla strand

In Stockholm, the drivers for remediation are both protection of the human health and of the environment (groundwater and recipients), and for urban development. Many of the most attractive plots for housing are near water and harbours where the industrial sites were located in the past.

The most common remediation method in Sweden is excavation and transport to a nearby treatment plant. This is a fast and not so expensive method. Sweden still have large areas outside the urban areas for location of treatment plants, which keeps the prices at a moderate level. Therefore in-situ remediation develops relatively slow in Sweden.

In Stockholm County there are approximately 10,800 contaminated sites. Approximately 850 of those are today remediated, partially or totally.

The city of Stockholm did carry through four very large remediation project between 1998 and 2004. The sites were Lyftkranen in Ulvsunda, Sickla Udde, Klara Sjö and Gasverkstomten in Hjorthagen. Most of the contaminated soil were excavated and deposited at a treatment plant, but a large in-situ remediation method with thermal removal was used at Lyftkranen.

For more information about in-situ remediation and ongoing projects:

<http://www.atgardsportalen.se/>

Methodology and requirements for investigation, risk assessment and remediation

Requirements to investigations, risk assessments, and remediation criteria is fairly the same as in Denmark. The geology in Sweden and Stockholm is different from that in Denmark, which sometimes requires different drilling equipment or sampling equipment.

Inventory is performed according to the MIFO methodology. The MIFO methodology has been developed by the Swedish Environmental Protection Agency and is described in report 4918. The actual inventory work can be performed by the County Administrative Board or the municipality.

The inventory is the basis of the work with potentially contaminated areas. After an area been included in the inventory, a risk assessment takes place based on an assessment of the risks to human health and the environment. The risk classification is used as a priority tool by the county administrative board in the continued work on polluted areas. Within the work of polluting areas, investigations and remediation measures may be the next step.

End users and buyers of contaminated sites management solutions

Within public clients/end-users one should distinguish between the municipalities managing the public means allocated to remediate the sites with major risks and the public entities acting as builder. These latter could be Swedish Traffic Administration, City of Stockholm, Stockholm Hamn AB, and Stockholm Vatten AB, and they have same drivers as the private clients/end-users.

Private clients/end-users: Real estate owners/investors, industries, developers, JM AB, Skanska among others.

Dominating market players

Sweden is an attractive market and the major players have established themselves in the capital years ago. They are international companies with possibility to draw on competences from their subsidiaries or headquarters in other regions/countries, including Denmark.

Consultants: All the large consultant firms, Sweco, ÅF, Tyréns, WSP, Ramböll, COWI, Projektengagemang, Norconsult, Golder, among others is represented in Stockholm.

Developers/Contractors (in-situ): ArchaeaSolutions Inc (Microbes), EkoTec AB (biological methods), Ezymex Miljöteknik AB (Enzymes and Bacteria), GeoServe (Air sparging and bio sparging, chemical oxidation, thermal methods etc.), RGS Nordic AB.

Legal requirements to foreign contractors and contract holders

In Sweden the environmental regulatory framework is the same for all entities, regardless of the origin of a contractor. For any specific remediation project, the proposed soil remediation techniques and solutions must be subject to approval by the Authorities.

A foreign company establishing itself in Sweden must pass the general procedures regarding settlement, registration, taxes etc. and observe the legislation, labour agreements etc.

Insurance and liability limitation

Insurance

Professional liability insurance will in most cases be required.

Limitation of liability

In Sweden Contractors and Consultants often work with standard contracts like ABT 06 and ABK 09, similar to Danish ABR89. In Standard ABT 06 contracts, the Contractor has unlimited liability for defects and damage to the contract works caused by defects. The liability for other damages is limited to 15 % of the contract price, unless the contractor has an insurance covering a higher amount.

The Contractor shall give a 5 years guarantee for the contract works.

In the standard ABK 09 contract, the design consultant has limitation of liability for damages to 120 price base amounts (in 2017 the Swedish price base was SEK 44,800). The length of the liability period will often be 10 years.

Language/local administrative procedure barriers

There are no difference between native and foreign companies. Regulations are the same for all. There will always be advantage to have local knowledge and knowing how the local authorities works.

Usually, all communication, both in written and vocabulary, is in Swedish.

In Sweden, all the administrative proceedings have to be executed in Swedish. All the documentation has to be prepared in Swedish language. The administrative procedures are also executed in Swedish language.

Assessment of market development

As mentioned in the Introduction the City of Stockholm and even more Greater Stockholm will grow immensely in numbers of inhabitants. The need for residential areas is great and much of the construction will be carried out in contaminated areas. The population growth will also drive the demand for infrastructure as roads, rail, airport, tram and subway.

All the above drives the market development for investigations, risk assessments, and remediation. In-situ remediation will grow in the next five years due to the landfill taxes regarding contaminated soil and due to requests from public clients for in-situ solutions to reduce the use of replacement masses.

Private clients will continue to use the most reliable and cheapest solution where it is possible. Excavation is therefore the most common technique.

The prices for analysis and drillings have been stagnant or decreased in recent years. The stagnant prices for analysis is due to higher volumes and to faster processes. The cost of drillings has decreased in Stockholm due to competition from companies outside Stockholm.

Due to competition the price levels for consultancy has been steady for the last decade. Consultancy fees have remained stable in recent years despite wage increases. This is mainly due to competition in the industry. Now, there may be a shortage of consultants and it may push prices upwards.

As mentioned above the cost of deposition of soil is expected to increase when the authorities try to reduce the use of clean replacement masses and to reduce the transports.

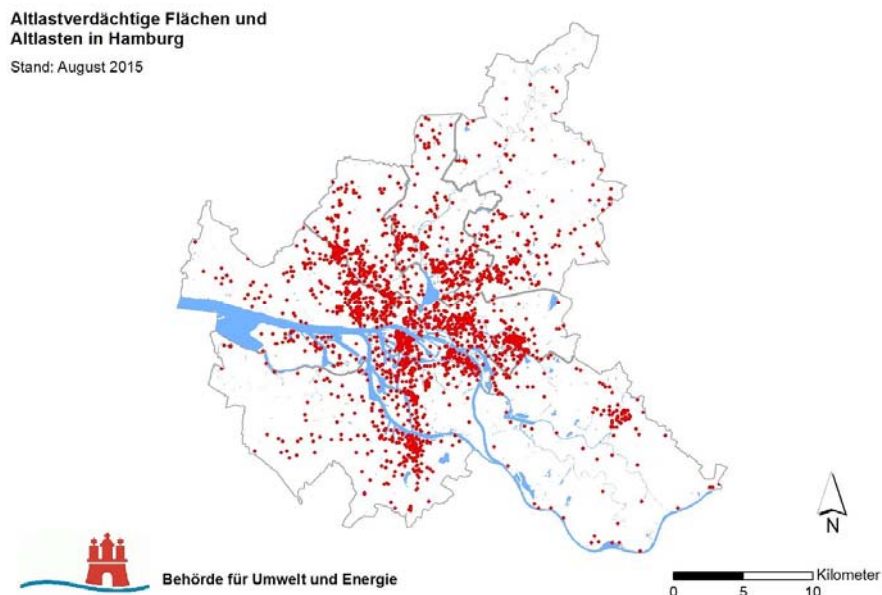
Hamburg, Germany

Introduction

In Germany, a tremendous transformation of old industrial areas into residential areas and light industry has occurred during the last decades. Part of this urban development has happened in the Ruhr district, but focus is now on other former industrial areas, and here is Hamburg a good example, as it is heading towards becoming a strong international metropolis/large city. In future, the general development aim for public open space will be 'More City in the City'. The aim is to strengthen the existing growth momentum primarily by finding available space inside already developed areas. HafenCity is, at the moment, the largest harbour development project for urban development in Europe, a plan for the development of a European city by the waterfront. In an area of 157 ha, a lively city with a maritime touch is being created gathering/joining/attracting jobs and accommodation, culture and leisure time, tourism and retail shops – unlike downtown dominated by offices and stores.

Since 1979 the City of Hamburg is gathering information about sites with the potential of contamination. In the land register of contaminated sites, all available information about potential contamination, investigations etc. are documented.

The Figure below shows all *potential* contaminated sites as well as contaminated sites in the City of Hamburg as of August 2015:



As of 1 July 2017, the register lists 1,612 sites, which are *potentially* contaminated and 557 sites where investigations confirmed that the site is contaminated. Out of these 557 sites, 144 are currently under remediation. Until the end of June 2017, 528 sites have successfully be remediated.

Hamburg's new strategy "Metropole Hamburg – Wachsende Stadt" defines until the year 2030 the challenge to reduce land utilisation in the outskirts of Hamburg and to use abandoned sites within the centre of the City to meet the challenges of a growing city. The figure above shows that most of the (potential) contaminated sites are in the centre of the City and strong efforts are needed to investigate and to identify, if sites need remediation to avoid environmental hazards or if sites can be used without remediation.

Hamburg with its' specific topographical situation, located at the river Elbe and with a high groundwater level has specific challenges with contaminated sites and their potential to pollute besides the soil, in particular the groundwater and surface water. Driven by this challenge, the Ministry puts a lot of efforts into the identification of potentially polluted sites, site investigations and, if needed, the remediation of the contaminated sites. This is also supported by the strong need of available land to develop the city within the existing boundaries.

Legislative framework and contaminated sites liability

Definition of "site contamination"

According to the Federal Soil Conservation Act (Bundes-Bodenschutzgesetz), "site contamination" is contamination at abandoned waste sites or industrial sites that provokes deleterious changes in the ground or other threats to public health. Such phenomena are caused by improper handling, storage or depositing of waste and improper use of environmentally hazardous substances.

Typical suspected contaminated sites are:

- abandoned waste disposal sites i.e. closed down waste disposal facilities as well as other sites on which wastes have been treated, stored or disposed,
- abandoned industrial sites i.e. closed down facilities and other sites on which potentially contaminating activities have been carried out.

Legislation

In 1999, Germany enacted soil protection laws that provide statutory and technical site contamination remediation instruments, the goal being to ensure that such measures are enforced in the various regional states. Despite the laws, improper land use by companies, farmers and private individuals in some cases gives rise to deleterious changes in the soil and to site contamination. According to official government statistics, more than 1,000 cases of soil contamination (as defined by section 324a of the German Penal Code (StGB)) come to light each year, resulting in around 90 convictions annually.

Site remediation measures are governed by the following laws: Gesetz zum Schutz vor schädlichen Bodenveränderungen und Altlasten (Bundes-Bodenschutzgesetz – BBodSchG); and Bundes-Bodenschutz- und Altlastenverordnung (BBodSchV). The main site remediation goal set by the BBodSchG law is hazard prevention. However, this also entails ecological measures aimed at sustainable soil protection, for mere hazard prevention cannot possibly restore soils to their original state. Lasting soil stewardship will only be achievable if the proper precautionary and preventive measures are taken.

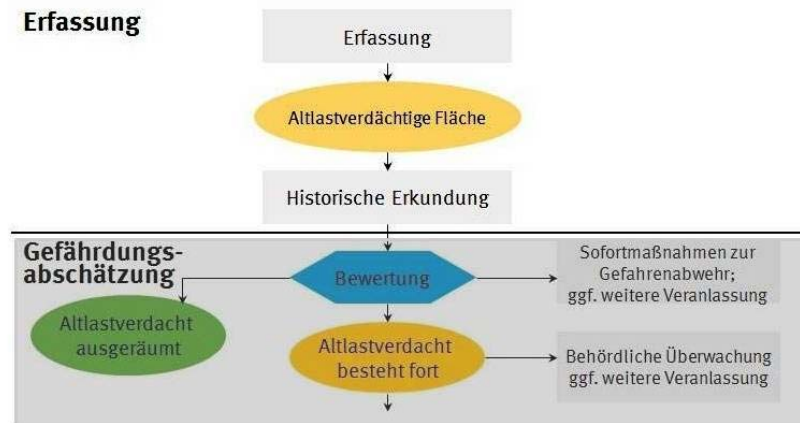
The relevant soil protection law in Hamburg is the "HmbBodSchG - Hamburgisches Bodenschutzgesetz- Hamburgisches Gesetz zur Ausführung und Ergänzung des Bundes-Bodenschutzgesetzes", which implements the national Bundes-Bodenschutzgesetz in the territory of Hamburg.

How contaminated sites are identified

To date, soil sampling and assays are not required by law for the purpose of determining whether a given site is contaminated, but are instead determined through historical reviews including assessments of documents, maps and aerial photos. Key information can also be obtained through interviews and site inspections, and they should be an integral part of such historical investigations. These historical reviews are carried out by the relevant authorities, often in conjunction with cadastral land surveys. In this process, information is compiled from sources such as municipal commercial registers, and is then assessed with the goal of identifying possible contaminated sites. Such assessments are based on factors such as the manner in which hazardous substances were handled at the abandoned sites, or the manner in which waste was handled, stored and deposited.

During the subsequent initial assessment, the authorizing body determines whether there is good reason to believe that the site in question is contaminated. In Germany, a formal initial assessment following the historical investigation phase has proven to be effective, as it allows for further investigation of suspected contaminated sites and for their hazard related prioritization. Virtually all such sites has been identified.

The following graph shows the first steps of working with contaminated sites in Germany - capturing and historical exploration of suspected hazardous waste sites (source: UBA):



Targeted technical investigations – in conjunction with existing information concerning the site in question – allow the authorities to either confirm or allay suspicions that a particular site may be contaminated. Such investigations are normally done by independent consultants, who provide a summary assessment of the relevant findings. However, it falls to the authorities to make a hazard assessment and to determine which steps need to be taken, if any.

The graphic above depicts the various assessment steps and decision options that come into force. The flow chart of the subsequent site contamination investigation and assessment phases is based on past experience, and is not set in stone. In the event a given investigation provides an indisputably sound basis for a definitive hazard assessment, the authorizing body can decide to forego any further investigation and make its' determination as to whether or not the site in question is contaminated. In such cases, a process different from that depicted in the flow chart can be used. Substance-related assessment criteria are discussed below.

Authorizing bodies often carry out preliminary investigations aimed at determining whether a suspected contaminated site is in fact contaminated. Such investigations mainly involve site measurements, which are obtained using technical investigation measures such as soil and groundwater sample assays. The preliminary nature of such investigations is reflected by the relatively small number of samples and investigation parameters. It is essential that the findings of the preliminary investigations also are assessed using test values, in such a way that the particularities of each individual setting are taken into account.

Detailed investigations provide data for the subsequent hazard assessment, and allow for determination of the following:

- The amount and spatial distribution of pollutants.
- The mobile elements of these pollutants.
- Their propagation potential in soil, water and air.

- Their potential for being up taken by humans, animals and plants.

Such detailed investigations also aim to determine whether spatially limited pollutant deposition at a possibly contaminated site poses a hazard and whether neighbouring non-polluted sites need to be protected against such contamination. The findings of the detailed investigations are then evaluated in light of site particularities, with the goal of determining the extent to which preventive measures need to be taken.

The Fachbeirat für Bodenuntersuchungen (FBU; soil investigation advisory council) assesses suitable soil investigation methods. The board's main tasks include compiling findings concerning the use of recommended methods and determining the equivalence of such methods.

The authorizing body's final hazard assessment indicates whether or not the site in question is contaminated. By law, precautionary measures must be taken for sites that are found to be contaminated. As each site has its own particularities (e.g. geological and hydrological characteristics; contamination scope and type; relevance of natural resources that were used in particular ways), the BBodSchV law stipulates neither limit values for remediation requirements, nor target values to be achieved through site remediation. Instead, the law allows the authorities considerable leeway in such matters.

Test and measurement values for contaminants

The criteria for hazard assessments are governed by the Gefahrenbeurteilung sind in der Bundes-Bodenschutz- und Altlastenverordnung (BBodSchV) regulation, whose Annex 2 contains testing and measurement criteria for specific contaminants and exposure pathways, as well as rules for the application of these elements:

- Testing and measurement criteria for soil-human exposure pathways, in terms of direct contact and use.
- Testing and measurement criteria for soil-crop exposure pathways (use related, in terms of crop quality).
- Test values for the assessment of soil-groundwater exposure pathways.

If tests reveal that contaminant test values are exceeded, it can normally be assumed that suspicions of site contamination or deleterious soil changes are justified, and a detailed investigation should be undertaken. In cases where contaminant concentration or content falls below the relevant test value, suspicions of site contamination or deleterious soil changes are allayed concerning the relevant pollutant and no further investigations are needed.

If the relevant measurement values are exceeded, the authorities must then determine, in light of site particularities, the extent to which preventive measures need to be taken.

The BBodSchV law only contains soil-human exposure pathway measurement values for dioxin and furan. When it comes to measurement values for determining the body's absorption capacity for the total content of a soil pollutant, no sound scientific methodologies are available – despite the fact that such methods are essential for the determination of measurement values.

Investigations, remediation and follow-up measures

The main site remediation goal set by the BBodSchG law is hazard prevention. The duty to prevent hazards is governed by section 4(3) of the law, which states that contamination attributable to soil contamination, as well as water pollution attributable to deleterious soil changes or site contamination are to be cleaned up in such a way that any hazardous, substantial disadvantage or substantial harm to individuals or the public good is eliminated.

Various hazard prevention instruments are available, whose selection depends mainly on the following factors:

- The resources to be protected
- Current and future use allowable under the planning law
- The geological, hydro-geological and hydraulic conditions at the site
- Pollutant properties
- The relevant transmission and exposure pathways

According to section 2(7) of the BBodSchG law, the relevant site contamination factors are as follows: decontamination measures for contaminant elimination or mitigation purposes; measures aimed at avoiding or mitigating long term propagation of the pollutants in question.

In cases where site remediation is not a feasible option, protective and limiting measures, particularly usage limitations, can be applied.

Section 13 of the (BBodSchV) regulation indicates the cases in which the authorities Bundes-Bodenschutz- und Altlastenverordnung are empowered to require that polluters conduct remediation investigations and submit a remediation plan. Remediation investigations, which may be conducted by external specialists, involve a comparative assessment of possible hazard prevention measures or combinations thereof and should in all cases take into account the principle of proportionality. In other words, the measures required by the authorities and the impact of such measures on the party responsible for remediation should be reasonable in terms of the hazard that is to be avoided. To this end, the measures that are used should be those most likely to achieve the desired outcome (i.e. the remediation objective set by the authorizing body).

Natural pollutant mitigation mechanisms should also be factored into official decisions concerning remediation measures or protective and limiting measures.

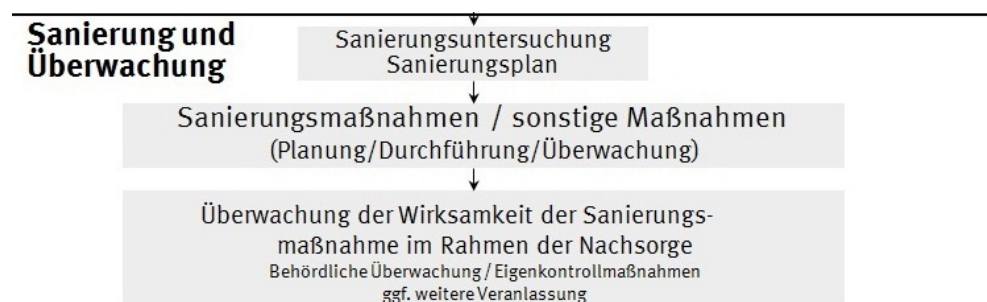
Deleterious soil changes and site contamination that occurred after the BBodSchG law came into effect (1 March 1999) are to be eliminated insofar as this is reasonable in light of the preexisting site contamination.

The time, effort and financial resources needed to meet official site remediation objectives (including any required follow-up measures) vary according to the measures in question. The duty to prevent hazards is governed by section 4(3) of the BBodSchG law, which states that determination of the party responsible for remediation is to be based on the “perpetrator principle” (the party that caused the pollution, such party’s legal successor, the property owner, and/or the party that controls the property), whereas responsibility for financing the measures in question is based on the polluter pays principle.

Follow-up measures are necessary in all cases where long-term (a) post-remediation maintenance of the remediated construction or facility and/or (b) exposure pathway monitoring are necessary, owing to the presence of residual pollution potential.

It is essential that all technical and administrative measures are tailored to site particularities, pollutant characteristics, property use, the resources to be protected and the relevant exposure pathways. Such measures need to be suitable, necessary and reasonable.

The following graph compiles the process steps necessary after a contaminated site has been ascertained. It starts with the remediation investigation, followed by remediation up to follow-up measures.



Tendering of contaminated sites projects

Public Tenders in Germany are published in following portal site:

<http://www.service.bund.de/Content/DE/Ausschreibungen>

In case of EU-wide tenders they are published in:

<http://ted.europa.eu/TED/>

Investigation and remediation projects for private entities are most often tendered through special invitation, which means that professional relations are important to be on the invitation list.

One of the largest public tender project was the rehabilitation of the former dumpsite "Georgswerder", which is located on an island in the River Elbe. It has also been the largest remediation project of the City of Hamburg. The size of the rehabilitated dumpsite is 45 ha and approx. 7 million m³ of construction material from the II World War and later municipal waste incl. 200,000 tons of hazardous waste have been dumped on the site. In 1983 site investigations confirmed contamination with the SOWESO dioxin 2,3,7,8-TCDD and this kicked-off the remediation project. The cost for remediation was more than 75 million Euro and now the annual aftercare cost are about 600,000 Euro.

Besides of this public remediation project, many former industrial sites have been remediated, for example:

- gas plants ("Am Radeland", Bahrenfeld, Grasbrook)
- rubber plant "Trelleborg";
- laundry "Jarrestadt";
- chemical cleaning facilities;
- dockyard "Stülckenwerft"

Financing of investigation and remediation of contaminated sites

By public means, federally owned properties

The federal government is one of Germany's largest property owners. As with all property, such ownership entails specific rights and duties. The government's property portfolio was managed by the Bundesvermögensverwaltung from 1950 to 2004, and thereafter by the Bundesanstalt für Immobilienaufgaben (BImA).

The BImA agency manages the federal government's property portfolio under its own responsibility, and in particular government buildings. The agency decides which measures are to be undertaken and provides the budgetary resources for them. Pursuant to the Ressortvereinbarung agreement between the Federal Ministry of Transportation, Construction and Urban development (BMVBS) and the Federal Ministry of Finance, building authorities carry out the relevant measures.

Contaminated military sites

Contaminated military sites are contaminated sites and military waste disposal sites that are attributable to post World War II military operations.

Following the demise of the Soviet bloc in the late 1980s, the former East Germany's army was disbanded, and the former "west group" of the Soviet armed forces withdrew. Furthermore, part of the eight western divisions of the troops that had been stationed in the former West Germany (pursuant to the 1954 agreement) withdrew, NATO drastically reduced its forces in Germany, and most military bases used by these various forces were closed. Restructuring of the German military has also resulted in military-base closings.

In 1993, the federal government proposed to the regional states of the former East Germany that it would take over the "west group" military bases that the German army would not be using. This also included assuming responsibility for cleaning up contaminated sites and then selling them off. Some of the regional states accepted this proposal.

Owing to the scope of the problem, identification, investigation and assessment of suspected site contamination, as well as cleanup of this contamination, was a political priority in Germany. The German military and the regional states elaborated protocols and instruments for the cleanup of contaminated military sites. As early as 1995, immediate hazards had been averted, and a list of all German military facilities had been compiled.

Polluter Pays Principle

Germany follows the "Polluter Pays Principle", which means that either the polluter, the owner or occupier has to perform site investigations and if necessary the related site remediation. "The Länder" (states) as the responsible authority in Germany for the enforcement of the BBodSchG will first make one of three bodies mentioned above, responsible for further action.

If the public is either owner, polluter or occupier of a contaminated site, and no private body can be made responsible, it's the responsibility of the public authority to take further action.

Remediation of contaminated sites by the public concentrates on abandoned waste disposal sites and in some cases also on contaminated and abandoned industrial sites, if they are in the ownership of the public.

By private means

"The Länder" as responsible authority for contaminated sites will first make private bodies (either as polluter, owner or occupier) responsible for site investigations and remediation activities. Therefore, the remediation of contaminated sites by private parties concentrates mainly on industrial sites in use or

abandoned industrial sites as well as sites in the ownership of private bodies. However, the major part of the private investment in remediation is related to development of brownfields, where the added value through site development can pay for the necessary remediation.

Financing, National / EU

Research programs and models for contaminated-site remediation, as well as implementation authority are organized and funded in accordance with the relevant spheres of responsibility and are assigned to the various regional states. The federal government provided extensive site remediation funding (more than 3 billion Euros) under the Verwaltungsabkommen zur Regelung der Finanzierung ökologischer Altlasten (VA-Altlastenfinanzierung) administrative agreement that was concluded with the former East German regional states.

Aside from the Ministry for the Environment's Umweltforschungsplan (Environmental research program), the federal government currently lacks a general funding program for technique and procedure optimization or for the financing of specific projects.

The lion's share of contaminated site remediation and land recycling project funding has stemmed from the EU's Framework Program for Research (FP), beginning with FP4. Like Germany's research funding in this domain, such projects are only eligible for funding secondarily or in direct connection with current areas of research.

FP6 allowed a first step to be taken toward collaboration and coordination via networking of the various member states' research programs. The European Commission's ERA-NET scheme aims to promote coordination and reciprocal openness on the part of national and regional research programs. The ultimate goal is to achieve long term collaboration on the part of the various national programs beyond the confines of European research.

The European Fund for Regional Development (EFRE) and the LIFE+ program are also highly effective funding instruments that focus on municipal implementation and use.

City (state) of Hamburg

Both, public and private landowners will use the available funds on national level or by the EU.

The City of Hamburg does not offer additional funds to private owners/investors to remediate sites, however, the support them in the entire process of investigations and remediation.

Over the last 30 years the City of Hamburg has allocated 300 million Euro for site remediation activities. However, the annual demand is estimated to 16 million Euro.

Methodology and requirements for investigation, risk assessment and remediation

Environmental site assessments afford a means to initially assess environmental risks associated with contaminated sites, and may either lead to recommendations for more detailed technical assessment, or establish very low or minimal risk potential and preclude requirement for further investigation.

Detailed investigations provide data for the subsequent hazard assessment. Common practice in Germany is to the Source-Pathway-Receptor method.

Section 2(7) of the Bundes-Bodenschutzgesetz (BBodSchG) law defines the term “remediation measures” as follows:

- 1 Measures aimed at pollutant elimination or mitigation (decontamination measures)
- 2 Measures that aim to prevent or mitigate pollutant propagation over the long term, without actually cleaning up the pollution (safety measures)
- 3 Measure that aim to eliminate or mitigate deleterious changes in the physical, chemical or biological properties of the soil.

According to section 5(4) of the BbodSchG law, sites are to be cleaned up in cases where deleterious soil changes or site contamination have occurred after 1 March 1999, so far as such measures are reasonable in light of the relevant site’s pre-existing contamination.

The law requires the authorizing body to determine, which measures are necessary and in keeping with the principle of proportionality, in order to comply with statutory hazard prevention requirements. This proportionality assessment is part of the remediation study. If the relevant remediation measures are disproportionate for a given site, protective and mitigating measures can be used instead. Natural pollutant mitigation mechanisms should also be factored into official decisions concerning cleanup measures or protective and limiting measures.

The cost and effort entailed by the various possible measures, including follow-up measures, as well as for any necessary monitoring of a given cleaned up site, can vary considerably. Thanks to the availability of a network of expert engineering providers and the related clean-up infrastructure, several solutions and technical methods are available. However, this does not exclude the possibility that (a) no reasonably priced cleanup solution is available; (b) the

cleanup cost may be unreasonable; or (c) there might be opposition to the use of innovative techniques or management concepts.

Often, a constellation of measures is carried out using mobile and semi-mobile cleanup equipment modules. Complex management concepts that encompass monitoring solutions have also proven successful.

The hazard-prevention measure selection process should take the environmental impact of the envisaged measures into account, as well as the socio-economic dimensions of site cleanup and land recycling. It is often the case that a combination of decontamination and construction measures for land reuse purposes is more sustainable than conventional excavation. Moreover, soil and groundwater cleanup efficiency can be optimized through the development of more complex, innovative cleanup strategies.

End users and buyers of contaminated sites management solutions

Public

Today the City of Hamburg has an annual budget of approx. 16 million Euro for site remediation activities.

Private

Main end-users/buyers are project developers and investors as Hamburg is a growing city and the City's strategy is on brownfield rehabilitation and use of abandoned sites in the center of Hamburg.

The link below provides a list of city development projects and the name of the developer:

<https://www.hdb-hamburg.de/projektentwicklung.html>

Dominating market players

The market for consultants and contractors to provide site investigation services is dominated by German players, often from small and medium size companies based in the region of the contaminated site. In particular public authorities tend to contract smaller companies known to them and based in the region. Larger remediation projects more often are being tendered to larger consultants/contractors with offices in Germany.

According to a study of Bulwiengesa in 2017, the largest project developer in Germany are Zech Group, CG Gruppe and Bonova³.

³ More information about the study: <http://www.bulwiengesa.de/de/publikationen/studien/projektentwicklerstudie-2017>

Legal requirements to foreign contractors and contract holders

The environmental regulatory framework in Germany is the same for all entities, regardless of the origin of a contractor. However, proposed remedial techniques implying use of remediation equipment, the remediation equipment must be approved for use in Germany i.e. have Safety Certificates for use in Germany e.g. Conformity Certificate and CE Certificate.

Insurance and liability limitation

Insurance requirements

Minimum requirement will be a "Comprehensive general liability or Third Party Liability" and a "Workers compensation Liability" insurance of the Contractor.

Contractors are statutorily required to maintain third party liability insurance covering most claims arising from defects, but the amount covered by insurance is often subject to agreement. Contractors are often not in the commercial position to contractually limit their liability.

In connection with public tenders, a bidder has to provide a performance guarantee for the project, usually 5-10 % of the value of the fee,

The German courts have not recognized standard clauses in agreements that exclude or limit the liability of a party for bodily harm caused to another party, or for the breach of fundamental contractual obligations (Kardinalpflichten).

Generally, liability can be excluded for negligence and gross negligence, but not for intentional behaviour.

Limitation of liability

Liability can be limited to direct damages, and liability for indirect or consequential losses, and loss of profit, can be excluded. However, German courts are generally very restrictive in relation to these contractual limitations. In addition, statutory restrictions regarding the validity of limitations to liability apply even to commercial contracts, particularly if limitations are stated in standard terms and conditions. The scope of application of these statutory restrictions is very wide. Therefore, any contractual limitation of liability should be carefully considered and should be individually negotiated and expressly agreed for each project.

Language/local administrative procedure barriers

All documentation related to site investigations and site remediation issues has to be prepared in German language in order to be recognised by "The Länder" authorities. The administrative procedures are also executed in German language.

Assessment of market development

There are several factors, which will guarantee that the remediation market in the city of Hamburg will constantly grow over the coming years.

The register of contaminated sites or sites which have the potential of contamination lists several hundred sites within the City of Hamburg and the majority of these sites are not cleaned-up or data is not sufficient yet to confirm whether remediation is required or not.

Furthermore, there is high demand to work towards the strategy of the City, and to develop abandoned sites in the centre of the City or to clean up contaminated sites to use them for development of residential areas, offices or light industry.

Bilag 2

Typical unit costs for investigation and remediation

	Denmark	Sweden	Germany	Poland
Consultancy				
Senior specialist, > 10 yrs. experience, EUR/Hour	120-130	120-130	100 - 150	60-70
Specialist, 5-10 yrs. experience, EUR/Hour	95-105	95-105	80 - 120	50-60
Junior specialist, < 5 yrs. experience, EUR/Hour	90-95	90-95	70 - 100	35-50
Chemical analysis				
Soil: Petrol, mineral oil, BTEX, PAH, metals, EUR/sample	30	319	25 - 35	76
Water: hydrocarbons, chlorinated carbons, EUR/sample	40	393	30 - 40	80
Drilling				
Drilling without casing, 0-6 metres, EUR/m	28	52	15 - 25	12
Drilling with casing, 0-6 metres, EUR/m	60	85	30 - 50	25
Drilling with casing, 6-15 metres, EUR/m	90	110	50 - 80	35
Remediation				
Excavation of contaminated soil, EUR/m ³	2	5	2 - 4	1-2.5
Transport of contaminated soil, EUR/m ³ /km	0.15	0,3-0,8	0.1	0.1-0.2
Disposal/treatment of soil contaminated with hydrocarbons, EUR/m ³	20- 70	50-150	30 - 60	30-60

Bilag 3

Relevante konklusioner og anbefalinger fra 2012-rapport: Brancheanalyse for jordforureningssektoren

Hovedkonklusioner vedrørende internationalt vækstpotentiale

Hovedkonklusion 3:

Vækstpotentialerne i Danmark er små. Markedet for håndtering af jordforureninger er langt i sin udvikling af den offentlige regulering og teknologiske metode. Det har skabt et modent marked med mange aktører, hvor omfanget af nye markedsmuligheder i Danmark er begrænset. Dette forhold og den omfattende regulering bevirker, at der er få internationale aktører på det danske marked. Og det gør, at vækstpotentialerne særligt skal findes i udlandet, hvor størrelsen og derved robustheden kan være afgørende.

Hovedkonklusion 4:

Få virksomheder ser deres opgaveløsning i en større sammenhæng. Det viser spørgeskemaundersøgelsen. De fleste virksomheder, der håndterer jordforureninger, sælger oftest deres ydelser alene. Det indikerer både et lavt samarbejde i branchen om systemløsninger samt en tendens til, at virksomheder fokuserer snævert på egen opgaveløsning. Dette kan være en betydelig hindring for at skabe vækst i udlandet.

Hovedkonklusion 5:

Få virksomheder eksporterer deres ydelser. Det viser spørgeskemaundersøgelsen. Eksporten består p.t. primært af systemløsninger til Skandinavien og Tyskland. Eksporten til f.eks. Asien, Indien, Kina og Østeuropa foregår oftest i samarbejder og konsortier. Et andet eksempel er en virksomhed, der er et datterselskab af en større global aktør og derved kan udnytte dennes netværk og erfaring. Dels med danske eller internationale partnere, der kan skabe volumen og sikkerhed omkring opgaveløsningen, dels med lokale partnere, der kan skabe adgang til netværk, myndigheder og opgaver.

Hovedkonklusion 6:

Få virksomheder er gearet til eksport. Eksport kræver volumen, sikkerhed og indsigt i udenlandske markeder. Det gør, at det langt overvejende er de få store

virksomheder med langsigtede investeringsressourcer og et internationalt netværk, der reelt kan igangsætte og drive eksportaktiviteter. For den overvejende del af de øvrige markedsaktører betyder det, at de skal indgå strategiske samarbejder for at kunne etablere sig på udenlandske markeder. Det viser brancheanalysen, at de kun gør i begrænset grad.

Hovedkonklusion 7:

Store aktører er især egnede til at eksportere. Aktører, som er store, eller udgør dele af større aktører har en robusthed eller besidder en viden, som gør det mere attraktivt og muligt at fokusere mere på nye markeder uden for Danmark. Det danske marked er præget af få store aktører og en underskov af mindre rådgivere, leverandører og entreprenører. Det er primært de store aktører, der opfylder ovenstående forudsætninger for eksport, og som kan (og vil) gennemføre tiltag, der kan realisere vækstmuligheder i udlandet. Det gør, at der er få aktører på det danske marked, der reelt har styrken og mulighederne for at ekspandere til udlandet som ”stand alone”-virksomheder.

Hovedkonklusion 8:

Der er eksport- og vækstmuligheder på både modne og mindre modne markeder. På mindre modne markeder kan højteknologiske og især lavteknologiske metoder være velegnede. På de modne markeder vil højteknologiske metoder være mere velegnede. Uanset marked vil eksport- og vækstmuligheder sandsynligvis særligt vedrøre rådgivningsydelser eller ydelser, som udgør dele af større projekter, som en organisation udfører. Lavere lønninger i udlandet bevirker, at det er mest rentabelt, at lokale udenlandske virksomheder varetager den fysiske håndtering af jordforureninger. Danske virksomheder har et højt vidensniveau og en betydelig erfaring med planlægningen og udførelsen af høj- og lavteknologiske ydelser. De ydelser kan de virksomheder, som er gearret til eksport, tilpasse og sælge i udlandet (typisk via donorfinansierede projekter i udlandet). Ydelserne kan eksempelvis vedrøre kortlægninger, risikovurderinger, omkostningskalkulationer, udbudsrådgivning, teknologiudvikling, undersøgelser, afværgemetoder, styring af jordstrømme, monitorering, kapacitetsopbygning, implementering af regulativer samt rådgivning om at skabe sammenhænge mellem håndtering af jordforureninger og især infrastruktur-, bygge- og byudviklingsprojekter.

Anbefalinger

COWI og RGS90 har på baggrund af resultaterne fra brøcheanalysen derfor følgende anbefalinger til mulige næste skridt, der kan fremme vækstmuligheder i jordforureningssektoren.

Identificer vækstmulighederne i dialog med branchen i forhold til:

- a. Relevante kompetencer: Hvilken viden og hvilke løsninger mener branchen egner sig til eksport – og hvor ligger mulighederne for synergi og systemløsninger?
 - b. Relevante markeder: Hvilke lande har (i kraft af (ny) lovning, bevågenhed eller store jordhåndteringsprojekter) behov, der matcher de kompetencer og systemløsninger, som danske virksomheder (sammen) kan tilbyde?
 - c. Relevante samarbejdspartnere: Hvilke brancher og virksomheder gennemfører projekter i udlandet, hvor jordforureningssektoren kan tilføre (ny) værdi?
- 4 Gennemfør korte, præcise og operationelle markedsanalyser og business cases for udvalgte vækstmarkeder (med afsæt i de identificerede vækstmuligheder) og grupper værdikæden i forhold til eksportmuligheder.
 - 5 Arranger studieture til de markeder, der har de største eksportpotentialer.
 - 6 Indsaml viden til monitorering af branchens indsats og resultater – skab indikatorer, der gør succeskriterierne og indsatsen målbare.
 - 7 Tilbyd viden om f.eks. partnerskabsmodeller, finansiering og juridiske aspekter.
 - 8 Skab en platform eller et netværk, der gør det muligt at dele viden, kompetencer og ideer og dermed styrke grundlaget for samarbejde i branchen og styrkelse af eksportmuligheder.