

**Jim Coulson**

# **SUSTAINABLE USE** of Wood in Construction



**WILEY** Blackwell

# **Sustainable Use of Wood in Construction**

**Jim Coulson**

**WILEY Blackwell**

This edition first published 2014  
© 2014 by John Wiley & Sons, Ltd

*Registered Office*

John Wiley & Sons, Ltd, The Atrium, Southern Gate, Chichester, West Sussex,  
PO19 8SQ, United Kingdom.

*Editorial Offices*

9600 Garsington Road, Oxford, OX4 2DQ, United Kingdom.  
The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ,  
United Kingdom.

For details of our global editorial offices, for customer services and for information about how to apply for permission to reuse the copyright material in this book please see our website at [www.wiley.com/wiley-blackwell](http://www.wiley.com/wiley-blackwell).

The right of the author to be identified as the author of this work has been asserted in accordance with the UK Copyright, Designs and Patents Act 1988.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, except as permitted by the UK Copyright, Designs and Patents Act 1988, without the prior permission of the publisher.

Designations used by companies to distinguish their products are often claimed as trademarks. All brand names and product names used in this book are trade names, service marks, trademarks or registered trademarks of their respective owners. The publisher is not associated with any product or vendor mentioned in this book.

**Limit of Liability/Disclaimer of Warranty:** While the publisher and author(s) have used their best efforts in preparing this book, they make no representations or warranties with respect to the accuracy or completeness of the contents of this book and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose. It is sold on the understanding that the publisher is not engaged in rendering professional services and neither the publisher nor the author shall be liable for damages arising herefrom. If professional advice or other expert assistance is required, the services of a competent professional should be sought.

*Library of Congress Cataloging-in-Publication Data applied for*

ISBN 978-1-118-53966-8 (pbk)

A catalogue record for this book is available from the British Library.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic books.

Cover photos courtesy of Structural Timber Association and iStock

Set in 10/12pt Palatino by SPi Publisher Services, Pondicherry, India  
Printed and bound in Malaysia by Vivar Printing Sdn Bhd

# Preface

I am starting to write this timber book in exactly the same location where I completed the writing of my last one: in the Caribbean. I must assure you, Dear Reader, that I'm not showing off, it just so happens that with the first book, I was scheduled to be on holiday at the same time as I was trying to finish it – and Barbados was a very relaxing place where I could get away from work and the distractions of everyday life. But then – lo and behold! – I was once again on holiday at the very time that I needed to begin working on this next book.

In 2012, my (hopefully helpful and informative) work: *Wood in Construction: How to Avoid Costly Mistakes* was first published. That book aimed to clarify much about the correct specification of timber and the most common wood-based materials, and also it attempted to kill off a few old wives' tales along the way. So I am now following up that book with this one, which I hope will be thought of as a sort of companion to – or perhaps an extension of – the earlier book.

In this new one, my intention will be to show how wood really can claim to be the 'miracle' material of the twenty-first century (as if it wasn't pretty good before). Because not only is wood a very strong, highly attractive and extremely versatile material in its own right; it is undeniably also – when properly grown, sensibly and well looked after – *the* one material on the planet that is completely and infinitely renewable. And, miraculously, it is at the same time an extraordinarily useful 'store' of atmospheric carbon; for the whole of its lifetime in our service.

Wood grows on trees (obviously). But perhaps more correctly, I should say it grows *in* trees, since it is the primary wood tissue (known as 'xylem') which makes up the majority of the overall volume of any individual tree. Xylem forms the entire trunk (and

of course, the branches too) of every single tree on this planet. Trees are, essentially, nothing more or less than fairly complex, 'woody-stemmed' plants. In other words, the trunk (or as we wood scientists prefer to call it, the *stem*) of any tree is made from the stuff that we know as wood; and which we trade commercially under the term 'timber' – or if you live in North America, it is called 'lumber' (no matter)

It is well known that the vast majority of plants, by their very nature and form, can be 'planted' by mankind and so they can be grown on, to any level of maturity as long as they survive. And, so long as they are placed into a more or less half-decent soil, with some sort of nutrient content to it, and are then allowed to grow up in whichever type of climate suits them best – warm or cold, wet or dry – then any plants can more or less thrive. Then – with the right amount of care (which in some cases may be minimal) – many, many plants can of course be harvested and used: for food, for fuel, for their fibre, for their oil, or whatever. And that principle, in a nutshell (or perhaps I should say, in a tree-trunk), is the key to the whole concept of the *sustainability* of wood as a material that we can, and indeed should, use. So it is my earnest philosophy that we all need to carry on using wood: and the more, the merrier.

That's because wood – when looked after in the right way – is basically no more or less than a crop, which needs to be harvested: in the same way that we can (and do) harvest wheat, potatoes, sugar cane or rhubarb; to name but a few examples. It is true that the timescale may be a little longer with trees than it is with those various and aforementioned food crops, but you might be surprised to know that it's not all *that* much longer, in a good many instances. Of course, it will very much depend upon the particular species or variety of tree that we might choose to grow, and the particular circumstances under which we are able to grow it. But my point here is that we need not necessarily wait for a hundred years or more – as so many people seem to think we must – when it comes to getting some useful timber from our trees. Nor do we have to always involve a second or third generation of humanity, after planting any individual tree, before we can fully reap its benefits: although, in a way, that is perhaps one of the great appeals of timber, at least in the popular imagination: the idea of leaving something of ourselves there for the future.

So in this book, I hope to show you first of all how wood 'works' (at least in the most basic and simple sense). And after that, my aim will be to show you how it is becoming much,

much easier to specify and use timber and wood-based products in construction, without having to worry so much about whether or not you are doing anything 'wrong'. So please, let me reassure you all – Mr Architect, Mr Engineer, Mr Builder, (and yes, even Mr DIY-er) – that you *can* happily specify, design and use this 'wonder material' that comes to us, courtesy of trees. And you can do so again and again and again, *ad infinitum*, because wood is indeed the nearest thing we have to an infinite resource.

As we go forward into a perhaps less certain future on this planet of ours; we need to capitalise on the reality of wood's renewable-ness, and then we can also capitalise on that wonderful fact more and more, for the present and the future benefit of this planet that we all live on.

My first wood book was not, in any real sense, an 'academic' textbook; although it did contain some rather essential elements of 'wood science' which I felt were important for understanding some of the later stuff that I then went on to write about. And please be reassured: you needn't worry unduly about this new one, this book seeks to be even less 'wood sciency' than the last one, although I will still need to cover a few matters of importance, about what wood *is* and what trees *are*, just so that you don't get too confused along the way. But then I hope that you will better understand why certain things are as they are; and why maybe they can't be altered too much, even if we should wish to try to do so (although, in the best traditions of predicting the future, I'm bound to be wrong about that claim, sooner or later!).

I have been studying wood for a very long time, about two-thirds of my whole life, in fact. And in that span of around 40 years, I have witnessed an amazing amount of progress in the way that timber is specified and used. But at the same time I have seen, in some other ways, a considerable amount of wasted – or maybe I should say, misdirected – effort in the manner in which the care of the world's forests has been highlighted or emphasised. Many of those forests have in fact been pretty well looked after for a long, long time (although in some places, I do admit, they have not been so well looked after, in more recent times).

I have also seen some – let us say, misguided – efforts from some of those who would wish others to use wood more 'wisely'. I have personally either seen or heard at first hand, instances where the 'environmentalists' have sometimes insisted upon practices that have not always (in my own

opinion) been most productive, or most conducive to winning the co-operation of those whom they were seeking to influence. But more of that later in the book.

I have also witnessed some of the ways in which those who have responsibility for the forests (their 'stewardship' as some like to say) have really taken that responsibility very seriously and in a number of examples, have been doing so for around two centuries. And that's long before any of the present-day 'green' attitudes became either fashionable, or politically sensitive. (Ah, but then I have been fortunate to have been able to see things on a more global scale; rather than just the narrow, parochial, and – I'm sorry to have to say – fairly typically *British* way of looking at things.)

Let me explain that last comment a bit.

In this country (and by the way, if you are a reader from elsewhere in the world, please accept my apologies for seeming to exclude you; it's nothing personal. I'm writing this book essentially from a UK perspective, and thus primarily for a UK readership) it appears to me that we – the British, that is – seem to have the view that everything we say, do or experience *must* be more or less the same for everyone else in the world. That attitude (some might say, 'worldview') is very much bound up in the British psyche, I believe. It's the sort of outlook that used to be called 'jingoistic' – and, although the word has been more or less deprecated since the days of Empire, it seems that some of the basic attitudes in this country have rather carried on as they were, regardless of the fact we are in a new millennium (and some might even say, in a new reality).

In my own not inconsiderable experience, I have been very aware of a tendency for the UK-based 'defenders' of wood to react somewhat unfavourably to its continued, and apparently unlimited, use (that is, they often express great caution and worry about anyone using any sort of wood for anything at all, and bang on all the time about 'saving trees') as though the whole world were in exactly the same position as ourselves, vis-à-vis the availability of timber ... but happily, a lot of the rest of the world isn't just like us.

Here in the UK we have a relatively limited stock of woodland, of any sort and that's primarily because we also have a pretty limited stock of the necessary countryside to grow those woodlands (or should I say forests) on. As a nation we are a huge nett *importer* of timber and wood-based products, to the tune of somewhere around 70 per cent of our total requirements. And because of that reason, it somehow seems as

though we cannot get our collective national head around the fact that many other countries in the world might actually still have an awful lot of useful wood knocking about in *their own* forests. Surplus wood, that is. Wood that is spare and available for export. In other words, there are places which have 'renewable' wood, harvested from forests that have been stable, and growing, *and* 'sustainable' for a very long time. Enough for all of their future generations to keep on growing and making a living from, in fact.

I first became involved with the UK timber trade in the early 1970s: around the time that the first 'oil crisis' struck the developed world; and that was long before anyone was using the term 'sustainability' in any meaningful or widely-publicised sense. But luckily (for me) even back then I had very good contacts with the North American wood industry – which was still a major source of imported timber in those days (especially from Canada). I also had a very good relationship with the Scandinavians (mainly the Swedes and Finns), who had themselves by then been exporters to the British Isles for something over 500 years. (All right, you pedants: I know that Finland, as a separate country, isn't 500 years old ... but that part of the world, whatever it was called back then, had been exporting 'Baltic red-wood' to England since about the mid-fifteenth century.)

Canada and Scandinavia have been major sources of sawn timber and wood-based boards (as an aside, this latter entity consisted mostly of plywood in the early part of the twentieth century, since there was no OSB, and not a huge amount of chipboard, even as late as the 1970s when I was newly 'into' wood-based panel products) exported to the UK, for several generations. And both of those timber-producing regions have had policies of 'renewable' forestry in place for well over a hundred years, and back then, in the nineteenth century, there was certainly no FSC or the like, to stir things up.

In order for you to understand the concept of what those exporting regions were doing all that time ago – and without any outside prompting or political pressures from the 'green' lobby – think of the old saying 'selling off the family silver', except that for the word 'silver' read 'forests', and for the word 'family' read 'nation'. So it shouldn't then take too much imagination to realise that a country which is rich in forests (and very often, such countries are not rich in too many other things); but which also has a relatively small population, would see those forests as a vital source of income and foreign exchange. And that being the case, why then would they willingly cut



down all of those trees for short-term gain and so leave themselves with nothing for the future? Of course they wouldn't, would they?

Well... yes and no – and it all depends upon where you're talking about, and exactly when things changed in certain places, from basically good to more or less bad. But then, we largely have world politics to blame for that more recent state of affairs. Most 'developed' nations with large forest areas (such as Canada, Sweden and so on) behaved – and continue to behave – really well, as I have just touched on, a few paragraphs earlier. But unfortunately, many of the 'young' and often newly-independent nations, who were also in possession of large, natural forests (and, as it happens, those were mostly *tropical* forests) very soon fell prey to political turmoil and corruption and so the 'ideal' of managing their nation's forest resources for their own economic future somehow got lost, corrupted or abandoned, or at best, seriously derailed for quite a long time.

Therefore, just like the proverbial curate's egg, the story of forest conservation and sustainability right around the world is, as they say, 'good in parts'.

By and large, the 'Westernised' nations had already put in place very effective policies to conserve and expand their forests. But the 'developing' nations – who had often possessed quite significant and workable forestry policies, many of which had been put in place when they were part of someone else's Empire – all too often fell into corrupt ways; and thus allowed their forest practices to seriously deteriorate for a regrettably long time. Happily, that process of mismanagement and decline eventually changed – at least in many of those places – and it is still changing and improving today of course.

Now then, all of the foregoing background information (or 'ramblings' as you might call them) brings me back to the main point and purpose of this book: I want to provide some basic information about where our uses of 'traditional' woods came from; but then I want to bring things up to date and explain what's happening nowadays in the world of wood, especially with regard to forest management attitudes. And along the way, I'd like to unravel some of the myths, but then also explore the facts; and then I will check out the regulations that have sprung up, ever since the timber trading world turned 'Green'. That last landmark was – as far as I can dimly recall – sometime in the late 1970s or early 1980s: which was, as far as the timber trade was then concerned, perhaps a little bit later than in many

other aspects of everyday life, but then, that's rather typical of the timber trade in all things.

Matters are still changing and evolving of course, even as I write this, so maybe it's best that you should regard this volume as less of a definitive textbook, but more of a sort of 'position paper' as to what's going on here and now. It aims to point out where we've come from and then to point the way that things seem to be going, as far as I can presently see. And I should also advise you that it is very much my own 'take' on things, and so the opinions in it (as opposed to the many facts which are also included) are very definitely my own and no-one else's. However, this book is most certainly intended to be helpful and encouraging and I am striving to get it as up-to-date as I can manage to make it, at a time when we are in what seems to be such a constantly-changing regulatory environment.

My overriding purpose is that I want to leave you with the absolutely positive feeling that it's not just 'OK' to be thinking about using wood. I want you to *know* that specifying and using timber and wood-based products – and hopefully, using even more timber than you already do – is actually beneficial for all of us who live on this planet. Well, I've made a (fairly lengthy!) start; and I've set out my stall in no uncertain terms, so now I'd better get on with it!

Jim Coulson  
Holetown, Barbados

# Acknowledgements

I would like to thank the following people and organisations who have assisted me in the preparation and writing of this book.

For supplying certain photographs and helping with other graphic materials for various illustrations: AHEC, Canada Wood UK, The UK Timber Trade Federation, Transparency International and GRANTA Design of Cambridge. For preparation of the CITES species table and the carbon cycle diagram, Simon Brock; and for the World Timber Maps and co-ordination of the illustrations, Neil Coulson: both of these latter individuals from TFT Woodexperts Limited.

For market information on the availability of commercial supplies of particular 'sustainable' timber species: James Latham plc and Timbmet Group.

For advice on various matters relating to Chain of Custody Certification and compliance with the UK government's Timber Procurement Policy: Annie Adams of CPET (the advisory body that is now operated by EFCA, on behalf of DEFRA).

# Contents

<i>Preface</i>	xi
<i>Acknowledgements</i>	xix
1 Some Things You Should Know About Wood, Trees and Forests	1
1.1 Some basic information on how trees grow	1
1.2 Basic tree types – softwoods and hardwoods	3
1.3 The properties of timbers	5
1.4 Different forests and tree types	6
1.5 Rate of growth	7
1.6 Natural forests	8
1.7 Managed forests: Conifers	12
1.8 Managed forests – broadleaves	16
2 The Concept of Being ‘Sustainable’	25
2.1 Being sustainable: A definition and a target	25
2.2 What can we do to help?	28
2.3 Using the forest resource: The economic argument	33
2.4 Legal harvesting	35
2.5 The Timber Trade Federation: Introducing its responsible purchasing policy	37
3 Voluntary Timber Certification Schemes	41
3.1 Some further details on the RPP	42
3.2 Checking legality – I: The Corruption Perceptions Index (CPI)	44
3.3 Checking legality – II: FLEGT	50
3.4 Going beyond FLEGT: MYTLAS	51
3.5 Checking legality – III: Other ‘legality’ certification schemes	52

3.6	Checking sustainability: Chain of Custody Certification	54
3.7	FSC and PEFC as Chain of Custody Certifiers	57
3.8	Other Chain of Custody Certification bodies	61
3.9	UKWAS	62
3.10	Third-party assurance	62
3.11	How Chain of Custody schemes operate	63
4	The UK Government and European Regulations: Legally Trading in World Timbers	65
4.1	Checking up on the checkers: The role of CPET	65
4.2	CPET's help with legality and sustainability requirements	66
4.3	Legality and sustainability: The UK government's definitions	67
4.4	Legal timber sources – the UK government's definition	67
4.5	Sustainable timber sources – the UK government's definition	68
4.6	Category A and Category B – 'Proof of Compliance'	68
4.7	Current and future supplies of certified timber	70
4.8	The EUTR: Europe's new and compulsory 'timber legality scheme'	71
4.9	The meaning of 'due diligence'	73
4.10	Satisfying the EUTR	74
4.11	Who actually needs to obey the EUTR?	81
4.12	The 'first placer on the market'	81
4.13	CE marking and the CPR	82
4.14	CITES: What exactly is it?	83
5	Specifying Sustainable Timber for Any Project: Some Important Dos and Don'ts; With a Bit More About Wood	89
5.1	Using wood in a sustainable way	90
5.2	The government's Timber Procurement Policy (TPP): A brief reminder	91
5.3	Certificates	91
5.4	What if I can't get the timber I want?	94
5.5	The use of recycled timber	96
5.6	Insisting on a particular Chain of Custody 'brand' for your certified timber	97
5.7	Deciding which wood to use	99
5.8	Some of wood's other characteristics	105

---

6	Some Principal Softwoods Used in Construction in the UK: With Their Main Properties and Sustainability Credentials	109
7	A Selection of Hardwoods Used in the UK: With Their Main Properties and Sustainability Credentials	125
8	Re-use of Timber and Wood Products: The Carbon Cycle, End of Life Disposal and Biomass	155
8.1	The true 'carbon cycle'	156
8.2	End of life disposal of timber and wood-based products	158
8.3	Recycled timber	158
8.4	Disposal of timber in landfill	159
8.5	Burning wood: Fossil fuels versus biomass	160
8.6	Biomass	162
9	Energy Considerations and Construction Materials	167
9.1	Embodied energy	168
9.2	Cradle to grave analysis	171
9.3	Cradle to cradle	172
9.4	BREEAM	173
Appendix 1	Terms, Abbreviations and Acronyms Used in This Book	179
Appendix 2	Timber and Wood Products: Some Helpful Organisations	185
	<i>Index</i>	187

# 1 Some Things You Should Know About Wood, Trees and Forests

Of course, to better understand wood and so be equipped to specify it and use it correctly for most construction purposes, you should really read my earlier book (*Wood in Construction: How to Avoid Costly Mistakes*). But even if you simply want to know how and why you should be using this remarkable and unique material in a 'sustainable' way, then you will still need to know a few essential facts about how trees grow; and what basic types of trees there are; and then what they might reasonably be used for. So that is the real purpose of this introductory chapter: to 'set the scene' on timber and its origins, before I then go on to explore the complexities of how and why we can – and indeed should – all seek to act 'sustainably' when it comes to using timber.

## 1.1 Some basic information on how trees grow

I said in the Foreword that trees are essentially plants that can be harvested, and that's true. But whereas most plants which we regard as crops have a fairly short 'rotation' time – measured in weeks or months, depending upon soil and climate – trees are a bit more *permanent*, one might say.

They grow with a 'woody' stem, which is of course, the tree trunk; and that's what we mostly use, in terms of what the tree gives us, out of its material products (there are also oils and resins and so on, but 'wood' is of course by far the biggest 'ingredient' that we get from a tree). That stem, or trunk, can



**Figure 1.1** The ‘woody stem’ of a tree allows it to remain standing for many years.

remain upright for years and years; and thus it allows the tree to constantly develop and expand, which it does by the process of adding new layers of growth directly on top of all the previous, older ones – instead of the stem dying back every year and then the whole plant needing to be replanted in order that the next ‘lifespan’ of a single-season crop can grow up anew.

In this way – by that very clever, and yet simple, expedient of just not dying back every year – trees can be more or less ‘permanent’. And it is this very permanence as a plant which makes trees so highly useful to us. By evolving as they have done, with this more or less ‘long-lasting’ and rigid trunk, trees have thus inadvertently provided mankind with a highly versatile material (their wood, of course) that we can use for all sorts of things. And we can indeed do lots of clever stuff with wood, thanks to its fantastic range of properties, which sets it apart from just about all of the other structural and decorative materials that we could employ.

You may perhaps be aware that wood’s primary ingredient is cellulose, which is a complex molecule whose elements are



hydrogen, oxygen and carbon (and thus it is known to chemists and biologists as a 'hydrocarbon'). Just by its very act of growing, a tree naturally draws huge amounts of carbon out of the atmosphere, by converting harmful carbon dioxide ( $\text{CO}_2$ ) and harmless water ( $\text{H}_2\text{O}$ ) into the much more complex material  $\text{C}_6\text{H}_{10}\text{O}_5$ ; which is what cellulose essentially is.

And from that relatively basic formula – depicting that wonderfully 'simple-but-complicated' chemical reaction within the tree – it should then become apparent that the more we can use wood, and also the more we can keep wood in service within our buildings, our furniture and so on; then the more 'used-up'  $\text{CO}_2$  we can keep locked away and thus out of harm's way, so far as our planet is concerned. (By the way, this process of locking away atmospheric carbon is known, rather grandly, as 'sequestration' and there are formulae for calculating how much carbon we can sequester, by using wood and by growing more trees, but I'll deal with that in a later chapter.)

So much for the inherent chemistry of wood (which I have greatly simplified here, but you get the idea, I hope). Yet it is a fact that this wonderful chemistry helps us, without too much effort on our part, to reduce the amount of carbon dioxide in the atmosphere, all the while that we are specifying and using timber and the various wood-based products it can be turned into. But to do your part of the work properly and without running into too many difficulties, it would be helpful for you now to understand a bit more about the fantastically varying *types* of trees that you can find in the world, and to know a little more about how they differ from one another.

## 1.2 Basic tree types – softwoods and hardwoods

I have of course explained these terms in much greater detail in my other book, but for now, let's just say that you need to be aware that those two rather simple-sounding names, if used just on their own, are really no great help to you at all.

That is because the so-called 'softwoods' are not particularly soft (and nor are they useless, or weak, or anything else that you might associate with the term 'soft'). And the so-called 'hardwoods' can quite often be anything but hard; and by no means are all of them particularly strong, or particularly long-lasting. And nor do they necessarily have all – or