

2019 Wales Construction & Demolition Waste Arisings Survey

Report No:625

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Crynodeb Gweithredol

Mae'r astudiaeth hon yn darparu gwybodaeth am y mathau, symiau, tarddiadau (yn ôl sector adeiladu a dymchwel a rhanbarth daearyddol) a thynged (dull rheoli) gwastraff adeiladu a dymchwel a gynhyrchir gan fusnesau a'r sector cyhoeddus yng Nghymru yn 2019. Mae hwn yn arolwg annibynnol ac mae'n disodli'r data o'r arolwg diwethaf ar gyfer blwyddyn galendr 2012 (Cyfoeth Naturiol Cymru, 2014).

Mae angen y wybodaeth hon am amrywiaeth o resymau, gan gynnwys:

- adroddiadau statudol ar gynhyrchu gwastraff i gydymffurfio â Rhan 2 o Atodlen 1 i Reoliadau Gwastraff (Cymru a Lloegr) 2011 a, hyd at 2020, Rheoliadau Ystadegau Gwastraff yr UE 2002 (Eurostat, 2002);
- llywio datblygiad polisi gwastraff cenedlaethol;
- monitro cynnydd yn erbyn targedau atal ac ailgylchu gwastraff cenedlaethol;
- hysbysu cynllunwyr gwastraff a'r rheolydd;
- cefnogi penderfyniadau buddsoddi megis dewis math a graddfa'r cyfleusterau rheoli gwastraff newydd sy'n ofynnol gan awdurdodau lleol a'r diwydiant gwastraff;
- diweddarau'r sylfaen dystiolaeth ar gyfer asesiad Adroddiad ar Sefyllfa Adnoddau Naturiol Cymru (Cyfoeth Naturiol Cymru, 2021); a
- rhoi gwell dealltwriaeth i fusnesau o'u harferion gwastraff cyfredol ac ar gyfer datblygu strategaethau cymorth i reoli gwastraff yn gynaliadwy gan Lywodraeth Cymru i wella perfformiad amgylcheddol busnesau.

Yr arolwg

Rheolwyd yr astudiaeth i amcangyfrif y gwastraff adeiladu a dymchwel a gynhyrchwyd yng Nghymru ar gyfer blwyddyn galendr 2019 gan Cyfoeth Naturiol Cymru ar ran Llywodraeth Cymru, a ddarparodd gyllid y prosiect. Cyflawnwyd y prosiect gan SLR Consulting Ltd mewn partneriaeth ag Anthesis (UK) Ltd, gyda chefnogaeth gan Ainsworth & Parkinson ar gyfer archebion yr arolwg a Groundwork Cymru ar gyfer y gwaith o gynnal yr arolwg.

Casglwyd data ar gyfer 2019 rhwng mis Ebrill 2021 a mis Medi 2021 o sampl gynrychioliadol o 508 o safleoedd busnes o sectorau a meintiau gwahanol ledled Cymru.

Cafodd y data ei grosio gan ddefnyddio data poblogaeth safleoedd busnes y Swyddfa Ystadegau Gwladol (ONS) i lefelau rhanbarthol a chenedlaethol yng Nghymru. Dangosodd data'r ONS fod 13,990 o safleoedd busnes adeiladu a dymchwel yng Nghymru yn 2019 gyda 49% ym maes adeiladu (gan gynnwys peirianeg sifil), 1% ym maes dymchwel, a 50% ym maes adeiladu cyffredinol. O'r safleoedd busnes hyn, roedd gan 92% ohonynt lai na deg o weithwyr ac roedd gan lai nag 1% ohonynt 100 neu fwy o weithwyr.

Roedd y fethodoleg a ddefnyddiwyd yn yr arolwg hwn yn gymharol ar y cyfan â'r arolygon adeiladu a dymchwel blaenorol a gwblhawyd yng Nghymru, y ddarparodd yr un mwyaf diweddar ohonynt ddata ar gyfer blwyddyn galendr 2012. Y gwahaniaethau allweddol oedd fel a ganlyn:

- Oherwydd pandemig COVID-19 parhaus, cynhaliwyd arolygon o bell dros y ffôn neu drwy alwadau fideo-gynadledda.
- Oherwydd yr ansicrwydd cynhenid sydd ynghlwm wrth wahaniaethu'r codau sy'n perthyn yn agos yn y Catalog Gwastraff Ewropeaidd, sef 17 09 04 (gwastraff adeiladu a dymchwel cymysg ac eithrio'r rhai a soniwyd yn 17 09 01, 17 09 02 ac 17 09 03) ac 17 01 07 (cymysgedd o goncrit, brics, teils a gwaith seramig ac eithrio'r rhai a soniwyd yn 17 01 06), mae arolwg 2019 yn adrodd am wastraff â chod 17 01 07 o dan y grŵp gwastraff cymysg yn hytrach na'r grŵp agregau.

Prif ganlyniadau

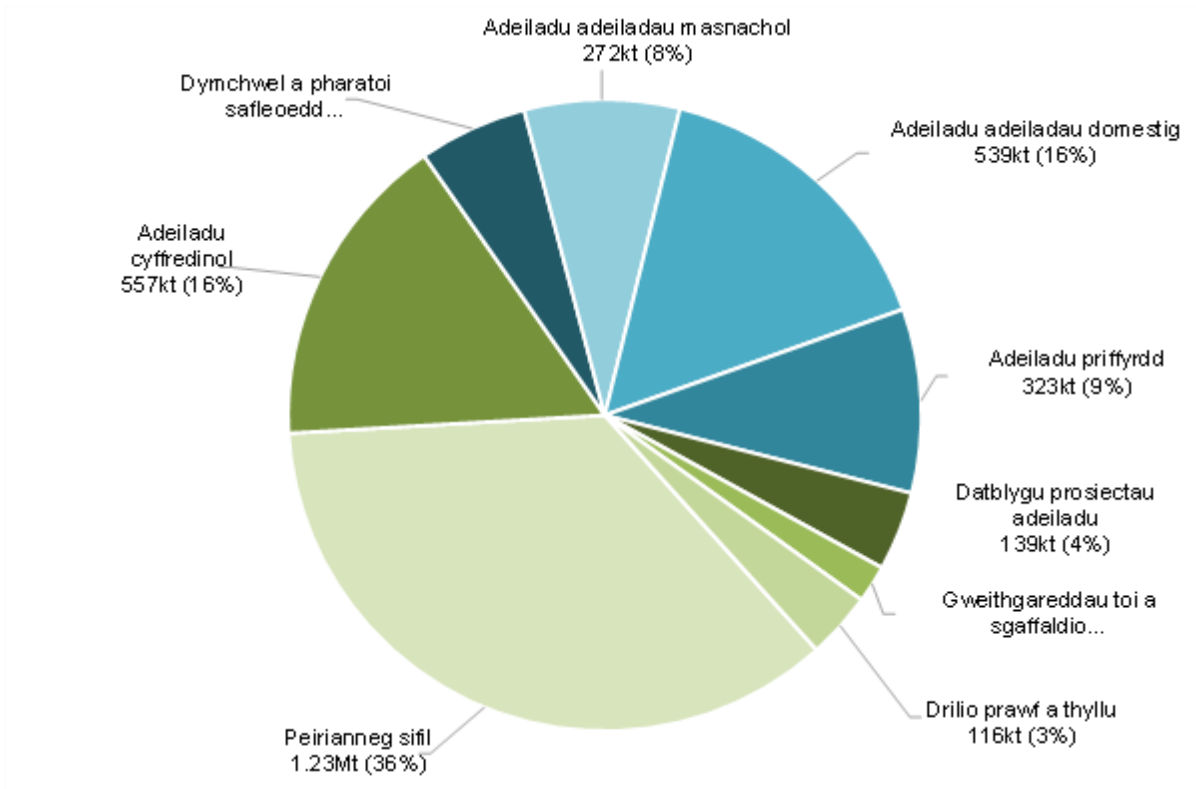
- Yn 2019, amcangyfrifwyd y cynhyrchodd sectorau adeiladu a dymchwel Cymru 3.43 miliwn o dunelli o wastraff. Y trachywiredd ar gyfer cyfanswm y gwastraff a gynhyrchwyd yng Nghymru oedd +/- 16.7% gyda hyder o 90%. Mae hyn yn golygu, pe bai'r arolwg yn cael ei ailadrodd, byddai disgwyl i'r amcangyfrif ostwng rhwng 2.86 miliwn o dunelli a 4.0 miliwn o dunelli bob 90 gwaith allan o 100.

Tabl 1. Crynodeb o gyfanswm y gwastraff adeiladu a dymchwel a gynhyrchwyd, gyda'r trachywiredd, Cymru 2019

Blwyddyn yr arolwg	Gwastraff sy'n cael ei gynhyrchu ym maes adeiladu a dymchwel	Amrediad (%)	Isaf (kt)	Uchaf (kt)
2019	3,427	+/- 16.7%	2,855	3,999
2012	3,359	+/- 33.2%	2,244	4,475

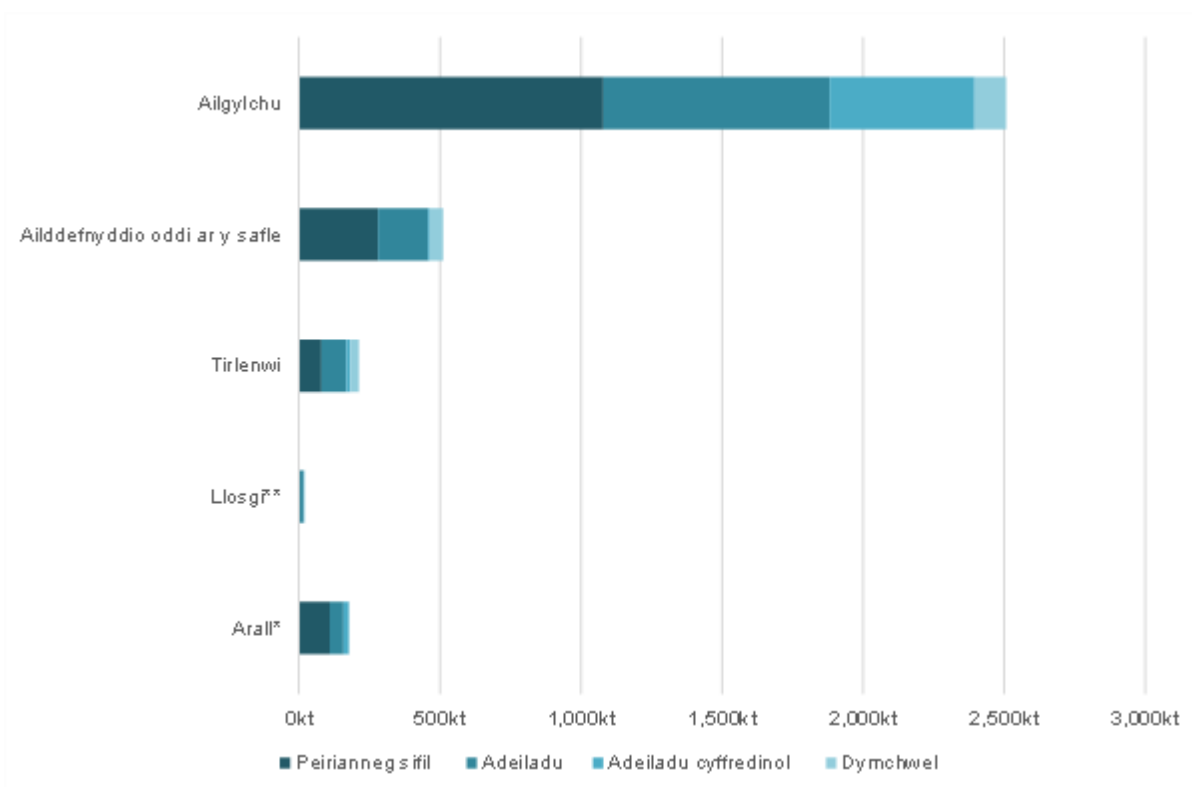
- Cyflawnodd canlyniadau arolwg 2019 welliant sylweddol ar drachywiredd yr arolwg o'u cymharu â 2012 (Cyfoeth Naturiol Cymru, 2014). Fel mae Tabl1 yn dangos, mae hyn yn haneru'r amrediad y mae'r tunelledd gwirioneddol a gynhyrchwyd yn gorwedd o'i fewn o +/- 1.12 miliwn o dunelli i +/- 0.57 miliwn o dunelli, gan ddarparu'r amcangyfrif mwyaf cywir o sgil-gynhyrchion gwastraff adeiladu a dymchwel cenedlaethol hyd yma.
- Mae'r trachywiredd uwch hwn yn darparu dangosydd cadarn ar gyfer mesur yn erbyn targedau atal gwastraff Llywodraeth Cymru (Llywodraeth Cymru, 2010).
- Roedd mwyafrif y gwastraff adeiladu a dymchwel yn cynnwys gwastraff cymysg (gan gynnwys agregau cymysg – codau 17 09 04 ac 17 01 07 yn y Catalog Gwastraff Ewropeaidd) a phridd, gan gyfrif am 45% a 38% yn y drefn honno. Roedd y gweddi yn bennaf yn agregau ar wahân (7%) a gwastraff anfetelaidd (3%), ynghyd â nifer o ffrydiau deunydd llai.
- Cynhyrchwyd y rhan fwyaf o wastraff adeiladu a dymchwel gan y sectorau adeiladu adeiladwaith peirianeg sifil (36%), adeiladu cyffredinol (16%) ac adeiladu adeiladau domestig (16%), gyda'r chwe sector arall sy'n weddill yn cyfrif am lai na 10% yr un o gyfanswm y sgil-gynhyrchion adeiladu a dymchwel – gweler Ffigur 1.

Ffigur 1: Cyfanswm y gwastraff fesul sector, Cymru 2019



- Anfonwyd y rhan fwyaf o wastraff adeiladu a dymchwel i'w hailgylchu, ei hailddefnyddio oddi ar y safle, a'i thirlenwi, fel y dangosir yn Ffigur 2.
- Mae Ffigur 2 yn grwpio'r naw sector adeiladu a dymchwel yn bedwar categori lefel uchel (disgrifir grwpiau yn yr atodiad technegol) ac mae hyn yn dangos mai peirianneg sifil ac adeiladu oedd y prif ffynonellau gwastraff adeiladu a dymchwel yn gyson ar draws y gwahanol ddulliau rheoli.
- Roedd dymchwel yn cyfrif am gyfran gymharol fach o wastraff adeiladu a dymchwel, a deallwyd bod swm sylweddol o'r deunyddiau a drafodwyd yn y sector hwn wedi osgoi mynd i mewn i'r ffrwd wastraff.

Ffigur 2: Cyfanswm y gwastraff adeiladu a dymchwel yn ôl dull rheoli, Cymru 2019



*Mae arall yn cynnwys gwastraff a reolir trwy ei drin, ei ôl-lenwi, ei gompostio, ei adfer fel arall, ei anfon at orsaf drosglwyddo, a phan oedd y dull rheoli 'ddim yn gwybod'.

**Mae llosgi yn cynnwys gydag adfer ynni a heb adfer ynni.

- Roedd y gyfradd ailgylchu (sy'n cynnwys paratoi ar gyfer ailddefnyddio, ailgylchu, compostio ac ôl-lenwi) gwastraff adeiladu a dymchwel nad yw'n beryglus a gynhyrchwyd yng Nghymru, ac eithrio sylweddau sy'n digwydd yn naturiol (Catalog Gwastraff Ewropeaidd 17 05 04), yn 93% yn 2019. Wrth ymestyn y metrig i gynnwys holl ddeunyddiau gwastraff adeiladu a dymchwel, y perfformiad oedd 90% (gweler Tabl 2).

Tabl 2. Crynodeb o'r gyfradd ailgylchu, Cymru 2019

Deunyddiau wedi'u cynnwys yn y metrig	Defnydd o'r metrig	Cyfradd ailgylchu
Gwastraff adeiladu a dymchwel ac eithrio gwastraff peryglus a phridd a cherrig	Mesur yn erbyn targedau Llywodraeth Cymru	93%
Holl wastraff adeiladu a dymchwel	Mesur perfformiad cyffredinol y sector	90%

Mae'r gyfradd ailgylchu yn cynnwys paratoi ar gyfer ailddefnyddio, ailgylchu, compostio ac ôl-lenwi. Mae gwastraff adeiladu a dymchwel ac eithrio gwastraff peryglus a phridd a cherrig yn eithrio pridd a cherrig â chod 17 05 04 yn y Catalog Gwastraff Ewropeaidd.

- Mae Tabl 3 yn dangos y gwastraff adeiladu a dymchwel a gynhyrchwyd yn ôl rhanbarthau Cymru, yn seiliedig ar leoliad safle busnes. Amcangyfrifwyd y cafodd 1.6

miliwn o dunelli o wastraff adeiladu a dymchwel eu cynhyrchu yn Ne-ddwyrain Cymru, gyda 1.0 miliwn o dunelli yn cael eu cynhyrchu yng Nghanolbarth Cymru a De-Orllewin Cymru, a 0.8 miliwn o dunelli yn cael eu cynhyrchu yng Ngogledd Cymru.

Tabl 3. Crynodeb o'r gwastraff a gynhyrchwyd yn ôl rhanbarth, Cymru 2019

Rhanbarth	Gwastraff a gynhyrchwyd (kt)	Canran
De-ddwyrain Cymru	1,618	47.0%
Canolbarth a De-orllewin Cymru	1,040	30.5%
Gogledd Cymru	769	22.5%
Cyfanswm	3,427	100%

Mae'r arolwg hwn o 2019 yn defnyddio rhanbarthau economaidd Cymru, sef Gogledd Cymru, Canolbarth a De-orllewin Cymru, a De-ddwyrain Cymru, sy'n ddiffiniad rhanbarthol gwahanol i'r un a ddefnyddiwyd yn 2012.

Mae'r canrannau rhanbarthol wedi'u talgrynnu i'r 0.5% agosaf.

Cymhariaeth â chynhyrchu gwastraff adeiladu a dymchwel yn 2012

O gymharu â chanlyniadau arolwg cynhyrchu gwastraff 2012:

- Mae'r 3.43 miliwn o dunelli o wastraff adeiladu a dymchwel a gynhyrchwyd yn 2019 yn debyg i amcangyfrif 2012 o 3.36 miliwn o dunelli. Fodd bynnag, nid yw'r cynnydd bach o tua 68 mil o dunelli (kt) yn arwyddocaol yn ystadegol.
- Mae trachywiredd yr arolwg wedi gwella o +/- 1.12 miliwn o dunelli yn 2012 i +/- 0.57 miliwn o dunelli yn 2019. Mae hyn yn rhoi hyder o 90% bod y gwastraff adeiladu a dymchwel a gynhyrchwyd rhwng 2.8 a 4.0 miliwn o dunelli yn 2019, y lled gwall lleiaf mewn arolwg gwastraff adeiladu a dymchwel yng Nghymru hyd yn hyn.
- Mae cyfradd ailgylchu gwastraff adeiladu a dymchwel, ac eithrio gwastraff peryglus a phridd a cherrig, wedi cynyddu o 87% yn 2012 i 93% yn 2019.
- Mae cyfradd y gwastraff adeiladu a dymchwel a waredwyd mewn safleoedd tirlenwi wedi gostwng o 19% yn 2012 i 6% yn 2019.

Wrth gymharu ag arolygon blaenorol, mae'n bwysig bod yn ymwybodol o'r amrywioldeb cynhenid sy'n bodoli o fewn y sector adeiladu a dymchwel, sy'n cynnwys y canlynol:

- Gall amrywiadau mewn gweithgarwch sector gael effaith uniongyrchol ar gynhyrchu gwastraff adeiladu a dymchwel bob blwyddyn.
- Gall maint a lleoliad prosiectau ddylanwadu'n sylweddol ar sgil-gynhyrchion.

- Y duedd i fusnesau fod yn rhan o fwy nag un dosbarthiad yn y Dosbarthiad Diwydiannol Safonol, gyda llawer yn ymgymryd â gweithgareddau sylweddol ar draws yr is-sectorau (e.e. adeiladu adeiladau domestig a masnachol).
- Gall y categorïau bras a ddefnyddir yn y Catalog Gwastraff Ewropeaidd, megis y rhai ar gyfer gwastraff cymysg, hefyd arwain at ddsbarthu gwastraff mewn ffordd anghyson yn y diwydiant.

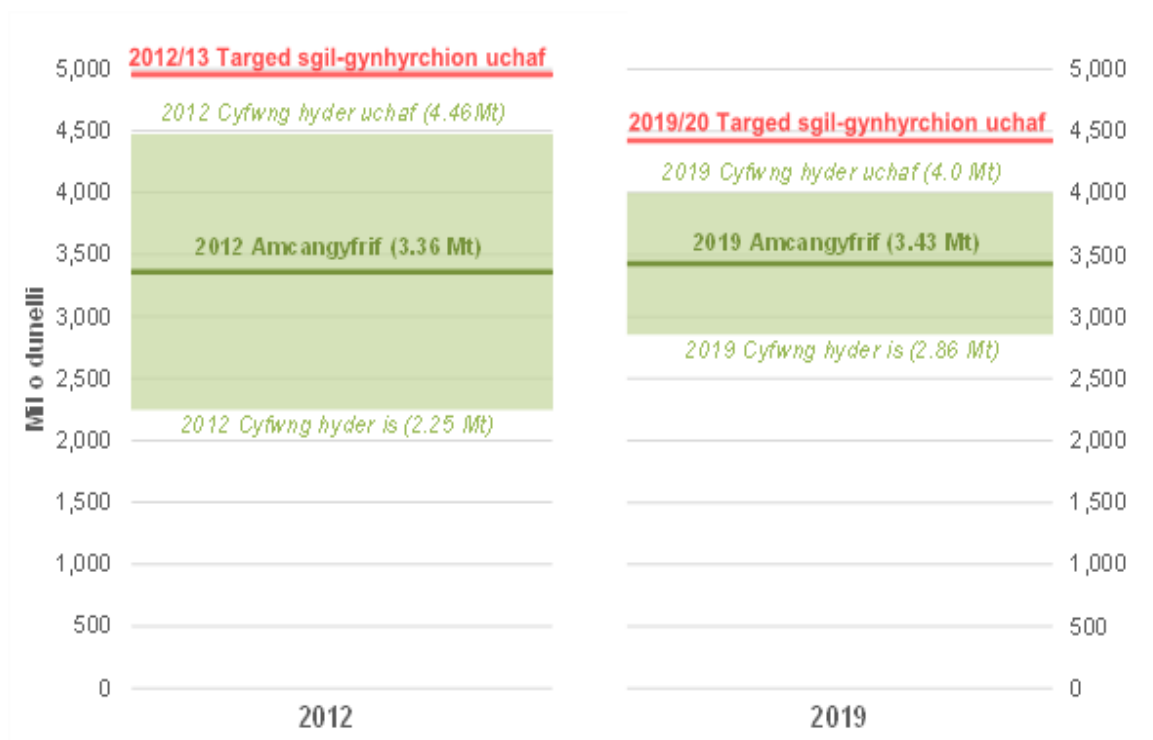
Cynnydd yn erbyn targedau

Atal gwastraff

Y targed atal gwastraff ar gyfer gwastraff adeiladu a dymchwel yw gostyngiad yng nghyfanswm y gwastraff adeiladu a dymchwel o 1.4% bob blwyddyn tan 2050 (gan ddefnyddio 2006/07 fel llinell sylfaen). Mae hyn yn cyfateb i ostyngiad blynyddol o 75,701 tonnelli i darged sgil-gynhyrchion uchaf o 4.42 miliwn o dunelli ar gyfer 2019/20.

Mae Ffigur 3 yn dangos targedau uchaf sgil-gynhyrchion gwastraff adeiladu a dymchwel ar gyfer 2019/20 ac yn dangos bod y sector adeiladu a dymchwel wedi cyrraedd y targed wrth ei fesur yn erbyn y tunelli amcangyfrifedig a gynhyrchwyd yn 2019 (3.43 miliwn o dunelli) a lled gwall yr arolwg (+/- 0.57 miliwn o dunelli).

Ffigur 3: Cynhyrchu gwastraff adeiladu a dymchwel o'i gymharu â'r targed, Cymru 2019



Ailgylchu

Gosododd Tuag at Ddyfodol Diwastraff darged ailgylchu o 90% erbyn 2019/20 ar gyfer y sector adeiladu a dymchwel. Nid yw'r targed yn cynnwys gwastraff peryglus a phridd a cherrig sy'n digwydd yn naturiol (Llywodraeth Cymru, 2010).

Mae canlyniadau'r arolwg yn dangos bod Cymru wedi cyrraedd y targed yn 2019 yn seiliedig ar y gyfradd ailgylchu amcangyfrifedig o 93%.

Wrth gynnwys gwastraff peryglus a phriddoedd naturiol yn y cyfrifiad, cyflawnodd Cymru gyfradd ailgylchu amcangyfrifedig o 90%. Gwastraff cymysg oedd y grŵp mwyaf o ddeunyddiau a gyfrannodd, a chynhyrchwyd y rhan fwyaf ohono gan y sector adeiladu cyffredinol.

Yn yr un modd ag mewn arolygon blaenorol, mae'r amcangyfrifon hyn wedi'u cyfyngu i drachywiredd yr wybodaeth am dynghedau terfynol a gafwyd gan y cynhyrchwyr gwastraff. Mae'n annhebygol y bydd unrhyw ddeunydd a gasglwyd i'w ailgylchu ond a waredwyd wedyn gan y diwydiant gwastraff (h.y. oherwydd halogiad neu ddiffyg ailgylchadwyedd cynhenid) yn cael ei adrodd yn ôl i'r holl gynhyrchwyr gwastraff, felly mae'r amcangyfrif hwn yn debygol o gynrychioli'r gyfradd ailgylchu 'uchaf'.

Tirlenwi

Mae Tuag at Ddyfodol Diwastraff yn cynnwys targedau i leihau maint y gwastraff adeiladu a dymchwel sy'n mynd i safleoedd tirlenwi yng Nghymru yn seiliedig ar ostyngiad canrannol o linell sylfaen 2007, gyda tharged penodol o ostyngiad o 75% wedi'i osod ar gyfer 2019/20 (Llywodraeth Cymru, 2010). Mae hyn yn trosi'n darged o ddim mwy na 318 kt i safleoedd tirlenwi erbyn 2019, yn seiliedig ar ffigur sylfaenol o 1,272 kt (Asiantaeth yr Amgylchedd Cymru, 2006).

Mae canlyniadau'r arolwg yn dangos bod Cymru wedi cyflawni'r targed yn 2019 yn seiliedig ar y tunelli amcangyfrifedig a gynhyrchwyd yn 2019 o 213 kt.

Yn yr un modd ag ailgylchu, mae amcangyfrifon tirlenwi hefyd wedi'u cyfyngu i drachywiredd yr wybodaeth am dynghedau terfynol a gafwyd gan y cynhyrchwyr gwastraff. Mae'n bosibl na fydd cynhyrchwyr gwastraff yn cael eu hysbysu am unrhyw ddeunydd a gasglwyd i'w ailgylchu ond a waredwyd gan y diwydiant gwastraff wedyn (h.y. oherwydd halogiad neu ddiffyg ailgylchadwyedd cynhenid). Felly, mae'r ffigur hwn yn debygol o gynrychioli'r 'lleiafswm' o'r hyn sy'n cael ei anfon i safleoedd tirlenwi.

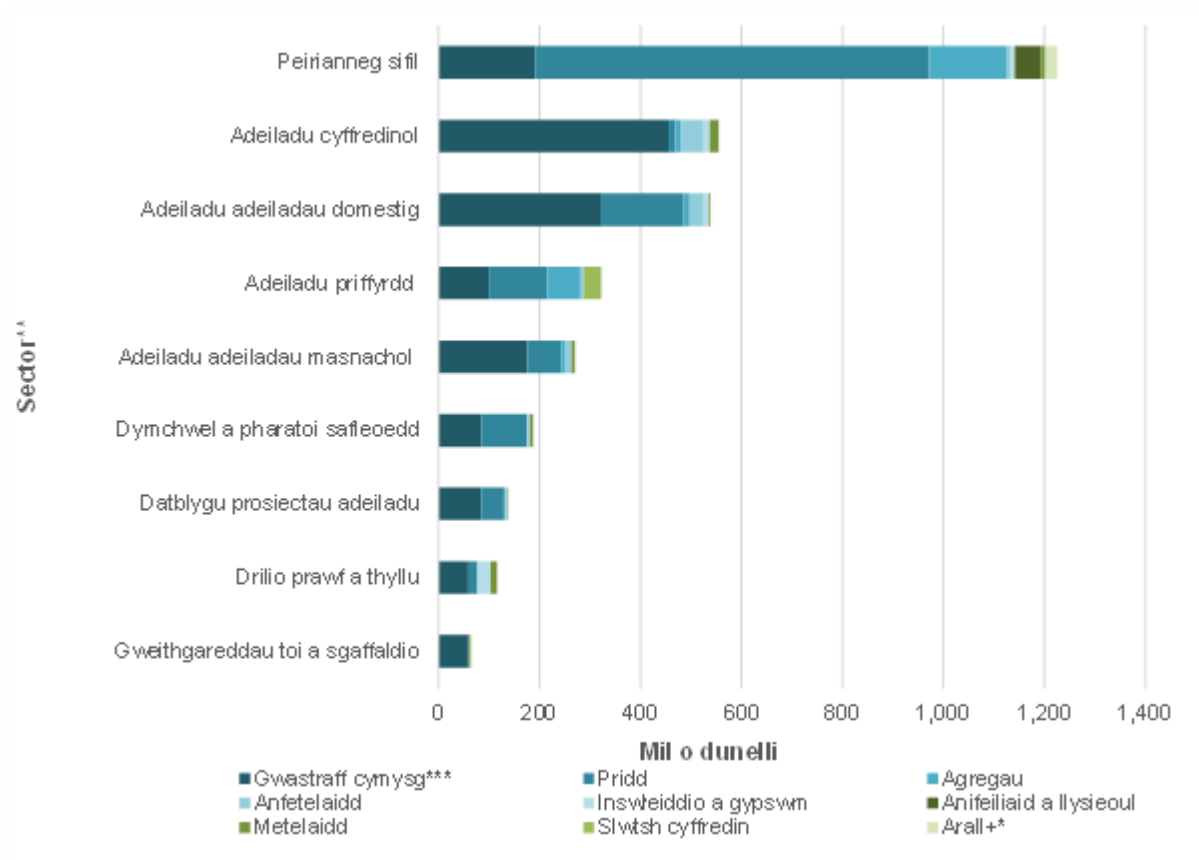
Canlyniadau fesul sector

O'r 3.4 miliwn o dunelli o wastraff adeiladu a dymchwel a gynhyrchwyd yng Nghymru, y cynhyrchiad mwyaf (fel y dangosir yn Ffigur 4) yn dod o'r sectorau canlynol:

- Peirianneg sifil gydag 1.23 Mt (36%),
- Adeiladu cyffredinol gyda 560 kt (16%), ac
- Adeiladu adeiladau domestig gyda 540 kt (16%).

Pridd a gwastraff cymysg oedd y prif ffrydiau deunydd ar draws y sectorau. Pridd oedd mwyaf y gwastraff a gynhyrchwyd gan y sector peirianeg sifil, a amcangyfrifwyd yn 780 kt yn 2019, a oedd ar ei ben ei hun yn cyfrif am dros 20% o gyfanswm sgil-gynhyrchion gwastraff adeiladu a dymchwel Cymru. Adeiladu cyffredinol oedd y ffynhonnell fwyaf o wastraff cymysg, gan gynhyrchu amcangyfrif o 450 kt.

Ffigur 4: Gwastraff fesul sector a ffrwd deunydd, Cymru 2019



*Mae Arall+ yn cynnwys gwastraff cemegol, offer wedi'u taflu a mwynau eraill.

**Er mwyn sicrhau bylchau gwell ar dablau a siartiau, mae disgrifiadau'r Dosbarthiad Diwydiannol Safonol wedi'u talfyrru (gweler Tabl 8).

***Mae agregau cymysg wedi'u cynnwys o fewn 'Gwastraff cymysg'.

Canlyniadau fesul llif gwastraff

Roedd mwyaf y gwastraff adeiladu a dymchwel yn cynnwys gwastraff cymysg (45%), pridd (38%) ac agregau ar wahân (7%), gyda chyfraniadau llai o ffrydiau gwastraff eraill fel y dangosir yn Ffigur 5. Mae hyn yn cyfateb i sgil-gynhyrchion cenedlaethol o 1.5 miliwn o dunelli o wastraff cymysg, 1.3 miliwn o dunelli o bridd, a 260 kt o agregau, gyda'r balans o 350 kt yn cynnwys amrywiaeth o ffrydiau gwastraff llai.

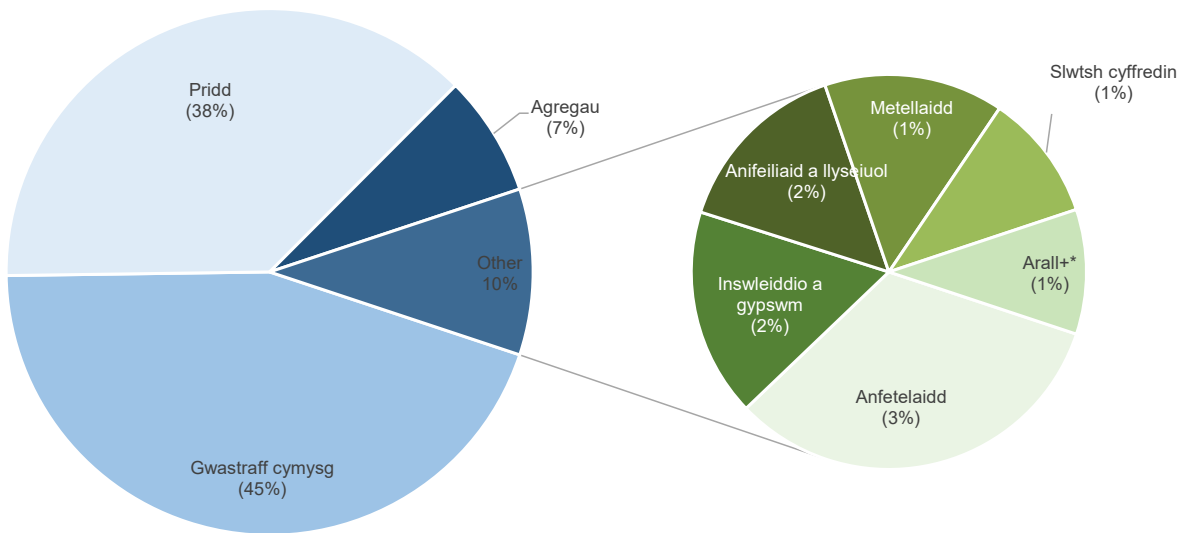
Mae 'pridd' fel y'i cofnodir yn y data hyn yn cynnwys priddoedd a cherrig. Mae 'agregau' fel y'i cofnodir yn y data hyn yn cynnwys nifer o fathau o wastraff anadweithiol, ond nid yw'n cynnwys agregau cymysg, sydd wedi'u cynnwys yn y categori 'Gwastraff cymysg'. Mae 'gwastraff cymysg' hefyd yn cynnwys gwastraff adeiladu a dymchwel cymysg mwy

cyffredinol, fel sy'n cael ei gasglu'n aml drwy sgiplau gwastraff cymysg, a gall gynnwys amrywiaeth o ddeunyddiau, megis pren, metelau, plastigion, gwastraff anadweithiol, ac, mewn rhai achosion, sylweddau a allai fod yn beryglus.

Mae rheoliadau gwastraff yn nodi y dylid gwahanu gwastraff peryglus cymysg yn y ffynhonnell yn y rhan fwyaf o achosion, ond mae gwastraff o'r fath weithiau'n cael ei gasglu ochr yn ochr â deunyddiau nad ydynt yn beryglus (e.e. cynwysyddion paent wedi'i ddefnyddio o fewn sgip).

Darperir dadansoddiad llawn o godau'r Catalog Gwastraff Ewropeaidd a gynhwysir o dan bob categori o ddeunydd yn yr atodiadau technegol.

Ffigur 5: Cyfansoddiad gwastraff adeiladu a dymchwel fesul ffrwd deunydd, Cymru 2019



*Mae Arall+ yn cynnwys gwastraff cemegol, offer wedi'u taflu a gwastraff mwynau arall.

Gwastraff a gynhyrchwyd fesul rhanbarth

Cynhyrchwyd y rhan fwyaf o'r gwastraff adeiladu a dymchwel gan unedau busnes yn Neddwyrain Cymru (47%), ac yna Gogledd Cymru (30%) a Chanolbarth a De-orllewin Cymru (22%). Dangosir y dadansoddiad o'r gwastraff rhanbarthol amcangyfrifedig a gynhyrchwyd yn Tabl 4.

Tabl 4: Gwastraff a gynhyrchwyd fesul rhanbarth, Cymru 2019

Rhanbarth	Gwastraff a gynhyrchwyd (kt)	Canran
De-ddwyrain Cymru	1,618	47.0%
Canolbarth a De-orllewin Cymru	1,040	30.5%
Gogledd Cymru	769	22.5%
Cyfanswm	3,427	100%

Mae'r arolwg hwn o 2019 yn defnyddio rhanbarthau economaidd Cymru, sef Gogledd Cymru, Canolbarth a De-orllewin Cymru, a De-ddwyrain Cymru, sy'n ddiffiniad rhanbarthol gwahanol i'r un a ddefnyddiwyd yn 2012.

Mae'r canrannau rhanbarthol wedi'u talgrynnu i'r 0.5% agosaf.

Mae dosraniad gwastraff i ranbarth yn seiliedig ar leoliad adroddedig y safle busnes adeiladu a dymchwel a arolygwyd, a phoblogaeth y safleoedd busnes yn y rhanbarth, nid ar leoliad y gweithgaredd adeiladu a dymchwel. Mae'r dull hwn yn gyson ag arolwg 2012 ac fe'i defnyddiwyd oherwydd y cyfyngiadau ymarferol sy'n gysylltiedig â dyrannu sgil-gynhyrchion gwastraff pob busnes a arolygwyd i ardaloedd daearyddol, gyda llawer o fusnesau'n adrodd am gyfanswm meintiau o'u holl brosiectau heb gyfeirio at leoliad.

Roedd dosbarthiad daearyddol y safleoedd busnes a arolygwyd yng Nghymru tua 44% yn Ne-ddwyrain Cymru, 30% yng Nghanolbarth a De-orllewin Cymru, a 25% yng Ngogledd Cymru, sy'n debyg iawn i ddsbarthiad poblogaeth safleoedd busnes a'r boblogaeth gyffredinol.

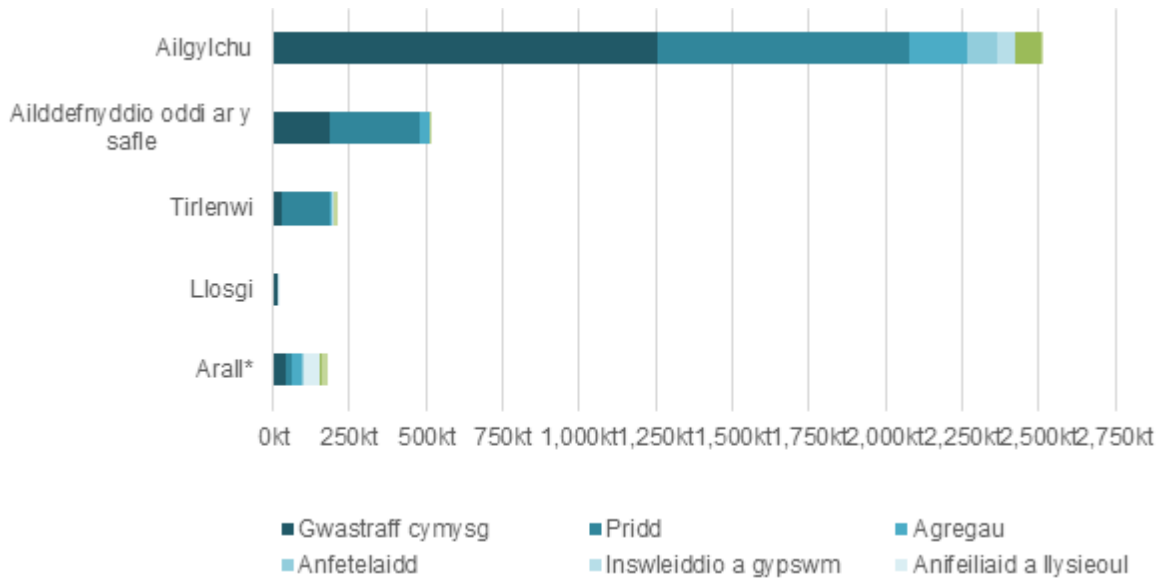
Y prif ddull o reoli gwastraff oedd ailgylchu, sy'n parhau i fod yn gymharol gyson ar draws rhanbarthau Cymru. Cyfradd ailgylchu De-ddwyrain Cymru (gan gynnwys yr holl ffrydiau gwastraff adeiladu a dymchwel) oedd 90%, gyda Gogledd Cymru a Chanolbarth a De-orllewin Cymru'r un yn 89%.

Sylwch fod yr arolwg hwn yn defnyddio rhanbarthau economaidd Cymru, sef Gogledd Cymru, Canolbarth a De-orllewin Cymru, a De-ddwyrain Cymru, gan greu grwpiau rhanbarthol o ardaloedd yr awdurdodau lleol sy'n ychydig yn wahanol i'r un a geir yn astudiaeth 2012. Mae hyn yn golygu nad oes modd cymharu canlyniadau rhanbarthol yn uniongyrchol â'r arolwg blaenorol.

Dulliau rheoli ar gyfer gwastraff a gynhyrchwyd yng Nghymru

Fel y dangosir yn Ffigur 6, cafodd bron i 2.6 miliwn o dunelli o wastraff adeiladu a dymchwel eu hailgylchu (75%), gyda 0.5 miliwn o dunelli (15%) pellach wedi'u paratoi i'w hailddefnyddio oddi ar y safle a 0.2 miliwn o dunelli yn cael eu gwaredu drwy safleoedd tirlenwi (6%). Rheolwyd 19 kt pellach gan waith llogsi, yr oedd 16 kt yn cynnwys adfer ynni, ac aeth 3 kt i'w losgi heb adfer ynni.

Ffigur 6: Gwastraff adeiladu a dymchwel fesul dull rheoli gwastraff, Cymru 2019



*Mae Arall+ yn cynnwys rheoli gwastraff trwy ôl-lenwi, adfer tir, adfer arall, gorsaf drosglwyddo, gwaith trin, a phan nodwyd y dull rheoli fel 'Ddim yn gwybod'.

**Mae llosgi yn cynnwys gydag adfer ynni a heb adfer ynni.

Mae Ffigur 6 hefyd yn dangos y dadansoddiad o ddeunyddiau ar gyfer pob dull rheoli, sy'n dangos y symiau mawr o wastraff cymysg a phridd a anfonir i'w hailgylchu a'u haildddefnyddio oddi ar y safle. Er bod deunyddiau eraill ar wahân yn ffurfio cyfran lai o'r tunelli cyffredinol a ddargyfeiriwyd, dylid nodi y bydd symiau sylweddol o ddeunyddiau ailgylchadwy – megis pren, metelau ac agregau – yn cael eu gwahanu oddi wrth y ffrwd gwastraff cymysg mewn cyfleusterau didoli ar gyfer ailgylchu ac aildddefnyddio mewn cyfleuster arall.

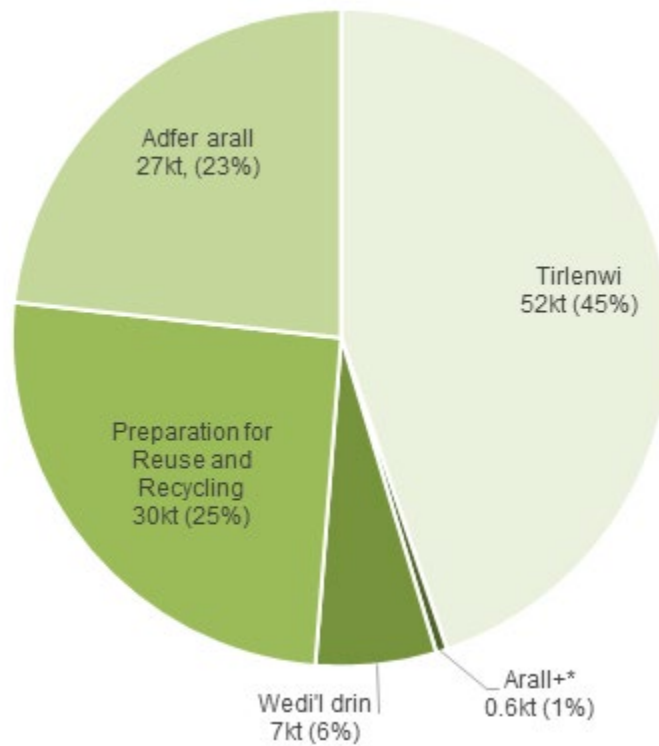
Pridd oedd y deunydd a gyfrannodd fwyaf at safleoedd tirlenwi, a oedd, ar tua 150 kt, yn cynrychioli dros 70% o'r gwastraff adeiladu a dymchwel a anfonwyd i safleoedd tirlenwi yn 2019.

Gwastraff peryglus

Amcangyfrifir y cynhyrchwyd 116 kt o wastraff peryglus gan y sector adeiladu a dymchwel yn 2019; roedd hyn yn cyfateb i ddim ond 3% o gyfanswm y gwastraff a gynhyrchwyd o 3.4 miliwn o dunelli.

- Yn ôl deunydd, roedd mwyafrif y gwastraff peryglus yn cynnwys pridd (42%) a gwastraff agregau (41%), gan gyfrif am 49 kt a 48 kt yn y drefn honno.
- Yn ôl is-sector, roedd adeiladu priffyrdd, ffyrdd, meysydd awyr a chyfleusterau chwaraeon yn cyfrif am 63 kt (55%), gyda'r ail gyfran fwyaf o'r sector adeiladau peirianeg sifil, gyda 24 kt (20%).
- Yn ôl dull rheoli gwastraff, adroddwyd y cafodd y mwyafrif ei anfon at safleoedd tirlenwi (52 kt), i'w paratoi er mwyn ei aildddefnyddio a'i ailgylchu (29 kt), ac er mwyn ei adfer fel arall (27 kt), fel y dangosir yn Ffigur 7.

Ffigur 7: Gwastraff adeiladu a dymchwel peryglus yn ôl dull rheoli gwastraff, Cymru 2019



*Mae Arall+ yn cynnwys dull rheoli a gofnodwyd fel gorsaf drosglwyddo a 'Ddim yn gwybod

Executive summary

This study provides information on the types, quantities, origins (by Construction and Demolition sector and geographic region), and fate (management method) of Construction and Demolition (C&D) wastes generated by businesses and the public sector in Wales in 2019. This is a stand-alone survey and supersedes the data from the last survey for the 2012 calendar year (Natural Resources Wales 2014).

This information is required for a variety of reasons including:

- statutory reporting on waste generation in compliance with Part 2 of Schedule 1 of the Waste (England and Wales) Regulations 2011 and, up until 2020, the EU Waste Statistics Regulations 2002 (Eurostat 2002);
- informing the development of national waste policy;
- monitoring progress against national waste prevention and recycling targets;
- informing waste planners and the regulator;
- supporting investment decisions such as the selection of the type and scale of new waste management facilities required by local authorities and the waste industry;
- updating the evidence base for the State of Natural Resources Report Wales assessment (Natural Resources Wales 2021), and;
- providing businesses with a better understanding of their current waste practices and for developing sustainable waste management support strategies by Welsh Government for improving environmental performance of businesses.

The survey

The study to estimate the Construction and Demolition (C&D) waste generated in Wales for the 2019 calendar year was managed by Natural Resources Wales on behalf of the Welsh Government, who provided the project funding. The project was delivered by SLR Consulting Ltd in partnership with Anthesis (UK) Ltd supported by Ainsworth & Parkinson for the survey bookings and Groundwork Wales for the survey delivery.

Data for 2019 was collected between April 2021 and September 2021 from a representative sample of 508 business sites of differing sectors and sizes throughout Wales.

The data was grossed up using Office for National Statistics (ONS) business site population data to regional and national levels in Wales. The ONS data showed that there was 13,990 Construction and Demolition business sites in Wales in 2019 with 49% in Construction (including Civil Engineering), 1% in Demolition and 50% in General Building.

Of these business sites, 92% had fewer than ten employees and <1% had one hundred or more employees.

The methodology used in this survey was mainly comparable with the previous C&D surveys completed in Wales, of which the most recent provided data for the 2012 calendar year. The key differences were that:

- Due to the ongoing Covid-19 pandemic, surveys were undertaken remotely by telephone or video-conference calls.
- Due to the inherent uncertainty involved when differentiating the closely related EWC codes 17 09 04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03) and 17 01 07 (mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06), the 2019 survey reports waste coded as 17 01 07 under the Mixed wastes grouping rather than aggregates grouping.

Headline results

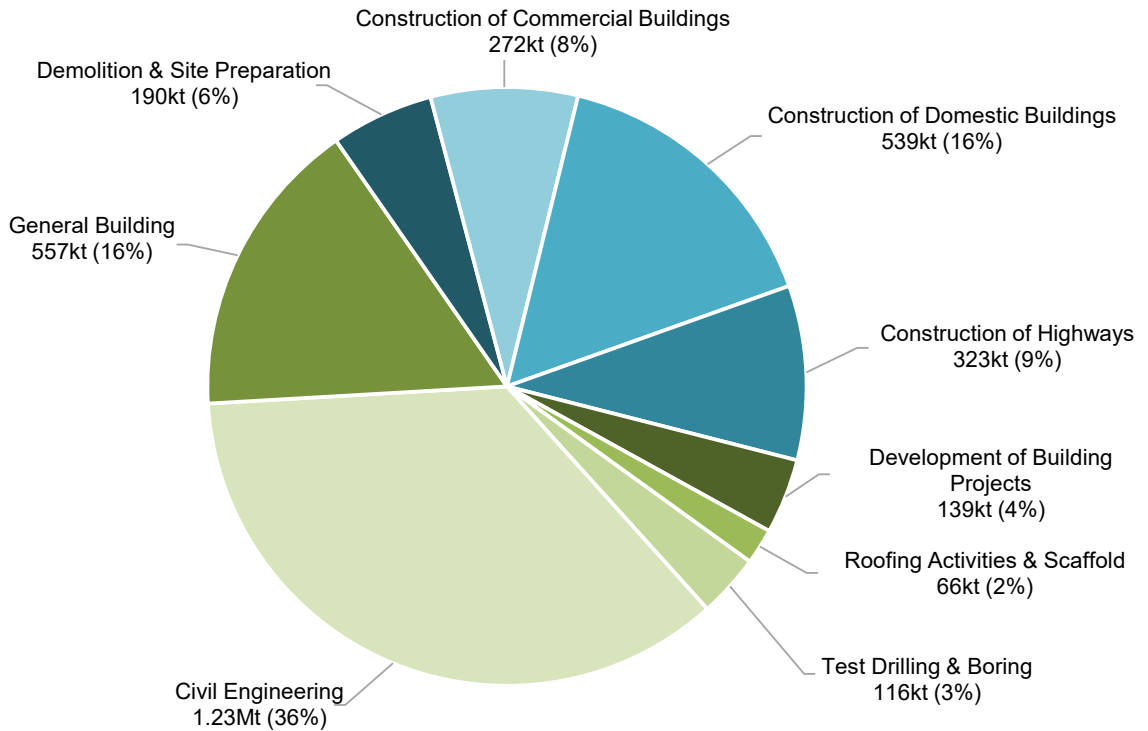
- In 2019 the Welsh Construction and Demolition sectors generated an estimated 3.43 million tonnes (Mt) of waste. The precision for the total waste generated in Wales was +/- 16.7% at 90% confidence. This means that if the survey was repeated, the estimate would be expected to fall between 2.86 Mt and 4.0 Mt every 90 times out 100.

Table 1. Summary of the total Construction and Demolition waste generated, with the precision, Wales 2019

Survey Year	Construction and Demolition waste generation	Range (%)	Lowest (kt)	Highest (kt)
2019	3,427	+/- 16.7%	2,855	3,999
2012	3,359	+/- 33.2%	2,244	4,475

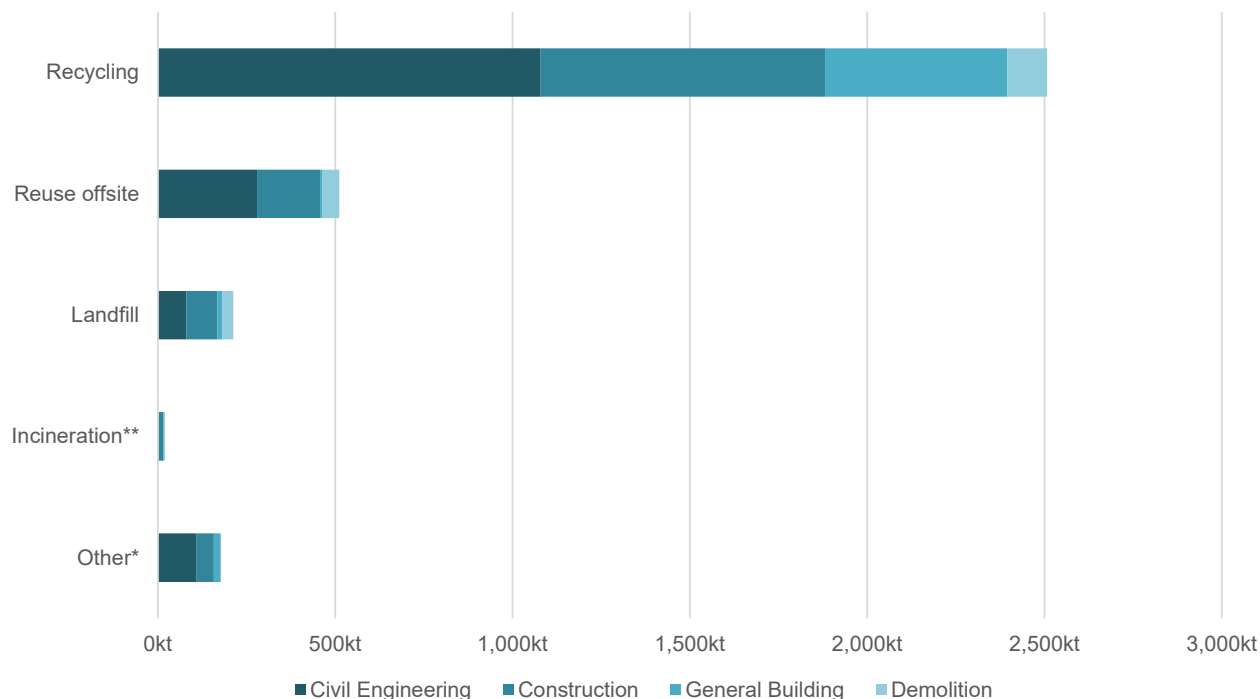
- The 2019 survey results delivered a significant improvement on the survey precision compared with 2012 (Natural Resources Wales 2014). As Table 1 shows, this halves the range within which the actual tonnage generated lies from +/- 1.12 Mt to +/- 0.57 Mt, providing the most accurate estimate of national C&D waste arisings to date.
- This increased precision provides a robust indicator for measurement against Welsh Government's waste prevention targets (Welsh Government 2010).
- The majority of C&D waste consisted of Mixed wastes (including mixed aggregates – EWC codes 17 09 04 and 17 01 07) and Soil, accounting for 45% and 38% respectively. The remainder was predominantly segregated Aggregates (7%) and Non-Metallic wastes (3%), along with a number of smaller material streams.
- The majority of C&D waste was generated by the Construction of Civil Engineering Constructions (36%), General Building (16%) and Construction of Domestic Building (16%) sectors, with the remaining six sectors accounting for less than 10% each of the total C&D arisings – see Figure 1.

Figure 1: Total waste by sector, Wales 2019



- The majority of C&D waste was sent for Recycling, Reuse offsite, and Landfill, as demonstrated in Figure 2.
- Figure 2 groups the nine C&D sectors into four high-level categories (groupings are described in the technical appendix) and this shows that Civil Engineering and Construction were consistently the dominant sources of C&D waste across the different management methods.
- Demolition accounted for a relatively small proportion of C&D waste, with a significant quantity of materials handled in this sector understood to have avoided entering the waste stream.

Figure 2: Total Construction and Demolition waste by Management Method, Wales 2019



*Other includes waste managed via Treatment, Backfilling, Composting, Other Recovery, Transfer Station and when management method was 'Don't Know'.

**Incineration includes both With and Without Energy Recovery.

- The Recycling rate (comprised of Preparation for Reuse, Recycling, Composting and Backfilling) of Non-Hazardous Construction & Demolition waste excluding naturally occurring substances (EWC 17 05 04) generated in Wales was 93% in 2019. When extending the metric to include all C&D waste materials the performance was 90% (see Table 2).

Table 2. Summary of the Recycling rate, Wales 2019

Materials included in Metric	Use of metric	Recycling rate
C&D Waste excl. Hazardous waste and Soil & stones	Measurement against Welsh government targets	93%
All C&D Waste	Measurement of overall sector performance	90%

The Recycling rate is comprised of Preparation for Reuse, Recycling, Composting and Backfilling. C&D Waste excl. Hazardous waste and Soil & Stones excludes Soil & stones with EWC code 17 05 04.

- Table 3 shows the C&D waste generation broken down into the regions of Wales, based on business site location. An estimated 1.6 Mt of Construction and Demolition waste was generated in South East Wales, with 1.0 Mt generated in Mid & South Wales, and 0.8 Mt generated in North Wales.

Table 3. Summary of waste generated by Region, Wales 2019

Region	Waste Generated (kt)	Percentage
South East Wales	1,618	47.0%
Mid & South West Wales	1,040	30.5%
North Wales	769	22.5%
Total	3,427	100%

This 2019 survey uses the Welsh economic regions of North Wales, Mid & South West Wales and South East Wales which is a different regional definition than used in 2012. The regional percentages are rounded to the nearest 0.5%.

Comparison with 2012 C&D waste generation

When compared to the results of the 2012 waste generation survey:

- The 3.43 Mt of C&D waste generated in 2019 is comparable to the 2012 estimate of 3.36 Mt. However the small increase of c.68 thousand tonnes (kt) is not statistically significant.
- The survey precision has improved from +/-1.12 Mt in 2012 to +/-0.57 Mt in 2019. This provides 90% confidence that C&D waste generated was between 2.8 and 4.0 Mt in 2019, the smallest margin for error in a Wales C&D waste survey to date.
- The Recycling rate of C&D waste excluding hazardous waste and Soil & stones has increased from 87% in 2012 to 93% in 2019.
- The rate of C&D waste disposed of to Landfill has decreased from 19% in 2012 to 6% in 2019.

When drawing comparisons to previous surveys it is important to be aware of the inherent variability that exists within the construction and demolition sector, which include:

- Fluctuations in sector activity can have a direct impact on annual C&D waste generation.
- Arisings can be significantly influenced by the size and location of projects.
- The tendency for businesses to 'cross-over' between different SIC classifications, with many undertaking significant activities across the subsectors (e.g. construction of both domestic and commercial buildings).
- The broad categories used within the European Waste Catalogue (EWC), such as those for mixed wastes, may also lead to inconsistent waste categorisation within the industry.

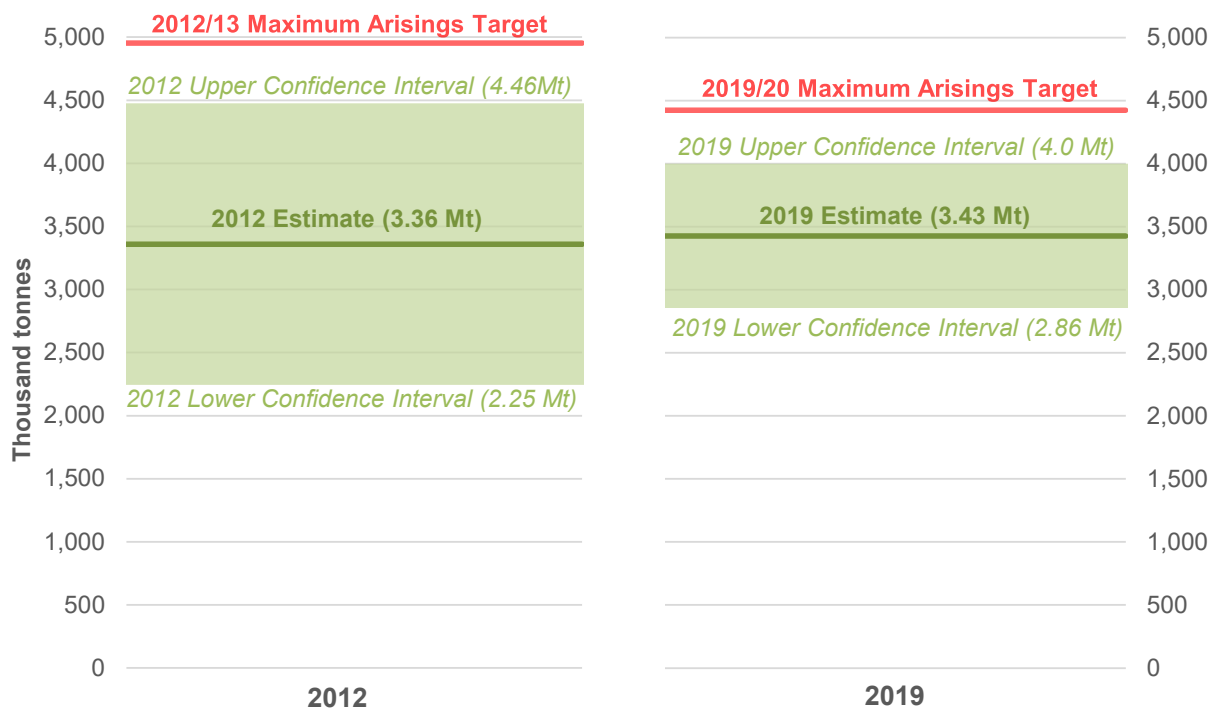
Progress against targets

Waste prevention

The waste prevention target for Construction and Demolition waste is a reduction in total C&D waste generation of 1.4% every year until 2050 (using 2006/07 as baseline). This equates to an annual reduction of 75,701 tonnes to a maximum arisings target of 4.42 Mt for 2019/20.

Figure 3 illustrates the targeted maximum C&D waste arisings for 2019/20 and shows that the target was achieved by the C&D sector when measured against both the estimated tonnes generated in 2019 (3.43 Mt) and the margin of survey error (+/-0.57 Mt).

Figure 3: Generation of Construction and Demolition waste compared to the target, Wales 2019



Recycling

Towards Zero Waste set a Recycling target of 90% by 2019/20 for the Construction and Demolition Sector. The target excludes hazardous wastes and naturally occurring soil and stones (Welsh Government 2010).

The survey results show that Wales achieved the target in 2019 based on the estimated 93% Recycling rate.

When including hazardous waste and natural occurring soils within the calculation, Wales achieved an estimated Recycling rate of 90%. Mixed wastes was the largest contributing material group, the majority of which was generated by the General Building sector.

As with previous surveys, these estimates are limited to the accuracy of information on final fates held by the waste producers. Any material collected for recycling but subsequently disposed of by the waste industry (i.e. due to contamination or inherent non-recyclability) is unlikely to be reported back to all waste producers, therefore this estimate is likely to represent the 'maximum' recycling rate.

Landfill

Towards Zero Waste contains targets to reduce the quantity of C&D waste Landfilled in Wales based on a percentage reduction of the 2007 baseline, with a specific target of a 75% reduction set for 2019/20 (Welsh Government 2010). This translates into a target of no more than 318 kt to Landfill by 2019 based on a baseline figure of 1,272kt (Environment Agency Wales 2006).

The survey results show that Wales achieved the target in 2019 based on the estimated tonnes generated in 2019 of 213 kt.

Similarly to recycling, landfill estimates are also limited to the accuracy of information on final fates held by the waste producers. Waste producers may not be informed of any material collected for recycling but subsequently disposed of by the waste industry (i.e. due to contamination or inherent non-recyclability). Therefore, this figure is likely to represent the 'minimum' quantity landfilled.

Results by Sector

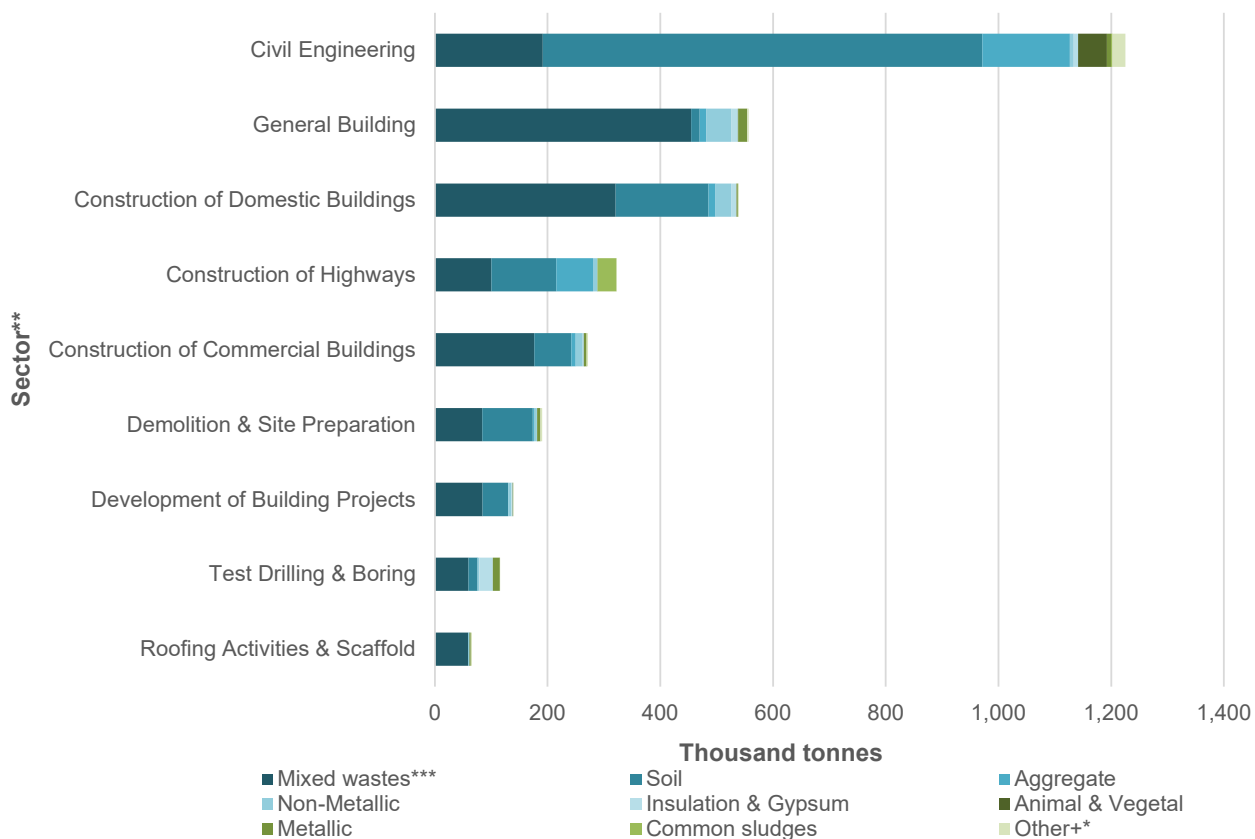
Of the 3.4 Mt of C&D waste generated in Wales, the largest generation (as shown in Figure 4), was from:

- Civil Engineering with 1.23 Mt (36%),
- General Building with 560 kt (16%), and
- Construction of Domestic Buildings with 540 kt (16%).

Soil and Mixed wastes were the predominant material streams across the sectors. The majority of waste generated by the Civil Engineering sector was Soil, estimated at 780 kt in

2019, which alone accounted for over 20% of Wales' total C&D waste arisings. General Building was the largest source of Mixed wastes, generating an estimated 450 kt.

Figure 4: Waste by sector and material stream, Wales 2019



*Other+ includes Chemical wastes, Discarded Equipment and Other Mineral.

**To allow for better spacing on tables and charts the SIC descriptions have been abbreviated see Table 8.

***Mixed aggregates are included within 'Mixed wastes'.

Results by Waste Stream

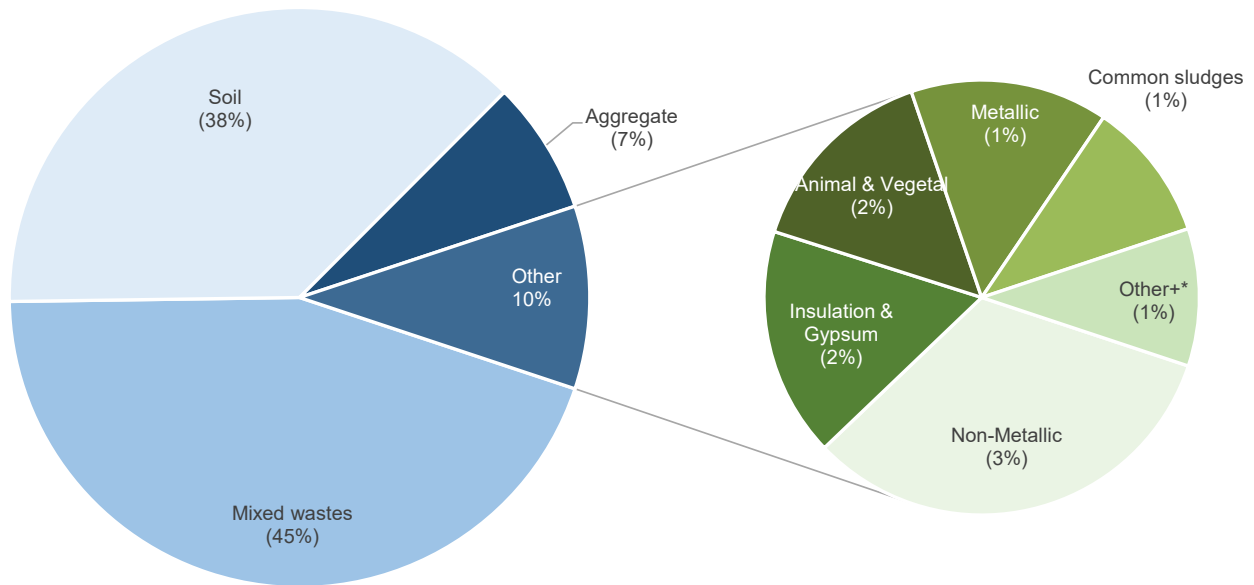
The majority of Construction and Demolition waste was made up of Mixed wastes (45%), Soil (38%), and segregated Aggregates (7%), with smaller contributions from other waste streams as illustrated in Figure 5. This equates to national arisings of 1.5 Mt of Mixed wastes, 1.3 Mt of Soil, and 260 kt of Aggregate, with the balance of 350 kt consisting of a variety of more minor waste streams.

'Soil' as recorded in this data includes soils and stones. 'Aggregate' as recorded in this data contain a number of inert waste types, but excludes mixed aggregates which are included within the 'Mixed waste' category. 'Mixed wastes' also include more general mixed construction and demolition wastes, as are often collected via mixed waste skips, and can contain a variety of materials such as wood, metals, plastics, inerts, and in some cases potentially hazardous substances.

Waste regulations stipulate that in most cases, mixed hazardous wastes should be separated at source, however these are sometimes collected alongside non-hazardous materials (e.g. used paint containers within a skip).

A full breakdown of EWC codes included under each material category is provided in the technical appendices.

Figure 5: Composition of Construction and Demolition waste by material stream, Wales 2019



*Other+ includes Chemical wastes, Discarded Equipment and Other Mineral wastes.

Regional Waste Generation

The majority of Construction and Demolition waste was generated by business units based in South East Wales (47%), followed by North Wales (30%) and Mid & South West Wales (22%). The breakdown of estimated Regional waste generation is shown in Table 4.

Table 4: Regional waste generation, Wales 2019

Region	Waste Generated (kt)	Percentage
South East Wales	1,618	47.0%
Mid & South West Wales	1,040	30.5%
North Wales	769	22.5%
Total	3,427	100%

This 2019 survey uses the Welsh economic regions of North Wales, Mid & South West Wales and South East Wales which is a different regional definition than used in 2012. The regional percentages are rounded to the nearest 0.5%.

The apportionment of waste to a region is based on the reported location of the Construction and Demolition business site surveyed, and the population of business sites in the region, not on the location of the construction and demolition activity. This approach is consistent with the 2012 survey and was taken due to the practical limitations associated with allocating every surveyed business' waste arisings to geographic areas, with many businesses reporting total quantities from all of their projects without reference to location.

The geographical distribution of business sites surveyed in Wales was approximately 44% in South East Wales, 30% in Mid & South West Wales and 25% in North Wales, which closely resembles the population distribution of both business sites and the general population.

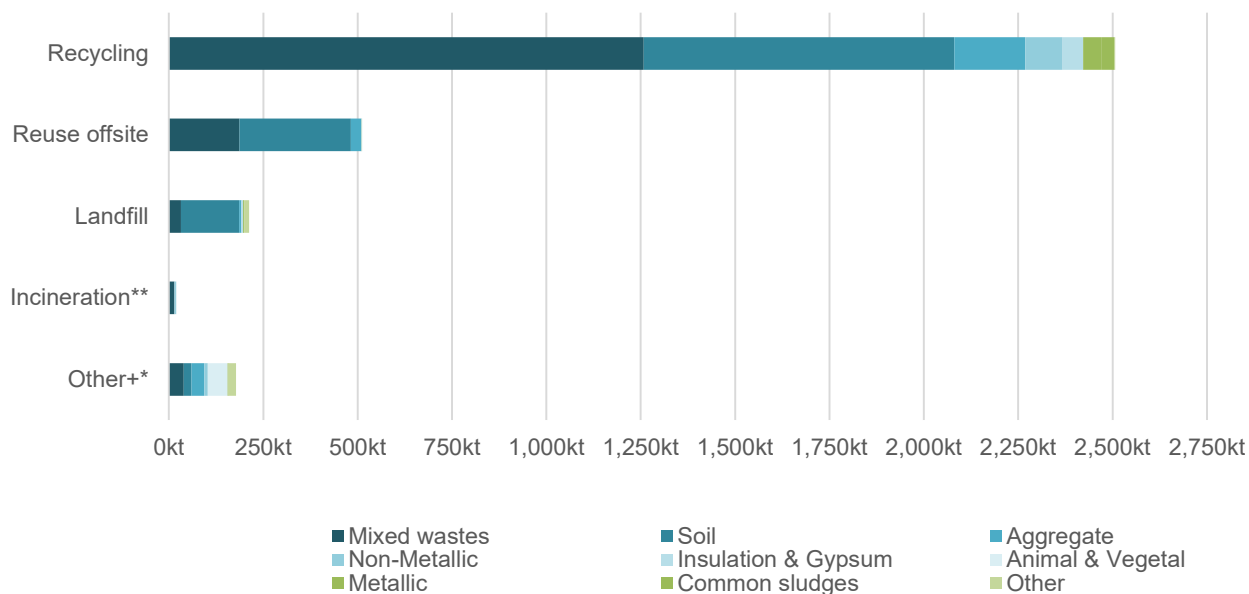
The dominant waste management method was recycling, which remains relatively consistent across the regions of Wales. South East Wales' Recycling rate (including all Construction and Demolition waste streams) was 90%, with North Wales and Mid & South West Wales each at 89%.

Note that this survey uses the Welsh economic regions of North Wales, Mid & South West Wales and South East Wales; a slightly different regional grouping of local authority areas than the 2012 study. This means that regional results cannot be directly compared with the previous survey.

Management Methods for waste generated in Wales

As shown in Figure 6, almost 2.6 Mt of Construction and Demolition waste was Recycled (75%) with a further 0.5 Mt (15%) prepared for Reuse offsite and 0.2 Mt disposed via Landfill (6%). A further 19 kt was managed by Incineration, of which 16 kt included Energy Recovery and 3 kt went to Incineration without Energy Recovery.

Figure 6: Construction and Demolition waste by waste management method, Wales 2019



*Other+ includes waste management via Backfilling, Land Recovery, Other Recovery, Transfer Station, Treatment Plant and when management method was 'Don't Know'.

**Incineration includes With and Without Energy Recovery.

Figure 6 also shows the material breakdown for each management method, which illustrates the large quantities of Mixed wastes and Soil sent for Recycling and Reuse offsite. Whilst other segregated materials make up a smaller fraction of the overall diverted tonnages, it should be noted that significant quantities of recyclable materials – such as wood, metals, and aggregates – will be separated from the Mixed waste stream at sorting facilities for onward recycling and reuse.

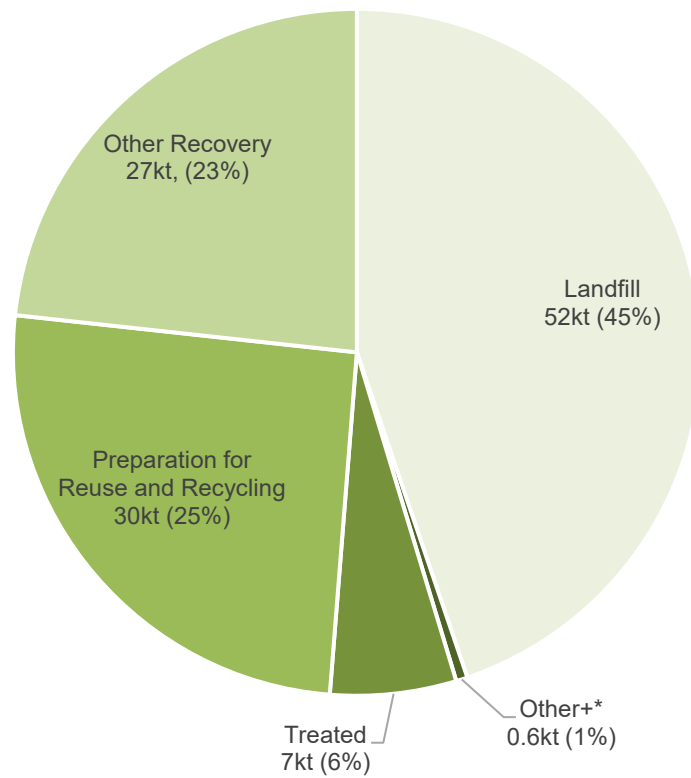
Soil was the largest contributing material to Landfill, which at c.150 kt represented over 70% of landfilled C&D waste in 2019.

Hazardous Waste

An estimated 116 kt of Hazardous wastes was generated by the Construction and Demolition sector in 2019; this equated to just 3% of the total waste generation of 3.4 Mt.

- By material, the majority of Hazardous wastes was made up of Soil (42%) and Aggregate wastes (41%), accounting for 49kt and 48kt respectively.
- By sub-sector, Construction of Highways, Roads, Airfields and Sport Facilities accounted for 63 kt (55%), with the second largest proportion from the Construction of Civil Engineering Constructions sector, with 24 kt (20%).
- By waste management method the majority was reported as Landfilled (52 kt), Sent for Preparation for Reuse and Recycling (29 kt) and Other Recovery (27 kt) as shown in Figure 7.

Figure 7: Hazardous C&D waste by waste management method, Wales 2019



*Other+ includes management method recorded as Transfer Station and 'Don't Know'

1. Introduction

Natural Resources Wales (NRW) has produced information on the types, quantities, origins (by industry sector and geographic region), and fate of Construction and Demolition (C&D) waste generated by businesses (including public and third sectors) in Wales in 2019.

This information is required for a variety of reasons including:

- reporting on waste generation in compliance with Part 2 of Schedule 1 of the Waste (England and Wales) Regulations 2011 and, up until 2020, the EU Waste Statistics Regulations 2002 (Eurostat 2002);
- informing the development of national waste policy;
- monitoring progress against national waste prevention and recycling targets;
- informing waste planning and regulation;
- providing data to the waste management industry to inform investment decisions;
- updating the evidence base for the State of Natural Resources Report Wales assessment (Natural Resources Wales 2021), and;
- providing businesses with a better understanding of their current waste practices and for developing sustainable waste management support strategies by Welsh Government for improving environmental performance of businesses.

A separate document associated with this report contains the detailed results of the survey and technical appendices associated with the works.

1.1 Background and Need for the Survey

Some data on waste managed by permitted waste facilities is available to NRW via statutory returns. However, this is not a suitable dataset for estimating waste generated in Wales by business sector and the majority of businesses in the scope of this survey are not required to report this information. To ensure a comprehensive set of waste data across all businesses, periodic surveys are required.

There are a wide variety of needs for this waste data. These include:

- Part 2 of Schedule 1 of the Waste (England and Wales) Regulations 2011 which requires the waste management plan for Wales to include the type, quantity and source of waste generated within Wales and an analysis of the current waste management situation in Wales
- Historically, European reporting purposes, such as the EU Waste Statistics Regulations that require the United Kingdom to report biennial data on waste generated by sector and waste type (material stream).

The data is used to provide evidence in support of waste policy development, the targeting of interventions, and to monitor progress against the waste prevention and recycling targets. The current targets for Construction and Demolition waste set in the Wales Waste Strategy ‘Towards Zero Waste’ and associated sector plans are outlined in Table 5.

Table 5: Waste targets in Wales (Towards Zero Waste 2010)

Target	Description
Waste prevention targets	For Construction and Demolition waste, a reduction of 1.4 per cent every year to 2050 based on 2006/07 baseline. This translates to 4.42 Mt in 2019/20.
Recycling targets (comprising Preparation for Reuse, Recycling Composting and Backfilling)	By 2019/20 to achieve a recycling target of 90% for Construction and Demolition
Landfill targets	By 2019/20, as a percentage of the 2007 baseline, to reduce the quantity of C&D waste that is Landfilled by 75%. This translates to no more than 328 kt Landfilled.

The survey provides information to be used:

- by the Welsh Government and Local Authorities to inform waste planning;
- by the waste management industry to inform decision making for future investment;
- by businesses to benchmark their current waste practices against other businesses of similar size and sector, and;
- for developing policies to encourage efficient use of resources, waste prevention and the sustainable management of Construction and Demolition waste.

Surveys of Construction and Demolition waste have been completed periodically with the most recent previous survey providing data for the 2012 calendar year. This 2019 survey has been undertaken to assess whether there has been any change in the quantity of waste generated and the waste management practices of business sectors. The methodology used in this survey was mainly comparable to 2012, with the key differences that:

- Due to the ongoing Covid-19 pandemic, surveys were undertaken remotely by telephone or video-conference calls.
- Due to the inherent uncertainty involved when differentiating the closely related EWC codes 17 09 04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03) and 17 01 07 (mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06), the 2019 survey reports waste coded as 17 01 07 under the Mixed wastes grouping rather than Aggregate grouping.
- General Building sectors have been consolidated into a combined General Building sector.
- The use of Welsh economic regions of North Wales, Mid & South West Wales and South East Wales are a slightly different regional grouping of local authority areas than the 2012 study.

The mostly comparable survey outputs enable comparisons between the 2012 and 2019 Welsh Government indicators on national waste generation, recycling performance and waste to landfill. The 2019 survey represents the most accurate estimate of National C&D waste generated in Wales undertaken to date. However readers should be aware of the increased uncertainty and need for some adjustment of 2012 data involved when comparing results between the surveys on a more granular level.

When drawing comparisons to previous surveys it is also important to be aware of the inherent variability that exists within the Construction and Demolition sector.

- Fluctuations in sector activity can have a direct impact on annual C&D waste generation.
- Arisings can be significantly influenced by the size and location of projects.
- The tendency for businesses to ‘cross-over’ between different SIC classifications, with many undertaking significant activities across the subsectors (e.g. construction of both domestic and commercial buildings).
- The broad categories used within the European Waste Catalogue (EWC), such as those for mixed wastes, may also lead to inconsistent waste categorisation within the industry.

1.2 Overall Aims

The main aims of the project were to determine, for the 2019 calendar year, how much waste was generated from Construction and Demolition businesses in Wales, with a breakdown of waste generated by waste type (material stream), sector and how that waste was managed.

1.3 Study Area

The geographical scope of the study was the whole of Wales, with a distribution of business sites to represent a regional level of South East, Mid & South West, and North Wales. Lists of the local authorities covered by each region are provided in section 2.8. Note that these are slightly different to those applied in 2012, meaning that regional results cannot be directly compared.

1.4 Project Management

The project was managed overall by NRW, on behalf of the Welsh Government who funded the survey. The survey was delivered by SLR Consulting Limited (SLR) in partnership with Anthesis (UK) Ltd (Anthesis). supported by Ainsworth & Parkinson for the survey bookings and Groundwork Wales for the survey delivery.

A steering group was set up with a membership designed to agree the survey methodology, be involved in making key decisions and review draft findings during the lifetime of the project. The steering group included:

- Dr Andy Rees - Welsh Government
- Robert Wilson - Welsh Government
- Joanne Smith - Welsh Government
- Stuart Neil - Welsh Government

- John Fry - Project Executive, NRW
- Marcus Fogarty - Project Manager, NRW
- Richard Cardwell - NRW
- Michelle Griffiths - NRW
- Gary Armstrong - Project Director, SLR
- Martin Garrett - Project Manager, SLR
- Peter Scholes - Delivery Director, Anthesis
- Hannah Dick – Delivery Manager, Anthesis
- Julian Parfitt - Project Statistician, Anthesis

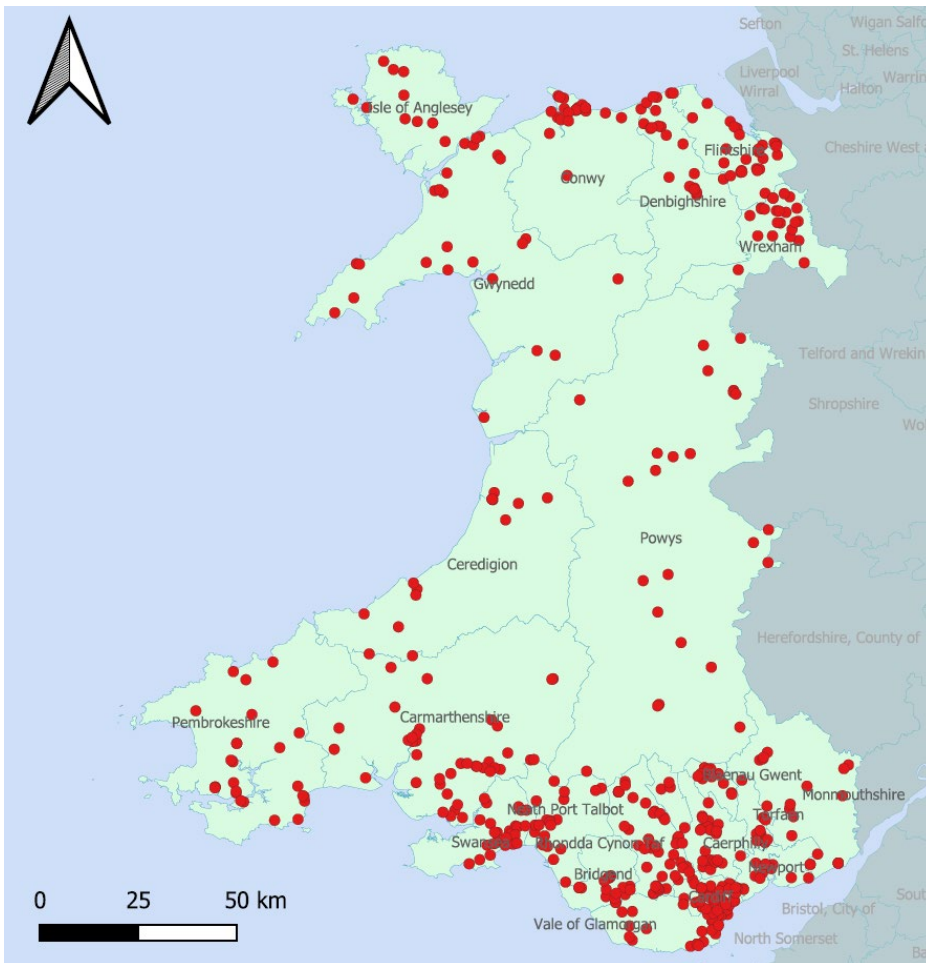
1.5 Survey Parameters

The survey of companies was carried out between April 2021 and September 2021, recording wastes generated by business sites for the 2019 calendar year.

The survey collected waste generation data from a total of 508 Construction and Demolition business sites throughout Wales, using a structured interview process and developed questionnaire, based upon the requirements of the sample matrix developed by the project statistician.

The business sites surveyed were selected at random from the population database provided by ONS, but this has still provided a good geographical spread of surveyed business sites across Wales as illustrated in Figure 8. Surveys were completed in all regions and Local Authorities in Wales. Due to the ongoing Covid-19 pandemic, surveys were undertaken remotely by telephone or video-conference calls.

Figure 8: Geographical spread of business sites surveyed, Wales 2019



2. Survey Design and Methodology

This section of the report describes the scope and methodology for the design and delivery of the survey element of the project. There are sections on:

- the scope of businesses;
- the questionnaire design;
- the sample frame development;
- the project delivery tasks;
- how waste was classified;
- how business sectors were classified, and;
- how tonnages were calculated.

The remaining sections detail the grouping of local authorities by region and describe how the recycling rate is calculated.

2.1 Scope of businesses and waste

508 Construction and Demolition business sites were surveyed. A business site was defined as an individual location. A single registered business may operate at multiple business sites. The survey covered the primary waste generation sectors and can be summarised as follows:

What was included in the survey:

- Businesses of all sizes within the Construction & Demolition sector, from those with one employee to 100+ employees;
- all wastes produced per project by the C&D business in Wales in 2019;
- Hazardous and Non-Hazardous wastes, and;
- the waste management method used to dispose of, recycle or recover the waste.

Data was gathered on 'Non-wastes' such as material directly reused on the same site that it was generated. The collection of this data was also part of the 2012 survey and has been separately identified as part of this survey. Materials managed directly onsite may not be considered 'waste' in accordance with the legal definition and are therefore not included in the waste generation results of this report.

What was not included in the survey:

- businesses involved in industry and commerce, and;
- businesses involved in waste management and recycling (to avoid potential double counting).

2.2 Design of the Questionnaire

The structure of the primary survey database, and therefore the survey questionnaire, was designed to fulfil Waste (England and Wales) Regulations 2011 (and EU Waste Statistics Regulation) reporting requirements and to produce data compatible with the previous survey of C&D waste arisings in Wales 2012 to update and supersede the dataset.

The survey questionnaire was designed to document individual waste streams, their nature (i.e. Hazardous or Non-Hazardous), form (liquid, solid, gas), description (as waste classification) and tonnage, as well as what happened to the waste (waste management method or fate) and where this happened to assess movements. This part of the data is fully compatible with previous waste surveys.

Detailed information on the survey questionnaire is available in the Technical Appendices.

2.3 Design of the Sample Matrix

The methodology used for development of the sample matrix and subsequent grossing of the survey results was based on previous surveys to ensure comparability of results. The design of the sample matrix itself was changed slightly from that applied in 2012, with the consolidation of General Building subsectors into a single sector. This allowed more

surveys to be undertaken in bricks that were anticipated to have a high impact on the overall survey results and therefore improve the precision of the survey.

A 'brick' represents a particular sector and size-band combination, e.g. 'Demolition & Site Preparation' sector with 3 to 9 employees.

The General Building sector contains the following subsectors:

- Electrical installation;
- Plumbing;
- Plastering;
- Joinery installation;
- Floor and wall covering;
- Painting and Glazing;
- Other building completion and finishing, and;
- Other construction installation.

A comparison figure for General Building in the 2012 data can be made by combining the results of the individual sectors.

ONS data was used to populate a population frame of business sites by number of employees and sector. The variation in 2012 data and number of business sites per brick of the frame was used to create the sample matrix. The sample matrix defined how many business sites needed to be reached for each brick. It was reviewed part way through the survey to incorporate inconsistencies in company size or sector that were identified in the original Office of National Statistics (ONS) dataset during recruitment, in order to reflect actual business recruitment rates within bricks. These aspects of the project are discussed in detail in the Technical Appendices.

2.4 Project Delivery Overview

The survey of Construction and Demolition waste generated in Wales for 2019 calendar year was carried out by SLR Consulting Ltd in partnership with Anthesis (UK) Ltd and managed by Natural Resources Wales on behalf of the Welsh Government that funded the project.

The project was delivered by SLR acting as the principal contractor providing overall project management, delivery scrutiny, data analysis and reporting. Anthesis was responsible for the project methodology, systems (software), day-to-day delivery management of the surveying and data security.

Ainsworth & Parkinson was responsible for the telephone recruitment of businesses for the survey and for booking survey visit appointments. Due to the ongoing Covid-19 pandemic, survey interviews with businesses were undertaken remotely by telephone or video-conference calls. The surveys were carried out by Groundwork Wales using the structured questionnaire and software during the survey call. Data quality and ease of use was key from the beginning with training of the surveyors, and the survey software providing

immediate data quality checks. The data was collated centrally each week, screening incoming raw data for outliers and following up to correct the data as needed.

During the survey SLR and Anthesis reviewed the progress and reported to NRW. Once the main data collection was complete, Anthesis collated and reviewed the data before SLR ran a series of data validations. Statistical analysis was provided by Anthesis with analysis, tabulation and report writing led by SLR.

2.5 Classifying Waste

The European Waste Catalogue (EWC) method was used to classify the wastes. The EWC chapters 15, 16, 17 and 20 were used, as described in Table 6 and listed in detail in the Technical Appendices. This classification method was used for consistency with the 2012 survey. The Non-wastes were added as separate lines so that these could be separated from the main dataset for reporting purposes.

Table 6. EWC Chapters and associated wastes included in the survey

EWC Chapter	Chapter Title	Typical Waste Types
Chapter 15	Waste packaging, absorbents, wiping cloths, filter materials and protective clothing not otherwise specified	Packaging, protective clothing
Chapter 16	Wastes not otherwise specified in the list	Electricals, batteries, pressure containers, end-of-life vehicles
Chapter 17	Construction and Demolition wastes (including excavated soil from contaminated sites)	Concrete, bricks, tiles, ceramics, wood, glass, plastic, bitumen, metals, soils, insulation, plasterboard
Chapter 20	Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions	Garden wastes, non-metallic recyclables, household like wastes

There is a methodology for mapping European Waste Catalogue (EWC) codes to Substance Oriented Classification (SOC) groups. Therefore, results from this survey can be compared with those generated by other surveys conducted both in the UK and across Europe.

A full breakdown of EWC codes which fall under the survey grouping names used in this report are provided in the Technical Appendices.

2.51 Aggregate

Aggregates include inert materials such as concrete, bricks, ceramics, and ballast, forming an important component of the C&D waste stream. There are a number of available EWC codes applicable to segregated aggregates, and a dedicated code (17 01 07) for 'mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06'.

The 17 01 07 code can be distinguished from the more general 17 09 04 code (*mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03*) in that it should be limited to mixtures of inert fractions. In contrast, the 17 09 04

code should be limited to mixtures of more general non-hazardous C&D waste (e.g. wood, metals, plastics etc. which may be collected in combination with inerts). In practice, it is understood there is potential for the inconsistent application of these waste codes within the industry.

Due to the inherent uncertainty involved when differentiating EWC code 17 09 04 and 17 01 07, the 2019 survey reports EWC code 17 01 07 under the Mixed wastes grouping rather than Aggregates grouping.

2.52 Non-Wastes & Backfilling

It was decided to collate some data on Non-wastes in the survey to be fully comparable with previous C&D surveys but to exclude these tonnages from the results.

The following was included in the survey but not classified as 'waste', rather they were classified as 'Non-wastes'.

- "Uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated" as defined under the Waste Framework Directive.
- Other materials that were directly reused onsite for their original purpose, without prior treatment.

All Non-wastes are excluded from analysis in this report, but data is available in the Technical Appendices detailed results tables.

The material recorded as Non-wastes are distinct from wastes categorised under the management method 'Backfilling', which has been reserved for material meeting the criteria of 'waste' and managed in accordance with the Commission Decision 2011/753/EU definition of Backfilling:

"backfilling' means a recovery operation where suitable waste is used for reclamation purposes in excavated areas or for engineering purposes in landscaping and where the waste is a substitute for non-waste materials".

Backfilling includes where a waste is used instead of other virgin materials in a process of landscaping engineering, so long as it is suitable for the application (i.e. exhibiting the necessary properties and performance criteria).

2.53 Waste Management Methods

The waste management method classifications were grouped as per Table 7 below.

Table 7: Waste Management descriptions grouped by waste management method

Primary Waste Management Method	Waste Management Description – sub category
Landfill	Landfill - non-hazardous Landfill – inert Landfill - hazardous
Thermal Treatment with Energy Recovery	Energy from Waste (EfW) Waste Derived Fuel (WDF)
Thermal Treatment without Energy Recovery	Incineration without Energy Recovery
Transfer Station	Transfer station
Treatment Plant	Physio/chemical treatment Biological Treatment MBT (mechanical biological) Separation Rendering Other Treatment
Recycling	MRF/transfer Reprocessor CA Site/Bring Site Other Recycling
Composting	Windrow composting Anaerobic Digestion (AD) Other composting
Land Recovery	Landspread Unknown land recovery
Reuse	Preparation for Re-use off site Other reuse
Backfilling	Backfilling
Other Recovery	Other Recovery
Don't Know	Don't know

2.6 Classifying Business Sectors

Business sites were classified to the SIC code as reported in ONS data. To allow for formatting and presentation of tables and charts the SIC descriptions have been abbreviated. The full sector label has been used in the text. The SIC codes and abbreviations are shown in Table 8.

Table 8: SIC Descriptions and abbreviations

SIC code	SIC Description	Label Abbreviation
43110 & 43120	Demolition & Site Preparation	Demolition & Site Preparation
41201	Construction of Commercial Buildings	Construction of Commercial Buildings
41202	Construction of Domestic Buildings	Construction of Domestic Buildings
43910 & 43991	Roofing activities & Scaffold Erection	Roofing Activities & Scaffold
43999 & 43130	Test Drilling & boring and Other Specialised Construction Activities	Test Drilling & Boring
42990, 42210, 42220 & 42910	Construction of Civil Engineering Constructions	Civil Engineering
42110, 42120 & 42130	Construction of Highways, Roads, Airfields, and Sport Facilities	Construction of Highways
41100	Development of Building Projects	Development of Building Projects
43210, 43220, 43310, 43320, 43330, 43341, 43342, 43390 & 41100	General Building	General Building

The General Building sector is comprised of the following subsectors:

- Electrical installation
- Plumbing
- Plastering
- Joinery installation
- Floor and wall covering
- Painting and Glazing
- Other building completion and finishing
- Other construction installation

2.7 Calculating Tonnages

A key requirement of the survey was that quantities of material in each waste stream could be represented as weights and recorded in metric tonnes. The challenge was that waste data was not always available as a tonnage figure.

Surveyors were instructed to ask for documented evidence of weights wherever possible, for instance from waste transfer notes, contractor invoices, or other business records. This point was stressed during the telephone booking process and in the appointment confirmation email so that businesses could prepare these documents in advance of the survey call.

Where documented evidence was not available, the surveyor was provided with a tool as part of the survey software to calculate annual tonnages from container volume and disposal frequency. The software used standard container types (summarised in the

Technical Appendices) for volume, and a series of bulk density conversion factors (presented in the Technical Appendices) from which weights could be calculated by entering the number of collections per year.

All the conversion factors could be overwritten by the surveyor if the standard conditions were not relevant, and surveyors were instructed to ‘reality check’ the resultant weights with the business representative before accepting them. For some individual items of waste (e.g. a fluorescent tube) a separate list of specific items (see the Technical Appendices) was also provided as part of the software package.

2.8 Classifying Regions

For the purposes of reporting regional data, local authorities were grouped into the regions shown in Table 9.

Table 9: Regional groupings by local authority

Region	Local Authority
North Wales:	Conwy, Denbighshire, Flintshire, Gwynedd, Isle of Anglesey, and Wrexham.
South East Wales:	Blaenau Gwent, Bridgend, Caerphilly, Cardiff, Merthyr Tydfil, Monmouthshire, Newport, Rhondda Cynon Taf, Torfaen, and Vale of Glamorgan.
Mid & South West Wales:	Carmarthenshire, Ceredigion, Neath Port Talbot, Pembrokeshire, Powys, and Swansea

This attribution of local authorities to regions is slightly different to that applied in 2012, and therefore results generated at regional level by the two surveys cannot be directly compared.

2.9 Recycling Rate Calculation

The recycling rate target definition for C&D waste set in Welsh Government’s Towards Zero Waste strategy (Paraphrased from page 60 of ‘Towards Zero Waste’ - Welsh Government, 2010) is consistent with that of the EU Waste Framework, as follows:

“The preparing for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the list of waste shall be increased to a minimum of 90% by weight by 2019/20”

Therefore the value measured against the Welsh Government C&D waste recycling target in this report has been calculated in accordance with the above description as follows:

- Tonnages for Reuse, Recycling, Composting and Backfilling primary waste management methods outlined in Table 7 are included in the numerator;
- Hazardous wastes are excluded from the numerator and denominator, and;
- Waste categorised as EWC 17 05 04 is excluded from the numerator and denominator.

2.10 Further Detail

The data was grossed up using Office for National Statistics (ONS) business site population data to regional and national levels in Wales. The ONS data showed that there were 13,990 Construction and Demolition business sites in Wales in 2019 with 49% in Construction (including Civil Engineering), 1% in Demolition and 50% in General Building. Of these business sites, 92% had fewer than ten employees and <1% had one hundred or more employees.

Further detail is provided in the accompanying Technical Appendices document. Detailed notes on how the survey was delivered, and quality assurance methods used, are given in the Technical Appendices. The data grossing and calculation of survey precision methodologies are described in the Technical Appendices. The lessons learned for future surveys are provided in the Conclusion and Recommendations section of this report.

3. Survey Results

This part of the report provides the analysis on the waste data. The sections detail:

- national waste generation overall and by Construction and Demolition sector;
- regional waste generation overall and by Construction and Demolition sector;
- methods of waste management at the national level;
- methods of waste management at the regional level;
- comparison with 2012 survey results and progress against targets;
- hazardous waste arisings, and;
- priority materials.

3.1 Waste Generation – National

An estimated 3.43 million tonnes (Mt) of Construction and Demolition waste was generated in Wales in 2019 with a precision of +/- 16.7% at 90% confidence.

The +/-16.7% precision means that if the 2019 survey was repeated, then for every 90 times out of 100 the estimate would fall within the range of 2.9 to 4.0 Mt, as illustrated in Table 10.

To allow for better spacing on tables and charts the SIC descriptions have been abbreviated. The full description has been used in the text, as shown in Table 8.

Table 10. Total Construction and Demolition waste generated and survey precision, Wales 2019

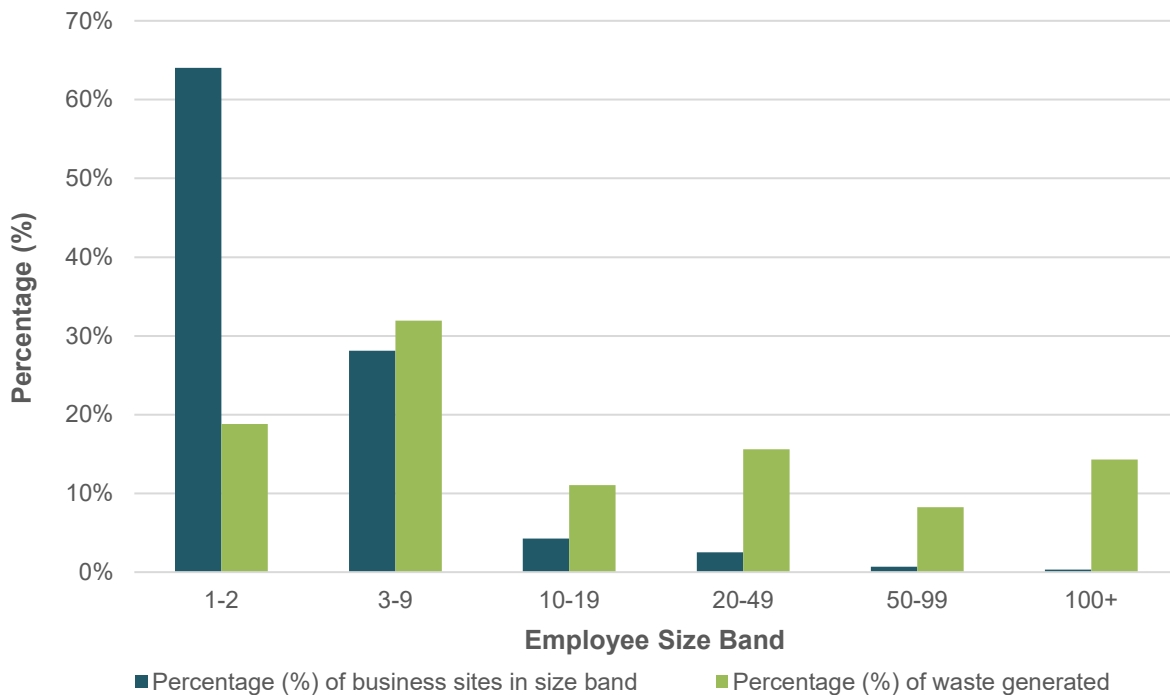
Survey Year	Construction and Demolition waste generation (kt)	Range (%)	Lowest (kt)	Highest (kt)
2019	3,427	+/- 16.7%	2,855	3,999

The 2019 survey results deliver a significant improvement on the survey precision compared with 2012, reducing from +/-33.2% to +/-16.7%, effectively halving the range within which the actual tonnage generated lies from +/- 1.12 Mt to +/- 0.57 Mt.

The 2019 survey provides the most accurate estimate of national C&D waste arisings to date. This increased precision provides a robust indicator for measurement against Welsh Government's waste prevention targets. Comparisons with the 2012 survey results are discussed in section 3.5.

Figure 9 illustrates how the proportion of C&D waste generated compares to the proportion of business sites (as % of total population) across the six employee size bands. The survey found that business sites with '3 to 9' employees generated the most C&D waste (32%), despite having over 60% of the business sites falling within the '1 to 2' employee band. Business sites with over 100 employees accounted for 14% of C&D waste generated despite accounting for <1% of the population.

Figure 9: Construction and Demolition waste by business site employee size band, Wales 2019

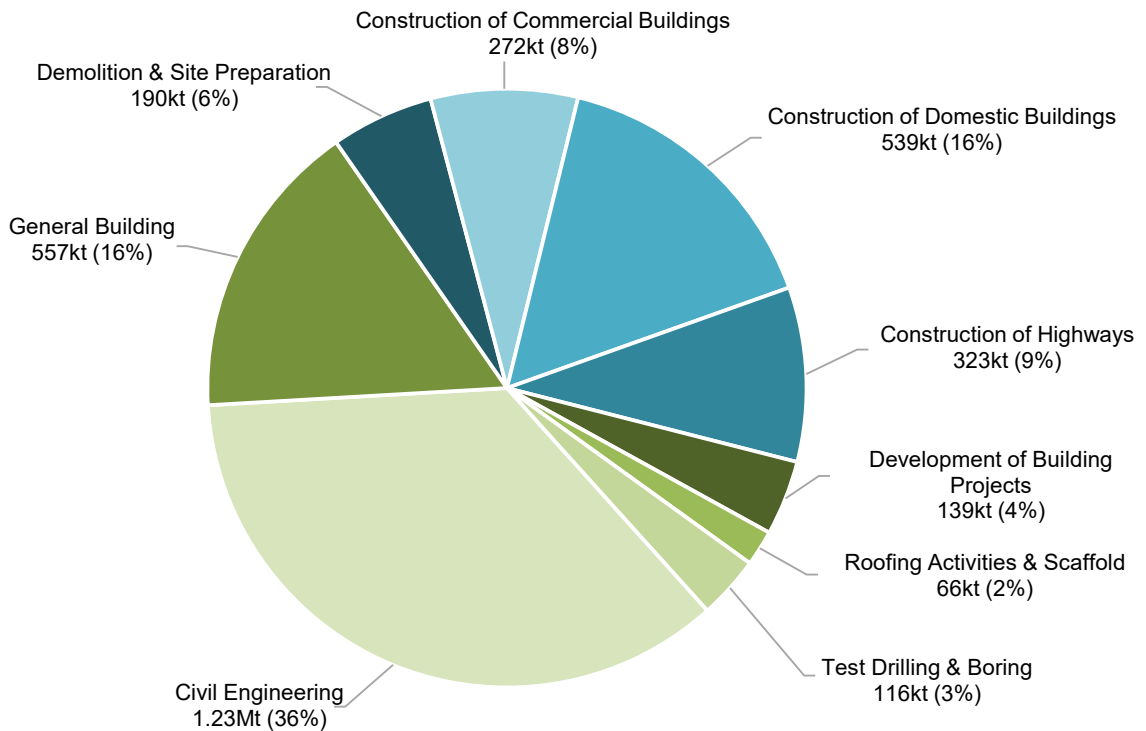


3.1.1 Waste Generation – by Sector

Figure 10 shows the breakdown of total C&D waste generated by sector and Figure 11 shows the waste broken down by waste stream for each of the C&D sectors.

It is important to remember that the grossed up results are based on businesses' primary activities. Many firms are known to undertake a variety of construction and demolition services which sometimes fall into different SIC classifications, for example firms constructing both domestic and commercial buildings, and this should be kept in mind when interpreting the results by sector.

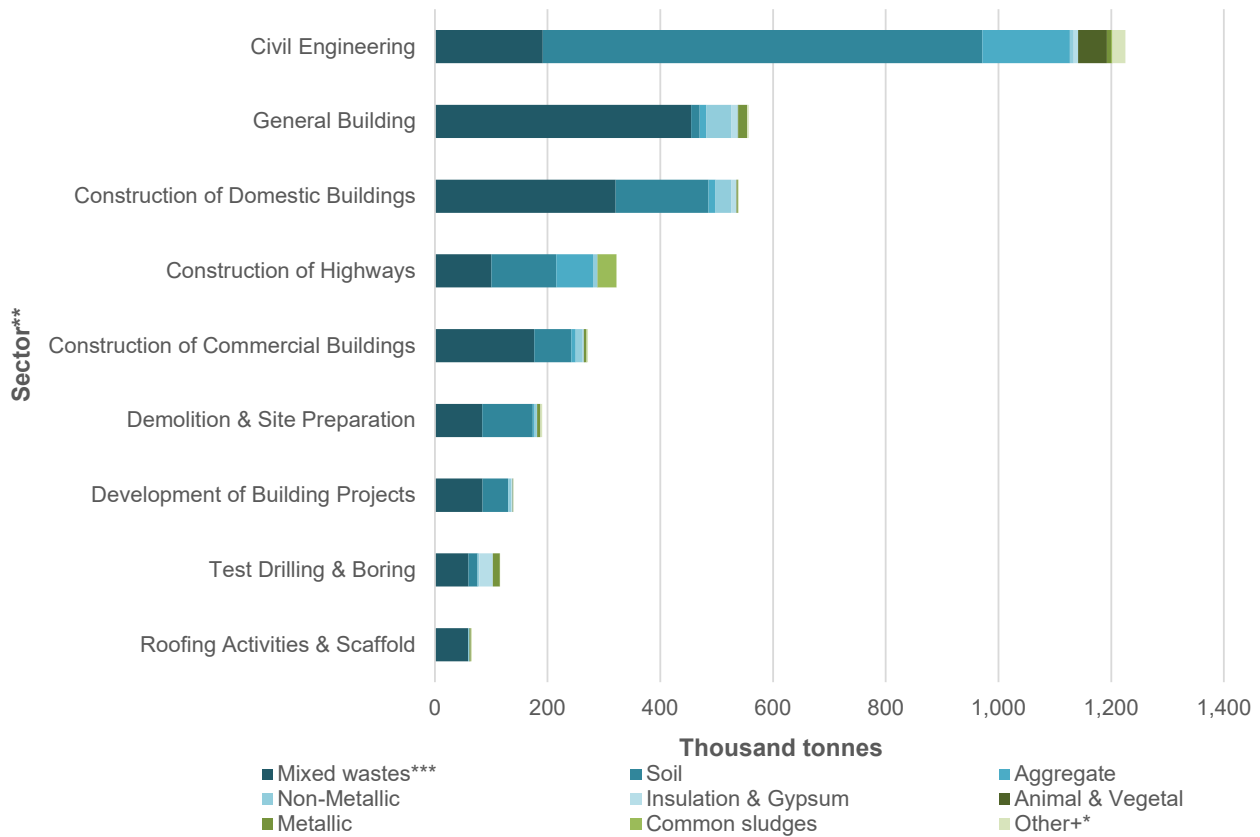
Figure 10: Total waste by sector, Wales 2019



Of the 3.4 Mt of C&D waste generated in 2019:

- Over a third was generated by the Civil Engineering sector, accounting for 1.23 Mt (36%), making this the largest sector in terms of C&D waste generation by a considerable margin.
- Civil Engineering generated the most Soil (780 kt), accounting for over 20% of Wales' total C&D waste arisings.
- The General Building (560 kt) and Construction of Domestic Buildings (540 kt) sectors were the second and third largest, each accounting for c.16% of total C&D waste. The remaining six sectors accounted for less than 10% each of the total C&D arisings.
- General Building generated the most Mixed waste (450 kt), followed by Construction of Domestic buildings (320 kt), which together accounted for half of Mixed waste arisings.
- Demolition accounted for a relatively small proportion of C&D waste, with a significant quantity of materials handled in this sector understood to have avoided entering the waste stream.

Figure 11: Construction and Demolition waste by sector and material stream, Wales 2019

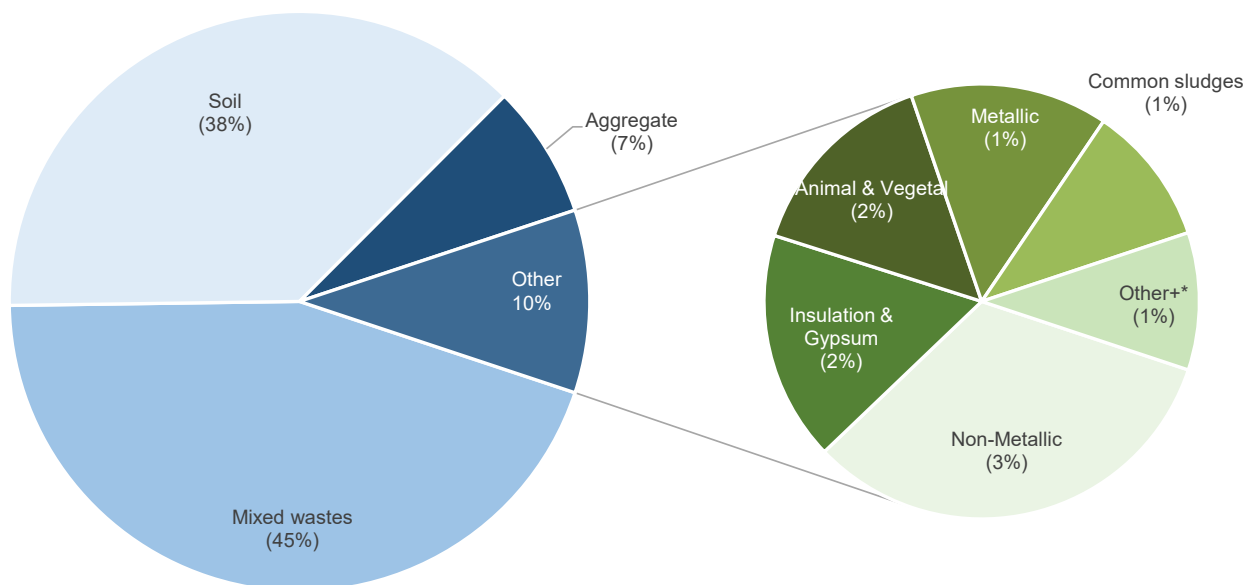


*Other+ includes Chemical wastes, Discarded Equipment and Other Mineral.

3.1.2 Waste Generation – by Material Stream

The relative breakdown of C&D waste arisings by high-level material stream is illustrated in Figure 12. A list of EWC codes included under each material stream is provided within the Technical Appendix.

Figure 12: Construction and Demolition waste by material stream, Wales 2019



*Other+ includes Chemical wastes, Discarded Equipment and Other Mineral wastes.

Mixed waste was the most significant material stream in 2019, with an estimated 1.5 Mt generated across the sector, equivalent to 45% of total C&D waste, followed by Soil at 1.3 Mt (38%).

Whilst segregated Aggregates make up a significant proportion of the remaining material streams (255 kt), it should be noted that this figure excludes mixed aggregates, which are included in the 'Mixed waste' stream (see section 2.5.1 for details).

Table 11 shows a breakdown of material streams grouped into three high-level categories. This shows that of the 1.5 Mt of Mixed wastes, 1.2 Mt was categorised as 'non-hazardous' and 271 kt was categorised as 'inert'. It is likely that there was also a significant quantity of 'inert' waste within the 'non-hazardous' Mixed wastes. However it is not possible to estimate this from the survey results alone, because undertaking a statistically robust compositional analysis of mixed C&D wastes in Wales was out of the scope of this study.

Table 11: Construction and Demolition waste by material stream and high-level category, Wales 2019

Material Stream	Non-hazardous (kt)	Inert (kt)	Hazardous (kt)	Total (kt)
Mixed wastes	1,255	271	5	1,531
Soil	0	1,243	49	1,292
Aggregate	150	56	48	255
Non-Metallic	114	0	0	114
Insulation & Gypsum	59	0	1	60
Animal & Vegetal	52	0	0	52
Metallic	51	0	0	51
Common sludges	36	0	0	36
Other	15	8	13	36
Total	1,733	1,578	116	3,427

Other includes Chemical wastes, Discarded Equipment and Other Mineral wastes

3.2 Waste Generation – by Region

An estimated breakdown of the Construction and Demolition waste arisings in 2019 across each of the three regions of Wales is provided in Table 12.

Table 12: Construction and Demolition waste generated by Region, Wales 2019

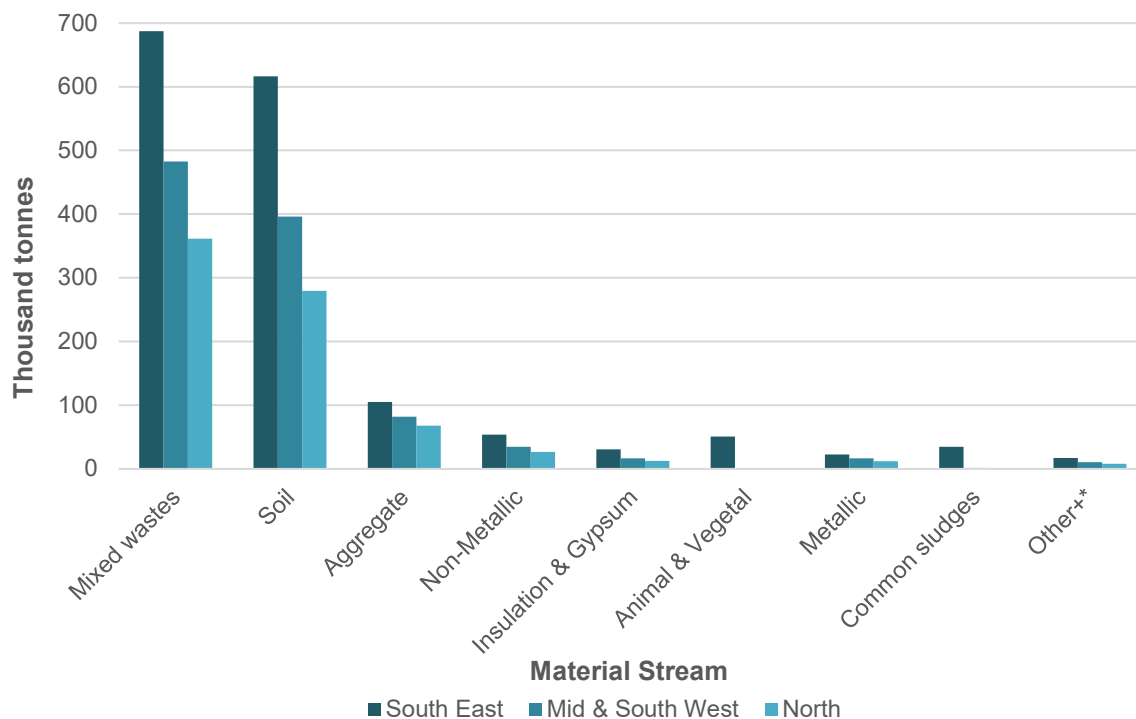
Region	Thousand tonnes	Percentage
South East Wales	1,618	47.0%
Mid & South West Wales	1,040	30.5%
North Wales	769	22.5%
Total	3,427	100%

Table rounded to nearest 0.5%

The majority of C&D waste was generated in South East Wales (47.0%), followed by North Wales (30.5%) and Mid & South West Wales (22.5%).

Following a similar pattern to the national arisings, Figure 13 illustrates the largest material stream generated across each region to be Mixed wastes, followed closely by Soil, with segregated Aggregate heading up the remaining smaller material streams.

Figure 13: Construction and Demolition waste by material stream and region, Wales 2019



*Other+ includes Chemical wastes, Discarded Equipment and Other Mineral.

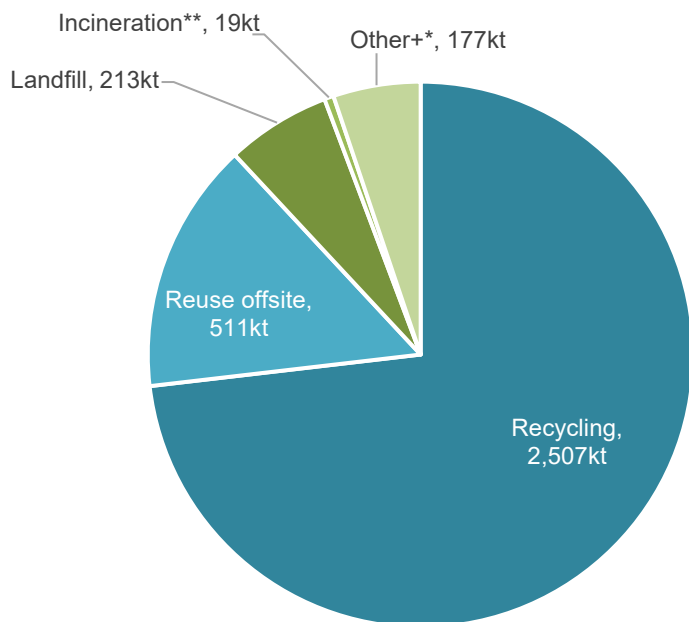
The geographical distribution of business sites surveyed in Wales was approximately 45% in South East Wales, 30% in Mid & South West Wales and 25% in North Wales, which closely resembles the population distribution of both business sites and the general population.

Note that this survey uses the Welsh economic regions of North Wales, Mid & South West Wales and South East Wales, a slightly different regional grouping of local authority areas than the 2012 study. This means that regional results cannot be directly compared with the previous survey.

3.3 Waste Management – National

As shown in Figure 14 and Table 13, at just over 2.5 Mt, the majority of Construction and Demolition wastes were sent for recycling (73%) with a further 511 kt (15%) prepared for Reuse offsite and 213 kt disposed via Landfill (6%). The 19 kt managed by Incineration included 16 kt with Energy Recovery and 3 kt Without Energy Recovery.

Figure 14: Construction and Demolition waste by waste management method, Wales 2019



*Other+ includes management method recorded as Backfilling, Composting, Land Recovery, Other Recovery, Transfer Station, Treatment Plant and 'Don't Know'

**Incineration includes With and Without Energy Recovery

Table 13: Construction and Demolition waste by waste management method, Wales 2019

Waste Management Method	C&D waste (kt)	Percentage
Recycling	2,507	73.2%
Preparation for Reuse offsite	511	14.9%
Landfill	213	6.2%
Other Recovery	53	1.6%
Composting	52	1.5%
Treated	21	0.6%
Incineration	19	0.6%
Land Recovery	12	0.3%
Backfilling	5	0.1%
Other	35	1.0%
Total	3,427	100%

Other includes management method recorded as Transfer Station and 'Don't Know'

3.3.1 Waste Management – by Sector

Within the C&D sector, Recycling rates were higher than Landfill rates for all sectors as shown in Table 14. Development of Building Projects had the highest performance (97%) closely followed by Roofing Activities & Scaffold Erection (96%). The highest Landfill rate was recorded by the Demolition & Site Preparation sector, at 16% of the sector arisings.

The Construction of Highways, Roads, Airfields, and Sport Facilities sector was the lowest performing sector in terms of Recycling with a rate of 78%, although the sector also recorded the highest Recovery rate (10%). This is related to the recovery of bituminous mixtures, coal tar, and tarred products used in road construction.

Table 14: Construction and Demolition waste by sector and waste management method, Wales 2019

C&D Sector	Preparation for Reuse, Recycling, Composting and Backfilling	Landfill	Recovery	Other
Construction of Civil Engineering Constructions	95%	3%	1%	1%
General Building	93%	3%	1%	3%
Construction of Domestic Buildings	83%	10%	3%	4%
Construction of Highways, Roads, Airfields, and Sport Facilities	78%	12%	10%	<0.5%
Construction of Commercial Buildings	85%	8%	6%	1%
Demolition & Site Preparation	84%	16%	<0.5%	<0.5%
Development of Building Projects	97%	3%	<0.5%	<0.5%
Test Drilling & Boring and Other Specialised Construction Activities	94%	6%	<0.5%	<0.5%
Roofing Activities & Scaffold Erection	96%	4%	<0.5%	<0.5%
Total C&D waste	90%	6%	2%	2%

Subtotals may not sum to 100% due to rounding.

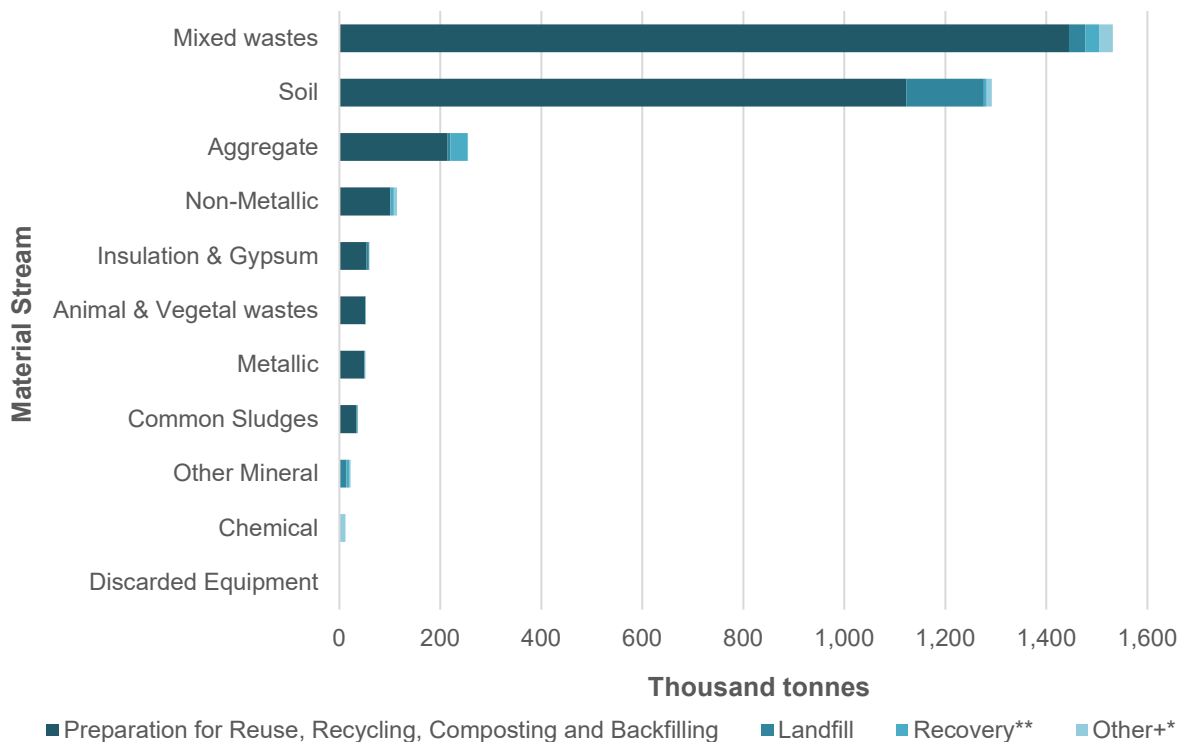
Recovery includes Incineration with Energy Recovery, Land Recovery and Other Recovery.

Other includes Incineration Without Energy Recovery, Transfer Station, Treatment Plant and 'Don't Know'.

3.3.2 Waste Management – by Material Stream

Figure 15 shows that relatively high levels of Recycling were achieved across the major waste streams.

Figure 15: Construction and Demolition waste by material stream and management, Wales 2019



*Recovery includes Incineration with Energy Recovery, Land Recovery and Other Recovery.

**Other+ includes Incineration Without Energy Recovery, Other Mineral, Transfer Station, Treatment Plant and when management method was recorded as 'Don't Know'.

A detailed breakdown of wastes by material stream and management method is provided in Table 15. The table shows high rates of Recycling for Mixed wastes, Soil, and Aggregates.

It is important to note that these management end fates have been reported by the producers of the waste. Management of waste is a complicated matter with wastes often moving through multiple facilities and bulked with waste from other origins before reaching end fate. It follows that the producer reported fates may not necessarily take into consideration any waste collected for recycling that was subsequently diverted for disposal following treatment by the waste industry (and vice versa).

Although 88% of Soil waste was diverted from Landfill, the remaining 12% was the largest contributing material to Landfill. At 154 kt, Soil waste accounted for 72% of C&D waste sent directly to Landfill in 2019.

Table 15: Construction and Demolition waste by material stream and waste management method, Wales 2019

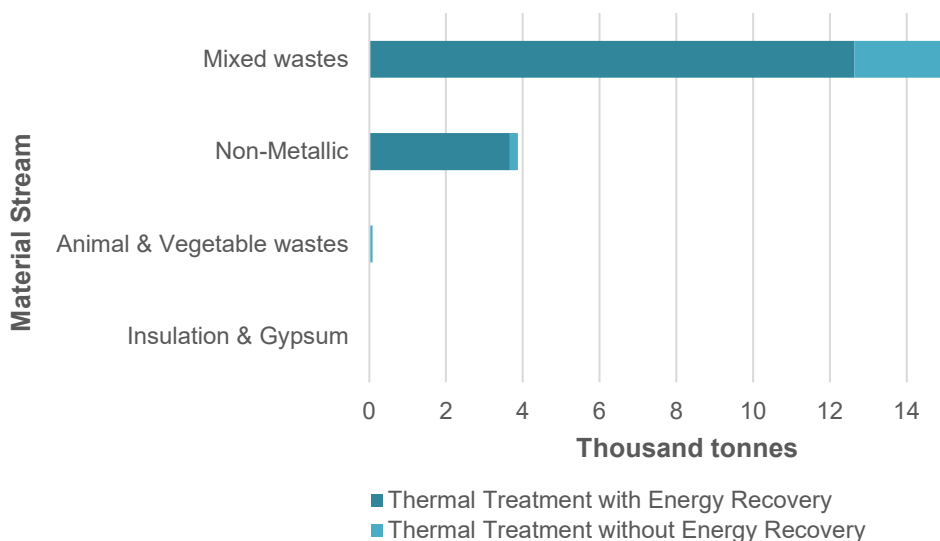
Material Stream	Preparation for Reuse, Recycling, Composting and Backfilling (kt & % of material stream)	Landfill (kt & % of material stream)	Recovery (kt & % of material stream)	Other (kt & % of material stream)	Total (kt & % of material stream)
Mixed wastes	1,445 (94%)	32 (2%)	27 (2%)	27 (2%)	1,531
Soil	1,123 (87%)	154 (12%)	6 (0%)	10 (1%)	1,292
Aggregate	215 (84%)	6 (2%)	34 (13%)	0 (0%)	255
Non-Metallic	101 (88%)	0 (0%)	6 (6%)	7 (6%)	114
Insulation & Gypsum	54 (91%)	5 (8%)	0 (0%)	1 (1%)	60
Animal & Vegetal wastes	52 (99%)	0 (0%)	0 (0%)	0 (0%)	52
Metallic	50 (97%)	0 (1%)	1 (2%)	0 (0%)	51
Common Sludges	34 (92%)	3 (7%)	0 (0%)	0 (0%)	36
Other Mineral	1 (6%)	13 (57%)	7 (29%)	2 (8%)	23
Chemical	0 (1%)	0 (0%)	0 (4%)	12 (95%)	13
Discarded Equipment	0 (79%)	0 (0%)	0 (21%)	0 (0%)	0
Total	3,074 (90%)	213 (6%)	81 (2%)	59 (2%)	3,427

Recovery includes Incineration with Energy Recovery, Land Recovery and Other Recovery.

Other includes Incineration Without Energy Recovery, Transfer Station, Treatment Plant and 'Don't Know'.

Aggregates and Mixed wastes comprised the largest contribution to the 81 kt sent for Recovery. Recovery included 19 kt sent directly for thermal treatment, of which 86% included some form of energy recovery. Of the 16 kt sent for energy recovery approximately 12 kt was Mixed wastes and 4 kt was categorised as 'Non-Metallic', the latter of which included wood, plastic, cardboard and other combustibles. A breakdown of wastes sent for thermal treatment is provided in Figure 16.

Figure 16: Construction and Demolition waste managed by thermal treatment, Wales 2019



3.4 Waste Management – by Region

Table 16 and Figure 17 show the differences in the management methods of Construction and Demolition wastes generated in each of the regions.

Recycling was the dominant recorded waste management method across each region of Wales. Each of the regions recorded a comparable Recycling rate to the national rate, with no statistically significant difference between regional performance.

Landfill rates ranged from 5% to 7% across the regions. The highest Landfill rate was recorded in the Mid & South West region. The variations in regional performance was not statistically significant.

Further details on the generation and management of all these wastes can be found in the Technical Appendices.

Figure 17: Construction and Demolition waste by management method and region, Wales 2019

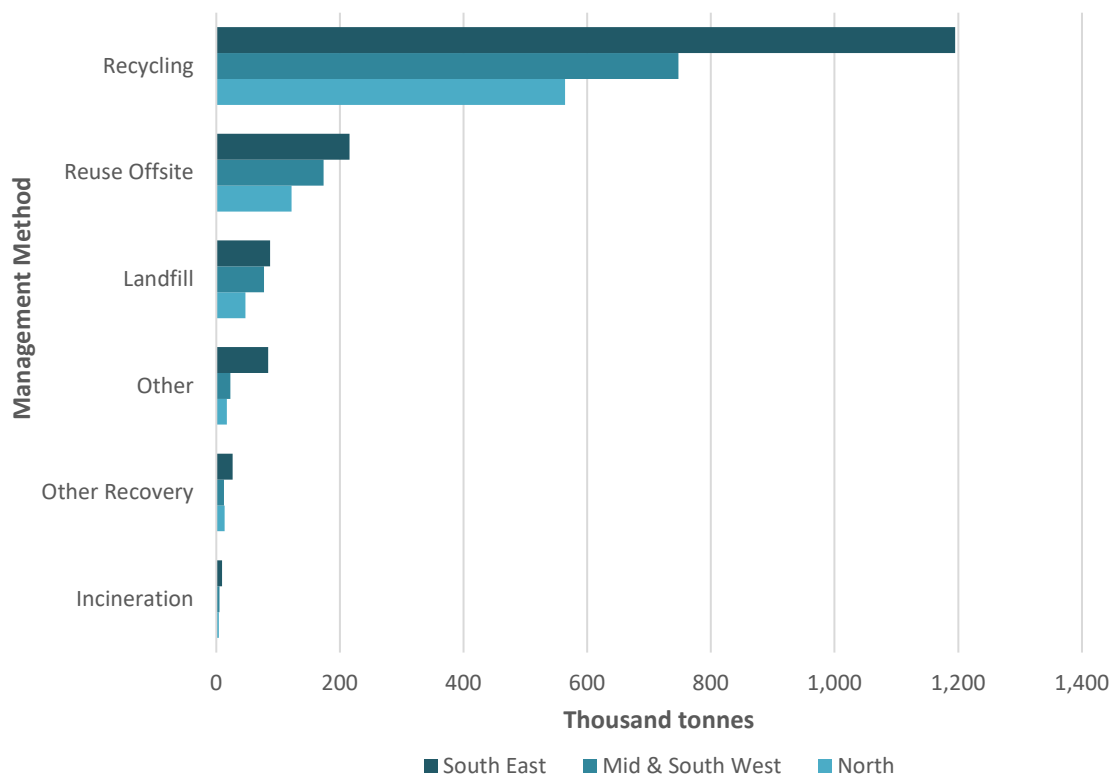


Table 16: Construction and Demolition waste by management method and region, Wales 2019

Waste management method	South East Wales (kt & %)	Mid & South West Wales (kt & %)	North Wales (kt & %)	All Wales (kt & %)
Preparation for Reuse, Recycling, Composting and Backfilling	1,463 (90%)	924 (89%)	688 (89%)	3,074 (90%)
Landfill	87 (5%)	78 (7%)	47 (6%)	213 (6%)
Treated	10 (<1%)	7 (<1%)	5 (<1%)	21 (<1%)
Incineration	9 (<1%)	5 (<1%)	4 (<1%)	19 (<1%)
Land Recovery	4 (<1%)	4 (<1%)	3 (<1%)	12 (<1%)
Other	44 (3%)	23 (2%)	22 (3%)	88 (3%)
Total	1,618	1,040	769	3,427

Incineration includes With and Without Energy Recovery.

Other includes waste management via Other Recovery, Transfer Station and 'Don't Know'

3.5 Comparison with Previous Surveys and Targets in ‘Towards Zero Waste’ National Waste Strategy

Comparing data with previous survey results is the only way that high-level trends can be identified because surveys are the only way of gathering this information at present. The ability to compare the 2012 and 2019 C&D results is constrained by the precision achieved by the two surveys. Both surveys have a certain margin of error, so differences between the 2012 and 2019 survey will sometimes be due to sampling error rather than a genuine change in waste generation or management. This must be taken into consideration when reading this section.

It is important to also be mindful of the variable nature of the construction and demolition sector. Fluctuations in sector activity can have a direct impact on annual C&D waste generation, and arisings can be significantly influenced by the size and location of projects. For example, overall arisings can increase simply due to there being more and/or larger-scale projects in a particular surveyed year, whilst the average weight generated per unit at a project level may have decreased.

Other potential sources of variability include the tendency for businesses to ‘cross-over’ between different SIC classifications, with many undertaking significant activities across the subsectors and the inconsistent application of EWC codes within industry. The ‘snapshot’ of performance brought by a survey may not necessarily be a good indicator of underlying trends within each C&D sector. Comparisons of 2019 with 2012 have therefore been limited to national results on waste generation, recycling performance, and landfill disposal.

3.5.1 Waste Generation

The 3.43 Mt of C&D waste generated in 2019 is comparable to the 2012 estimate of 3.36 Mt (Natural Resources Wales 2014). The estimated 68 kt increase in Construction and Demolition waste generated in Wales in 2019 compared to 2012 is not statistically significant because it is less than the margin of error between both surveys.

The 2019 survey results delivered a significant improvement on the survey precision compared with 2012, reducing from 33.2% to 16.7%. This improved precision effectively halves the range of uncertainty within which the actual tonnage of C&D waste generated lies from +/- 1.12 Mt to +/- 0.57 Mt compared to 2012 (based on C&D generation of 3,359 kt +/-33.2% in 2012, and 3,427 kt +/-16.7% in 2019). This provides the most accurate estimate of C&D waste generated in Wales undertaken to date as shown in Table 17.

Table 17: Comparison of Construction and Demolition waste in Wales in 2012 and 2019

Survey Year	Construction and Demolition waste generated (kt)	Range (%)	Lowest (kt)	Highest (kt)
2019	3,427	+/- 16.7%	2,855	3,999
2012	3,359	+/- 33.2%	2,244	4,475

3.5.2 Waste Prevention

The waste prevention target for Construction and Demolition waste is a reduction of 1.4% every year until 2050, using 2006/07 as baseline (Welsh Government 2010). This equates to an annual reduction of 75,701 tonnes to a target of 4.42 Mt for 2019/20.

Figure 18 illustrates the targeted maximum C&D waste arisings for 2019/20 and shows that the target was achieved by the C&D sector when measured against both the estimated tonnes generated in 2019 (3.43 Mt) and the margin of survey error (+/-0.57 Mt).

Figure 18: Generation of Construction and Demolition waste compared to the target, Wales 2019



3.5.3 Recycling

Towards Zero Waste set a Recycling target (comprised of Preparation for Reuse, Recycling, Backfilling and Composting) of 90% by 2019/20 for the Construction and Demolition Sector. The target excludes hazardous wastes and naturally occurring soil and stones (Welsh Government 2010).

The survey results show that Wales achieved the target in 2019 based on the estimated 93% Recycling performance.

When including hazardous waste and natural occurring soils to the total, 3.07 Mt was sent for Preparation for Reuse, Recycling, Composting and Backfilling activities, providing an estimated recovery rate of 90%. Mixed waste was the largest contributing material group, the majority of which was generated by the General Building sector.

As with previous surveys, these estimates are limited to the accuracy of information on final fates held by the waste producers. Any material collected for recycling but subsequently disposed of by the waste industry (i.e. due to contamination or inherent non-recyclability) is unlikely to be reported back to all waste producers, therefore this estimate is likely to represent the 'maximum' recycling rate. Further detail on survey precision is available in the Technical Appendices.

3.5.4 Landfill

Towards Zero Waste contains targets to reduce the quantity of C&D waste Landfilled in Wales based on a percentage reduction of the 2007 baseline, with a specific target of a 75% reduction set for 2019/20 (Welsh Government 2010). This translates into a target of no more than 318 kt to Landfill by 2019 based on a baseline figure of 1,272kt (Environment Agency Wales 2006).

The survey results show that Wales achieved the target in 2019 based on the estimated tonnes generated in 2019 of 213 kt.

Similarly to recycling, landfill estimates are also limited to the accuracy of information on final fates held by the waste producers.

The increasing costs of landfilling waste (Welsh Government 2022) are likely to be a significant contributor to less Construction & Demolition waste being sent direct to landfill and more being sent to intermediate waste sorting facilities compared to 2012. Waste materials are extracted for recycling at these facilities but, ultimately, a proportion of waste may have been unsuitable for recycling and sent indirectly for disposal to landfill. This detail may not have been reported back to waste producers and thus reported landfill figures are likely to be a 'minimum' estimate. Further detail on survey precision is available in the Technical Appendices.

4. Hazardous Waste

The Hazardous waste nature of individual waste streams was recorded, based upon a definition of Hazardous waste from the Hazardous waste regulations (UK Government 2005).

An estimated 116 kt of Hazardous waste was generated by the Construction and Demolition industry in 2019 out of a total waste generation of 3.4 Mt (3%).

A detailed breakdown of high-level waste nature (including Hazardous, Non-Hazardous and Inert) by sector is provided in Table 18, including the percentage breakdown across the three waste nature groupings.

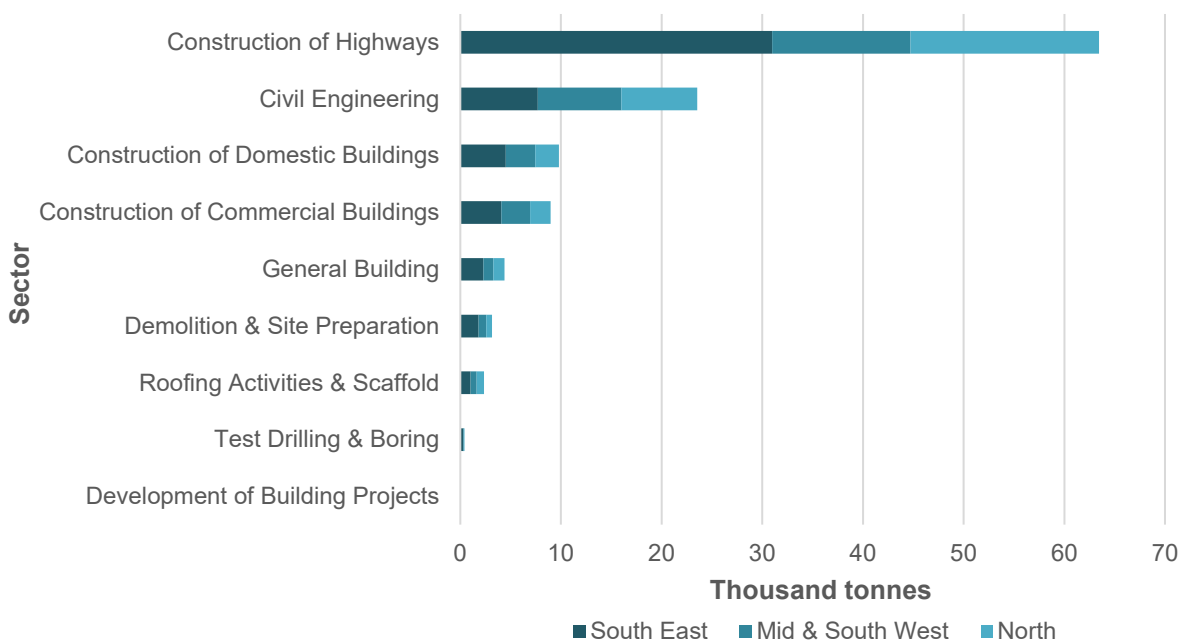
Table 18: Construction and Demolition waste by sector split by Hazardous, Non- Hazardous waste and Inert waste, Wales 2019

Sector	Hazardous (kt)	Hazardous (%)	Non-hazardous (kt)	Non-hazardous (%)	Inert (kt)	Inert (%)	Total (kt)
Construction of Highways	63	20%	133	41%	127	39%	323
Roofing Activities & Scaffold	2	4%	59	89%	5	7%	66
Construction of Commercial Buildings	9	3%	185	68%	78	29%	272
Civil Engineering	24	2%	339	28%	863	70%	1,225
Construction of Domestic Buildings	10	2%	327	61%	202	37%	539
Demolition & Site Preparation	3	2%	19	10%	168	88%	190
General Building	4	1%	524	94%	29	5%	557
Test Drilling & Boring	0	0%	73	63%	42	37%	116
Development of Building Projects	0	0%	75	54%	64	46%	139
Total	116	3%	1,733	51%	1,578	46%	3,427

Figure 19 shows that the sectors generating the largest quantity of C&D Hazardous waste were the:

- Construction of Highways, Roads, Airfields and Sports Facilities sector generating 63 kt (55%), which was 20% of the total waste generated by this sector. This sector also generated the most Hazardous waste in 2012 (20 kt).
- Construction of Civil Engineering Constructions was the next highest generating 24 kt (20%) of hazardous waste.

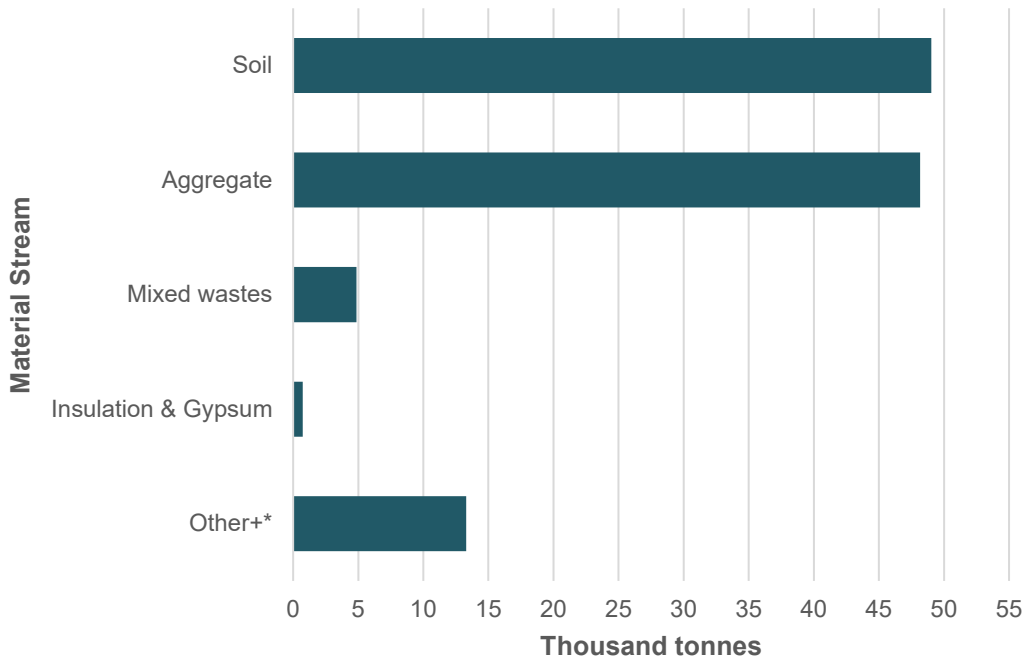
Figure 19: Hazardous waste by Construction and Demolition sector and region, Wales



The relatively high level of Hazardous waste generation within the Construction of Highways sector was driven by the generation of bituminous mixtures, coal tar, and tarred products wastes – all of which are fundamental to road construction. Contaminated soils was also generated from these construction sites.

Figure 20 shows that by material stream, Soil and Aggregates accounted for the majority of Hazardous wastes generated in Wales in 2019, at 49 kt and 48 kt respectively - collectively accounting for over 84% of Hazardous materials generated.

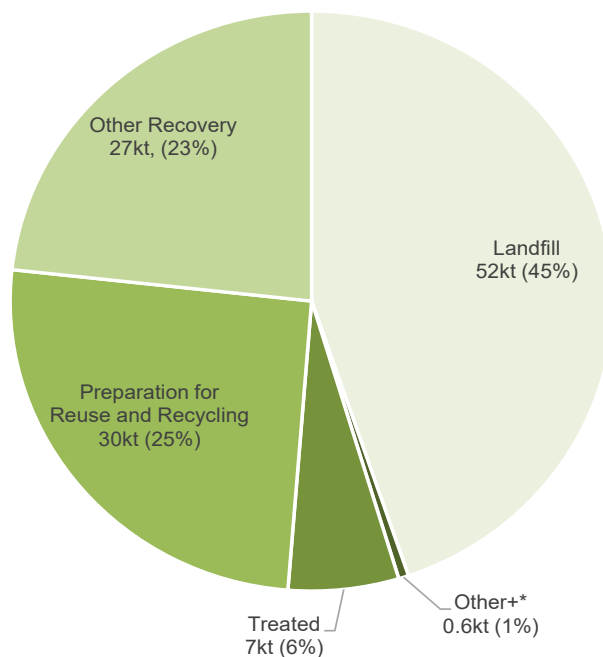
Figure 20: Construction and Demolition Hazardous waste by material stream, Wales 2019



*Other+ includes Animal & Vegetal wastes, Chemical wastes, Common Sludges, Discarded Equipment, Metallic, Non-Metallic, Other Mineral

Figure 21 shows the management of Hazardous waste generated in Wales in 2019. The majority of Hazardous C&D waste was reported as being managed by Landfill (52 kt), sent for Preparation for Reuse and Recycling (30 kt), and Other Recovery (27 kt).

Figure 21: Construction and Demolition Hazardous waste by waste management method, Wales 2019



*Other+ includes waste management via Transfer Station and when management method was recorded as 'Don't Know'.

5. Priority Materials

Following analysis of the 2019 survey results, the following materials were identified as priority materials for additional analysis and consideration in future studies:

- Mixed Wastes
- Soil
- Wood

Towards Zero Waste also identifies plastic, metal, and insulation & gypsum as a priority for C&D waste due to their potential to reduce Wales' ecological footprint. Whilst important, the potential to undertake insightful analysis of these materials using the survey data is more limited – the implications from such priority materials being included within Mixed wastes is discussed further in section 5.1.

The analysis of Soil and Wood in this section is based on waste that has already been segregated, and is therefore not inclusive of quantities that may reside within Mixed wastes.

It should be noted that the sample frame for this survey was designed to provide overall waste generation figures and so the precision limits (the plus or minus from the stated value) will widen substantially at this level of reporting.

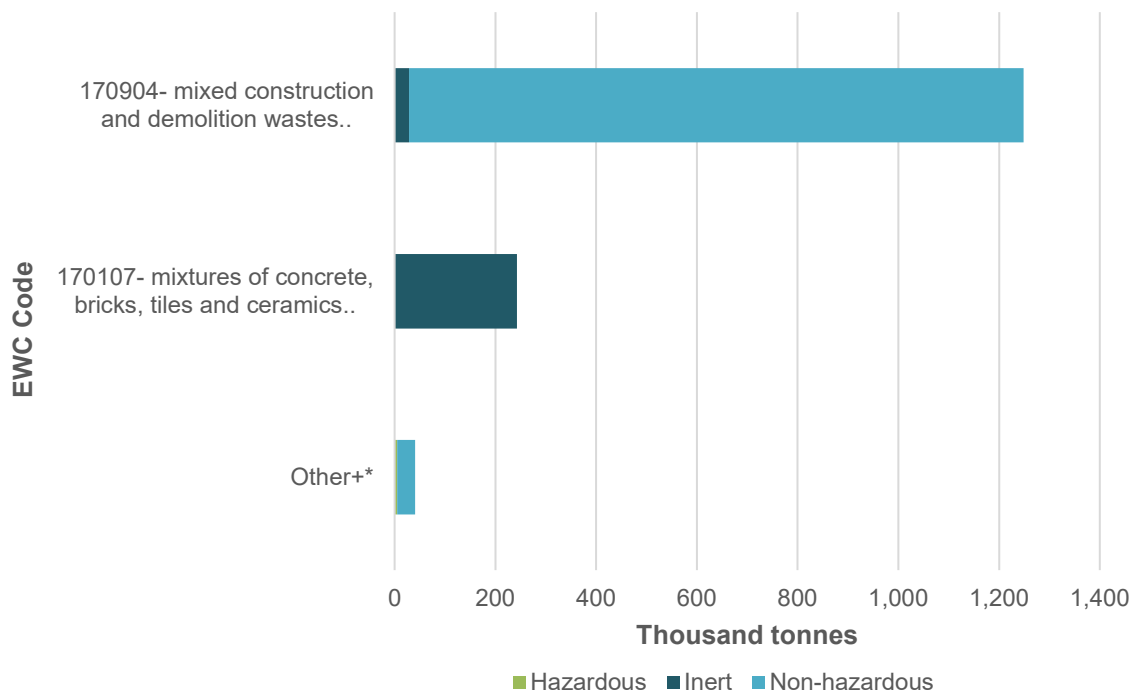
5.1 Mixed Wastes

An estimated 1.5 Mt of Mixed waste was generated by the C&D sector in 2019, which at 45% of generated C&D waste is the largest material stream.

There is uncertainty regarding the use of Mixed waste codes by industry, with potential for these to be applied inconsistently by different users. With this in mind, the Mixed waste category in this 2019 survey contains both the EWC code intended for inert mixtures of C&D waste (17 01 07), as well as the EWC code for general mixtures of C&D waste (17 09 04).

Together, EWC codes 17 01 07 and 17 09 04 accounted for 97% of Mixed waste arisings in 2019, as illustrated in Figure 22. Due to the uncertainty with regards to the coding of Mixed wastes, the split between 17 09 04 and 17 01 07 should be treated with caution and is indicative at best.

Figure 22: EWC codes used to categorise Mixed wastes and their nature, Wales 2019



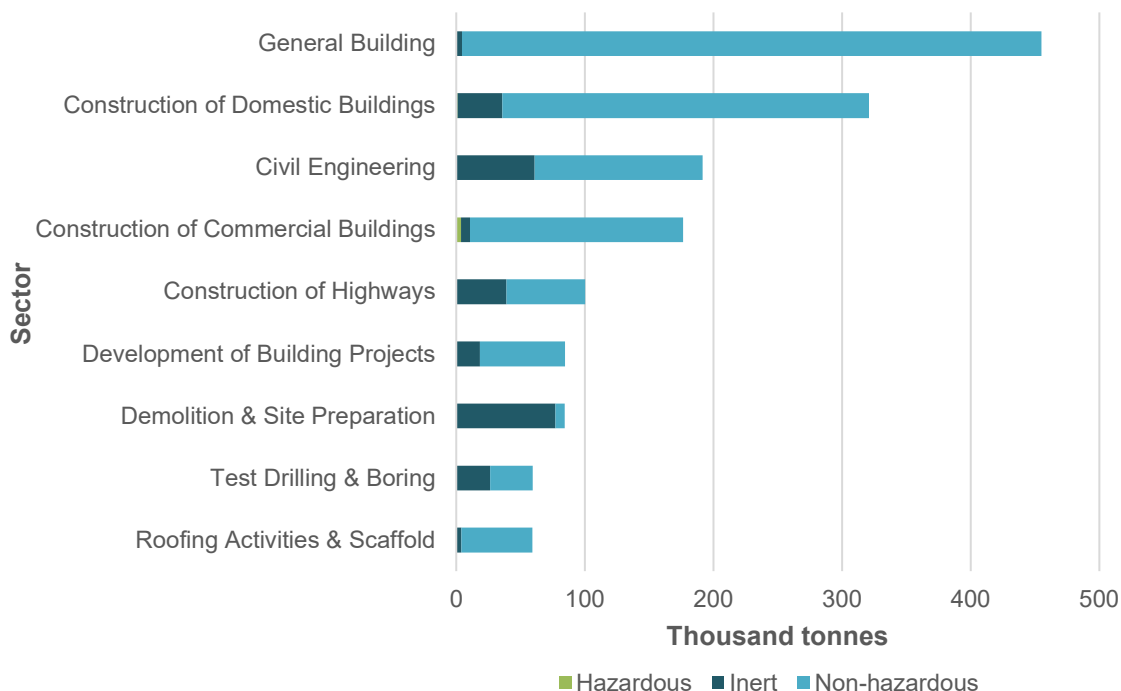
*Other+ includes the following EWC codes: 150106, 160199, 160799, 170903, 200199, 200301, 200303, 200307, 200399.

General Building generated the most Mixed waste (450 kt), followed by Construction of Domestic buildings (320 kt), which together account for half of Mixed waste arisings, as illustrated in Figure 23.

The majority of Mixed wastes were categorised as Non-hazardous in nature (82%), with the balance described as Inert (18%) and only a small fraction as Hazardous (<1%). Figure 23 identifies Demolition & Site Preparation as the only sector to generate a majority of Mixed wastes described as Inert.

Although the Inert and Hazardous/Non-hazardous categories are a useful indicator of the nature of Mixed wastes, they can be subject to the same pitfalls regarding consistency of application within industry previously described for EWC codes 17 09 04 and 17 01 07, and should be interpreted with a degree of caution.

Figure 23: Mixed wastes arisings by sector and nature, Wales 2019



The composition of Mixed wastes is identified as a significant information gap and cannot be accurately estimated with the 2019 survey data alone. The only insight into Mixed wastes composition (beyond the application of EWC codes) provided by the 2019 survey is through analysis of responses to the survey’s Mixed waste composition question. This question prompted participants with Mixed waste tonnages to enter information on material types and approximate percentage composition by volume. The volumetric estimates did not have to sum to 100% if the participant was unable to provide a comprehensive estimate. For example, a valid response might have estimated 50% rubble + 30% wood, leaving 20% unknown.

The volumetrically estimated Mixed waste composition data was not a core element of the 2019 survey. Most businesses do not retain reliable data on their Mixed waste compositions. Therefore the volumes are mostly approximated and subject to considerable uncertainty. In the absence of an accurate composition of Mixed wastes, a high-level analysis of the volumetric estimates identified that the most frequently referenced materials present in Mixed wastes were as follows:

- Packaging material,
- Wood,
- Plastic,
- Inerts.

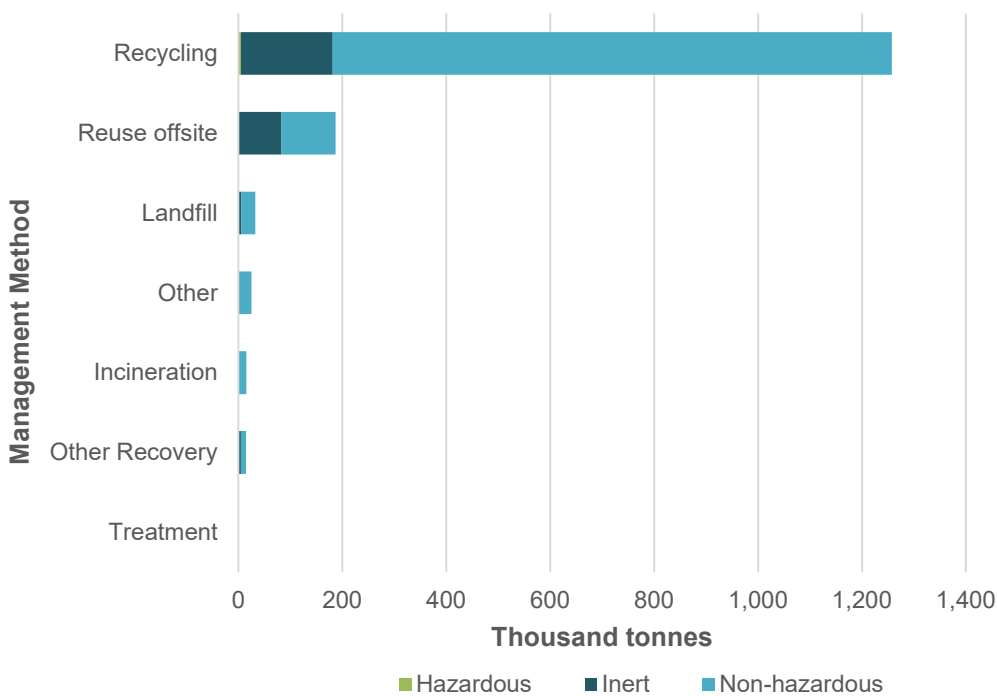
The knowledge gap regarding the composition of Mixed C&D wastes could be addressed by undertaking a separate compositional analysis study on these waste streams. Such a study would allow for an accurate estimate of total C&D waste arisings by material to be made, by corroborating Mixed waste arisings with reliable composition data. A

compositional study would also provide further information on the total quantities of C&D priority materials identified in Towards Zero Waste.

The vast majority of Mixed waste was collected for recycling in 2019, as illustrated in Figure 24. In addition to identifying the composition of Mixed C&D wastes generated, it is also recommended that research be undertaken to identify the level of material diversion at facilities receiving Mixed wastes, such as the level and nature of facility rejects.

Understanding more detail on the management of mixed C&D wastes will provide useful information on which materials would benefit from future segregation, and could inform future policies to deliver targeted support to businesses.

Figure 24: Management methods of Mixed wastes in the Construction and Demolition sector, Wales 2019

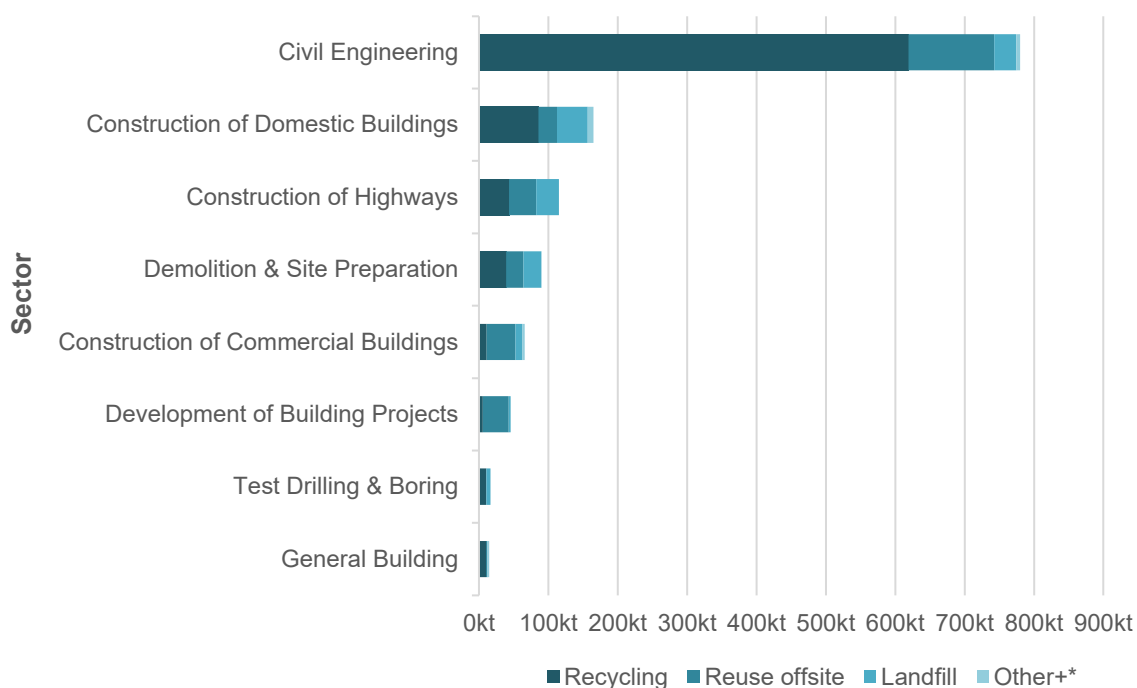


5.2 Soil

An estimated 1.3 Mt of Soil waste was generated as a separate material stream (excluding soil generated in mixed wastes) by the Construction and Demolition sector, making it the second largest material stream in 2019 (see Figure 12 for national results by material stream).

Of the total Soil wastes generated, around 820 kt (87%) was Prepared for Reuse or Recycling – mainly from the Civil Engineering sector – with just over 150 kt (12%) sent directly to Landfill. Figure 25 shows the management of Soil wastes across the C&D sectors in 2019.

Figure 25: Segregated Soil waste by management method and sector, Wales 2019

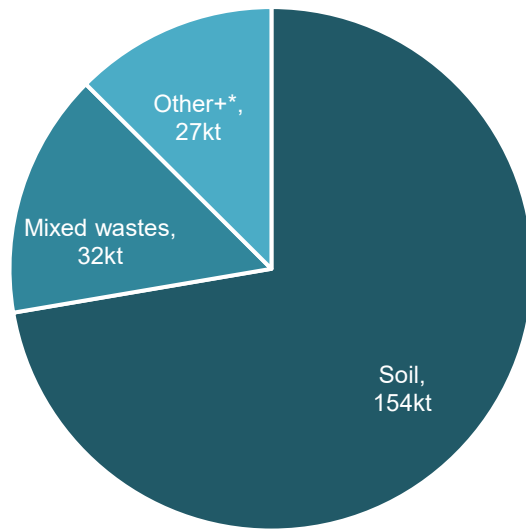


*Other+ includes Backfilling, Land Recovery, Other Recovery, Treatment, and when management method was recorded as 'Don't Know'.

At c.150 kt, Soil was the largest contributing material type disposed directly to Landfill, accounting for approximately 72% of Landfilled C&D waste in 2019 (see Figure 26). Of the small number of respondents that gave a reason for this, contamination was the most referenced, with one respondent citing invasive weeds as an example of a contaminant.

Given the prevalence of Soils sent directly to Landfill it is recommended that further research be undertaken to understand the drivers behind this, to what extent Soil is being buried as waste within the void of landfills and the extent it is being used as part of landfill management and restoration activities (e.g. lining and capping).

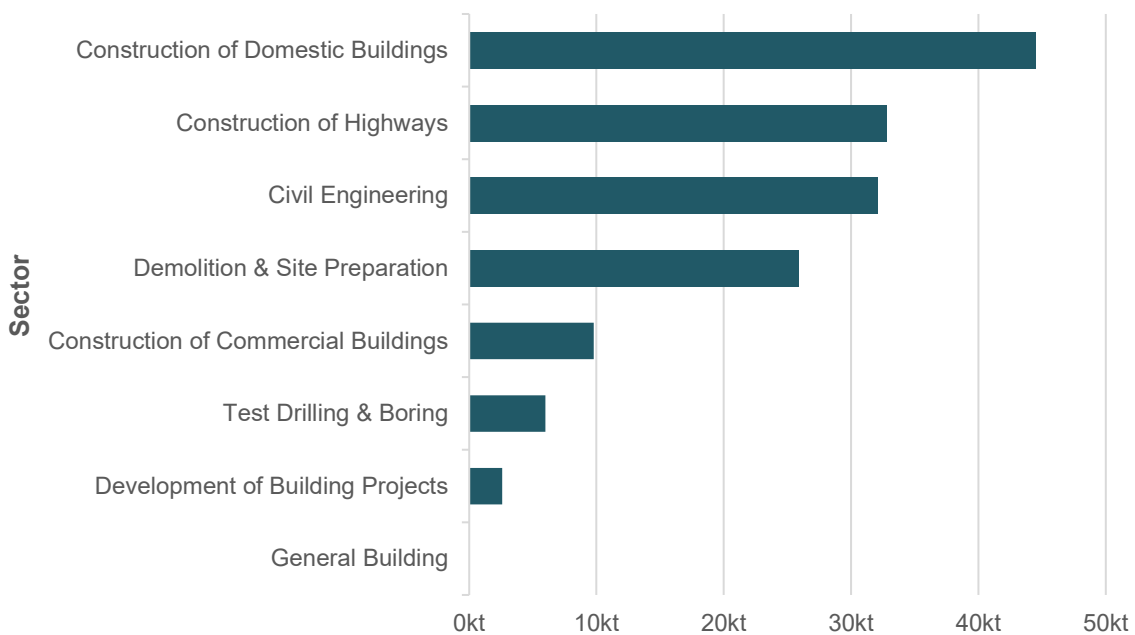
Figure 26: Landfilled Construction and Demolition waste by material stream, Wales 2019



*Other+ includes Backfilling, Land Recovery, Other Recovery, Treatment, and when management method was recorded as 'Don't Know'.

In terms of Soil wastes sent directly to Landfill, Construction of Domestic Buildings was estimated to be the largest contributing sector at around 45 kt, as illustrated in Figure 27. Although the General Building sector reported only a negligible quantity of directly landfilled Soils, it accounted for the majority of Mixed wastes directly landfilled (34%), which likely included soil material.

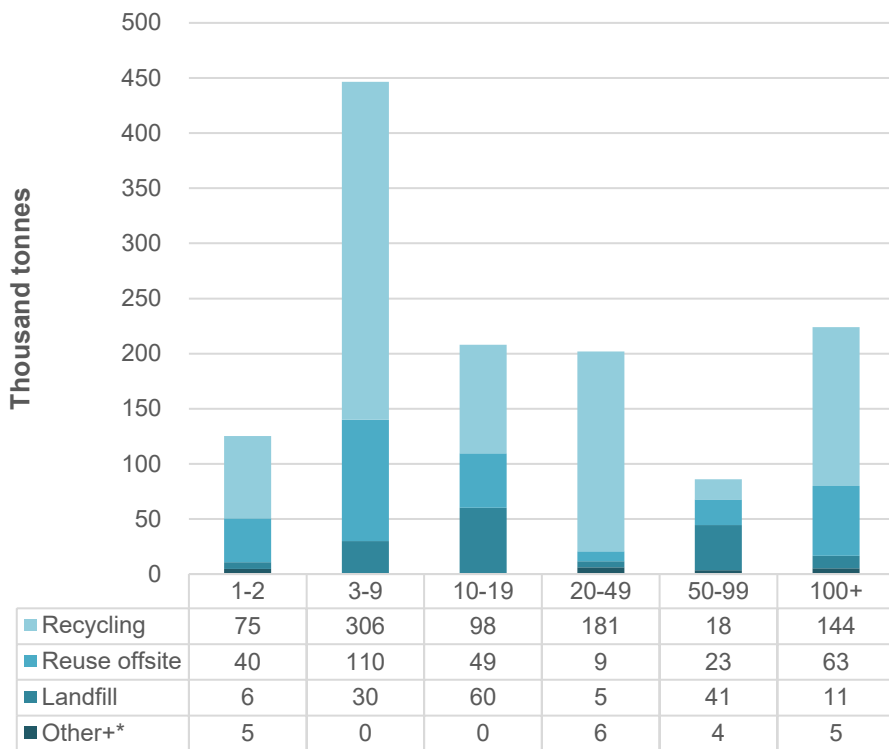
Figure 27: Landfilled Soil wastes by sector, Wales 2019



It is recommended that any future mixed C&D composition study undertaken considers variation in composition by sector, as this will be able to inform future policy and targeted measures such as reducing Soil disposal to landfill.

Figure 28 shows that whilst the majority of Soil was generated by companies with 3-9 employees, most of this material was Prepared for Reuse and Recycled. The largest quantities of Soil waste sent directly to Landfill was from businesses with 10-19 employees (60 kt) and 50-99 employees (41 kt).

Figure 28: Segregated Soil wastes by business site employee size band split by material stream, Wales 2019



*Other+ includes waste management via Backfilling, Land Recovery, Other Recovery, Treatment, and when management method was recorded as 'Don't Know'.

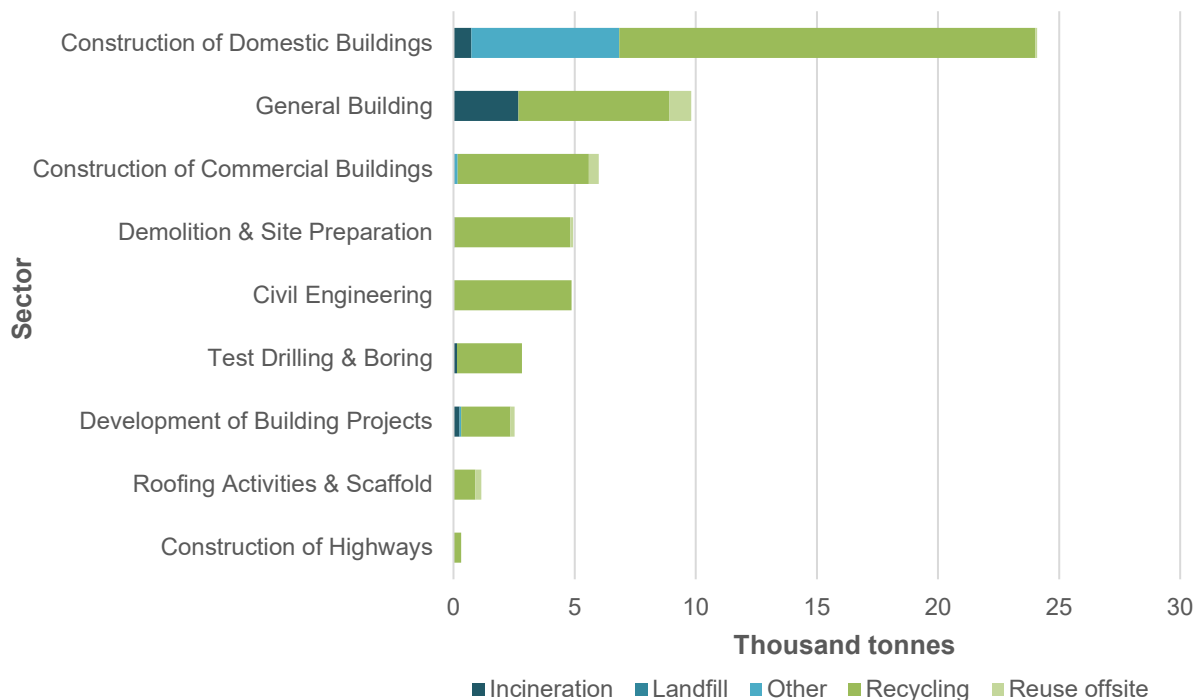
5.3 Wood

An estimated 56 kt of segregated Wood waste (excluding wood present in mixed wastes) was generated in 2019, with over 40% of this arising from the Construction of Domestic Buildings sector. The General Building sector was the second largest with just under 10 kt (17%).

The General Building and Construction of Domestic Buildings sectors also generated the most Mixed wastes, which is understood to contain significant quantities of Wood, although accurate data on this is not currently available.

Generation of segregated Wood waste by sector is shown in Figure 29.

Figure 29: Segregated Wood wastes by sector, Wales 2019

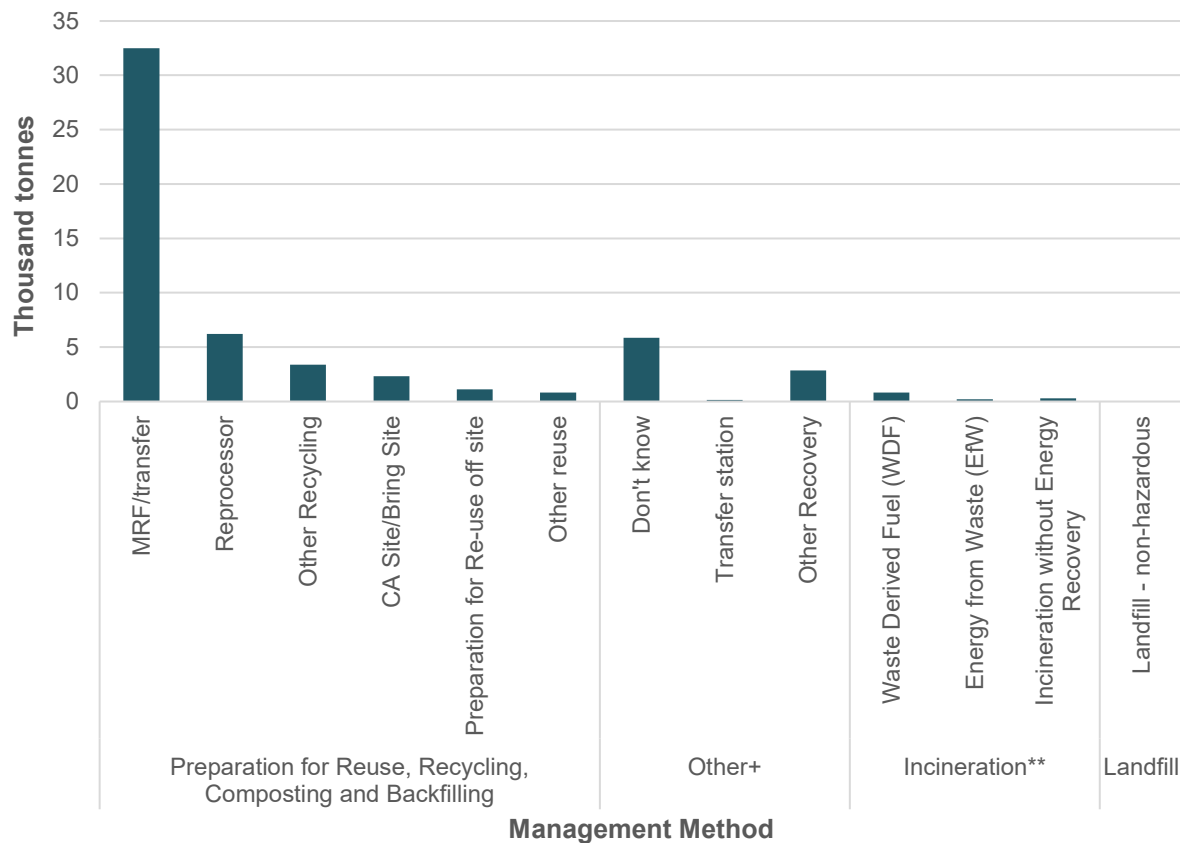


The majority (nearly 80%) of segregated Wood was sent for Recycling, and this trend was reflected across all the sectors. Only around 6% (<4 kt) of segregated Wood was identified by businesses surveyed as going for Thermal Treatment with Energy Recovery. None of the wood material was identified as Hazardous in nature.

Figure 30 shows that most of the segregated Wood waste collected for Reuse and Recycling was sent to MRF/transfer facilities. There is evidence from permitted waste wood sorting facilities that these facilities are substantial feeders for Chapter IV Industrial Emissions Directive compliant facilities, indicating that more C&D wood may be being sent for incineration than known or reported by the C&D waste producers surveyed.

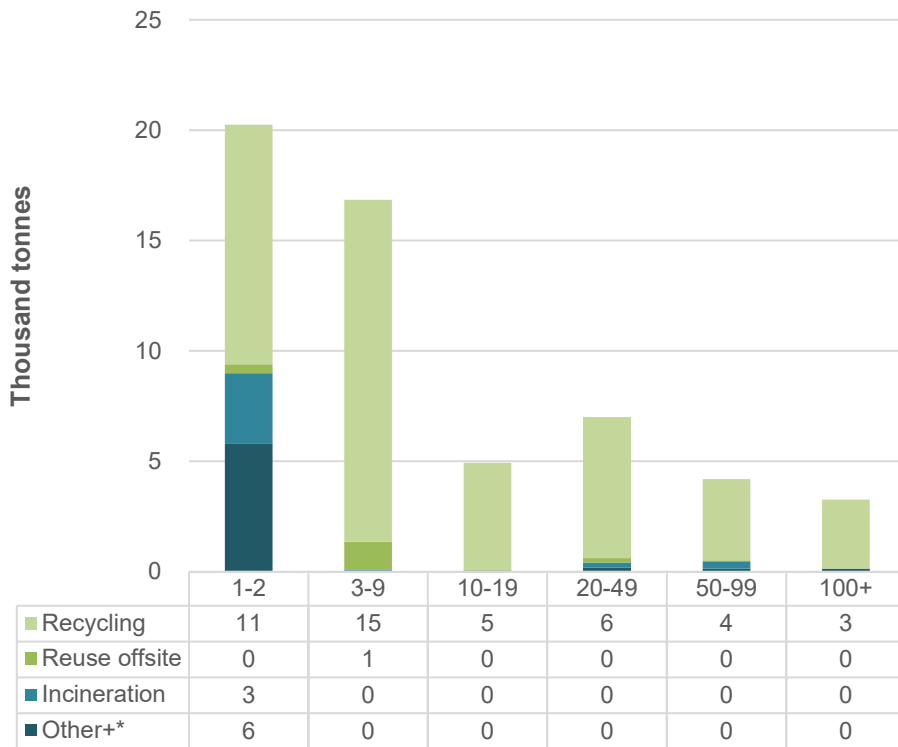
Identifying the scale of Wood within Mixed wastes via a compositional analysis study is recommended. As with Soils, this will provide more robust evidence on which sectors are generating the most Wood waste and inform future policy in terms of supporting businesses to segregate their C&D waste. It may also be useful to identify the scale of untreated C&D Wood waste that could potentially be recycled into products, rather than being mixed with treated wood and sent for incineration.

Figure 30: Segregated Wood waste by waste management method, Wales 2019



In terms of company size, the smaller businesses with only 1-2 and 3-9 employees collectively accounted for 66% (37 kt) of segregated Wood wastes, as illustrated in Figure 31. Conversely, the largest companies with 100+ employees generated only 6% (3 kt) of segregated Wood arisings in 2019.

Figure 31: Segregated Wood wastes by business site employee size band, Wales 2019



*Other+ includes waste management via Landfill, Other Recovery, Transfer Station and when management method was recorded as 'Don't Know'

6. Conclusions and Recommendations

The survey of Construction and Demolition waste generated in Wales 2019 collected data from 508 businesses, of differing size and sector, in a statistically valid manner. From grossing this data, it was estimated that a total of 3.4 Mt of waste was generated by all Construction & Demolition businesses in Wales in 2019.

Comparison with data from the 2012 survey indicated that there was not a statistically significant change in the total Construction and Demolition waste generated in Wales when factoring in the precision limits between both surveys. However, the significant improvement in survey precision has effectively halved the margin of error from +/- 1.12 Mt in 2012 to +/- 0.57 Mt in 2019, providing the most accurate estimate of national C&D waste arisings to date.

The Welsh Government's C&D waste prevention and landfill targets were achieved by the C&D sector in Wales in 2019 when measured against the estimated tonnages.

The C&D waste Recycling target was estimated to have been achieved in 2019 based on a 93% Recycling rate.

6.1 Data Confidence

The survey results were based on estimates provided by the business being interviewed (54% of weight recorded), with the remainder based on business recorded data from written sources, which included waste transfer notices (30%), weighbridge notices (6%), invoices (5%), or other written sources (5%).

Further data checks were completed at the grossing up stage with the surveyors and directly with the businesses concerned. This further checked outlying data when compared to other NRW data sources, data from the previous 2012 survey and, generated sensitivity analyses.

The inferred Construction and Demolition proportion from 2019 NRW landfill site returns was estimated to be around 500 kt, compared to the survey result of 213 kt landfilled. This difference is likely to be explained by precision margins between the survey and the method adopted for inferring "C&D" origin waste on permitted landfill operator returns. However, the difference also highlights potential discrepancies where some C&D waste producers may not have identified that landfill was an end fate for some of their generated wastes.

The procedures used created an effective and consistent data collection process by the surveyors. In addition, the steps to screen and check the collected and grossed data has

confirmed the data collected is sufficiently accurate and robust. Details of the precision of the data are published in the Technical Appendices document.

However, it must also be acknowledged that the results from all surveys are subject to limitations with respect to the quality of estimates produced. Whilst these limitations do not alter the results or the statistical data presented in this report, they should be borne in mind by users of the data.

Some totals presented in the data tables within this report do not reflect the summary components owing to rounding of figures.

6.2 Lessons Learned and Recommendations

1. This survey has demonstrated a robust survey delivery and data methodology that can be used for future surveys both within Wales and the rest of the UK. It was successfully delivered utilising remote surveys overcoming pandemic related restrictions in place. The 2019 results of this survey represent the most reliable and comprehensive set of national data on Construction and Demolition undertaken to date in Wales. Through investment in such surveys, Welsh Government has the benefit of a series of robust waste generation data allowing for comparisons between different years for key metrics, and building a picture of trends and developments over time. However, a comprehensive electronic waste tracking system would provide more real-time and frequent waste data without the inherent delay and error of a sampled survey. This would improve monitoring and understanding of waste trends through enabling regular comparison with other available data sources such as the construction index.
2. The project design, management process and the software packages on which survey delivery depended, proved themselves effective by efficiently delivering over 500 surveys remotely. Surveys over phone, Zoom, or Teams significantly reduced the carbon footprint of the project, allowed a larger number of surveys per surveyor day, and incurred lower travel & expenses costs compared with face-to-face surveys.
3. As with previous surveys, this 2019 survey highlighted issues of working with the ONS VAT and PAYE dataset and the need to reassign business positions in the sample matrix due to changes in either employee number size band or sector identified during the delivery phase. The lack of detail in the supplied data in terms of business contact information was also effectively addressed by allowing sufficient time and resource to research the data gaps prior to the delivery phase.
4. This report and its associated technical appendices contain sufficient detail to allow reproduction of this methodology in future surveys. This enables data consistency, comparability and highlights issues which could be addressed in the planning of future surveys to further improve delivery.
5. We recommend further interpretation and analysis of the data generated by this survey to help inform and develop policy, develop planning strategy and secure opportunities in improving sustainable C&D waste management in Wales.

6. Planning authorities can use the data at both a national and regional level to inform waste planning.
7. The results of the survey highlight areas where further initiatives and support could be focused to improve progress with achieving targets set in the National waste strategy 'Towards Zero Waste'. For example, the majority of C&D waste Landfilled in 2019 was Soil (c.150 kt), indicating that there are further opportunities to improve recovery of this material within the Construction and Demolition sectors.
8. It would be beneficial for further work to be completed to assess the effectiveness of sorting mixed C&D waste at intermediate waste facilities and typical end fates/quality of recovered materials from these facilities.
9. The knowledge gap regarding the composition of Mixed C&D wastes could be addressed by undertaking a compositional analysis study on these waste streams. Such a study would allow for an accurate estimate of total C&D waste arisings by material type to be made by corroborating Mixed waste arisings with reliable composition data. For example, this would enable estimates of Priority Materials to be made that are generated in both separate and mixed waste streams.
10. Information on waste management in this report is generally reliable but the accuracy of the results is limited to information available to surveyed producers on the final destinations of their waste. The accuracy is limited owing to the complexities of waste management routes and difficulties linking final fate back to source (e.g. the use of Don't Know, Treatment and Transfer). Improvements in the electronic tracking of waste from the point of generation to final disposal are required to improve the reliability of Construction and Demolition sector waste management statistics in the future.
11. If this survey was repeated again then it could be improved by not only recording information on transfer station operators, but also widening the scope to record details of the operators of sorting facilities, MRFs and skip operations. This would enable further work to be undertaken to identify/confirm final fates of the generated waste. Businesses were able to provide details of transfer stations, and this additional information would provide more options to follow up mixed material recycling and landfill rates after the survey is complete. This would not be required if wider improvements are made to the electronic tracking of waste.
12. The precision of the survey was improved by grouping the seven General Building subsectors into a General Building Sector. This is a valid approach as many of these businesses deliver a range of services as opposed to specialising in just one (i.e. plastering, plumbing, decorating), so may have chosen the SIC code based on either base trade or random selection. Grouping these subsectors minimised the levels of variation requiring fewer samples in the survey matrix to be allocated to these businesses, which then allowed more samples to be undertaken in critical bricks identified in other sectors.
13. As well as recording number of full-time employees per business, we suggest recording the number of sub-contractors or jobbing tradespeople used too. This data would not be used directly e.g. for identifying or changing the position of the

business in the sample frame, but would be useful when reviewing data and explaining abnormally high arisings compared to the number of direct employees.

14. Comparison of 2012 and 2019 data has identified a challenge in mixed waste classification that could be further addressed in future surveys. As was done on this survey, it is critical that surveyors have clear definitions, know how to engage with the respondent on mixed wastes (e.g. which EWC codes to use and when) and on how to determine re-use on site for categorising as 'Non-wastes'. Future surveyor training could be enhanced by including examples from both 2012 and 2019.

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Appendices

Available on request.

Data Archive Appendix

Data outputs associated with this project are archived on server-based storage at Natural Resources Wales.

The data archive contains:

[A] The final report and Technical Appendices in Microsoft Word and Adobe PDF formats.

[B] A full set of anonymised grossed data outputs

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue <https://libcat.naturalresources.wales> (English Version) and <https://catllyfr.cyfoethnaturiol.cymru> (Welsh Version) by searching 'Dataset Titles'.

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