Natural Frontiers

France has long been a rich country in a temperate climate with plenty of snow- and rainfall along its coasts and on the Alps and Pyrenees, as well as on the Massif Centrale, the Jura and the Vosges. The rain and snowmelt eventually make their way down rivers in the direction of the North Sea, the English Channel, the Atlantic and the Mediterranean.

The sheer quantity of navigable rivers has made France a tax man's dream: starting from the south-west, the Adour; the Layre and the basin of Arcachon; the Gironde estuary with the Garonne, Isle, Dordogne, Vézère, Lot, Drot, Tarn, Baise, Ariège; the Sandre, Charente and Sèvre; the Loire, Mayenne, Sarthe, Loir, Dive, Creuse, Cher, Allier, Yèvre; the Vilaine, Oust; the Blavet and the estuary of Lorient; the Aulne at Brest; the Vire; the Orne, the Dives; the Seine, with its tributaries Oise, Aisne, Marne, Aube and Yonne; the Somme; the Aa; in the Mediterranean, the Rhône, the Isère, the Saône, Doubs, the Aude, Tet; and finally, the Rhine, Moselle, Meuse and Sambre are all navigable rivers. No other country has such a concentration of navigable waterways, which neither freeze in winter nor run dry in summer, and few are the countries that have rivers on all four sides, or six sides as in France, flowing outwards from the middle in all directions. That these rivers' headwaters ran close, with barely a few miles between the Seine and the Rhône's tributary, or between the Seine and the Loire, or the Aude and the Garonne, or between the Doubs and the Rhine, the Somme and the Meuse, made things even easier to create a great tax empire. If all else is equal, France will produce more calories, more muscular young men, more wealth and more taxes than any other country in Europe.

This natural wealth was hidden for many years, as the French state has rarely occupied all the territory it possesses today. The mouths of the Rhine, Moselle, Meuse, Garonne, Loire and Seine were held by its neighbours, who were frequently its enemies: Flemish, Germans, English, Bretons, Basques and Normans, as well as the Pope at Avignon, and the Catalans on the Rhône. Much of French history is easier to understand from this geographic point of view, as part of France's attempts to conquer these exits to the sea, and the natural attempts of their occupiers to keep the lucrative tax barriers that went them. Only when France controlled both the hinterland and the sea ports, and linked up the Mediterranean and the Atlantic and the Channel and the North Sea, was it able to be the rich land that Nature promised.

The principal rivers, historically, are the Rhône and the Seine, both navigable in their main reaches and their tributaries for great lengths, and almost joined at Dijon, connecting the Mediterranean to the English Channel in the easiest, most direct way through the middle of Burgundy. The towns along this axis, not just Dijon, but Paris and Lyon, Beaune and Autun, Auxerre and Vézelay, and the great monastery of Cluny, are bywords for wealth; Burgundy itself was the richest state in Europe in the 15th Century.

Large parts of France are flat and swampy, and ideal for hydraulic engineering. The Brenne, the Doubs, the Landes, the Marennes, the Marais Poitevin, the Limousin, the Sologne, Lyon. There is so much stagnant water in France that its culture ensures the windows and shutters are closed by the time the malaria-carrying mosquitoes are airborne in the summer evenings. These areas are traditionally centres for tax evasion. Tax agents disliked the miasmic vapours and avoided them, making them centres for distilleries, fish-farming and salt making. In a country where salt was the largest source of government revenue, the salt marshes were a battleground between mosquitoes, tax-collectors and tax evaders.

Overall, then, if Europe is gifted with the greatest navigable waterways, the longest coastline for its landmass areas, and a temperate climate under which to profit from them, France is that part of Europe which can best take advantage of them. For much of the Roman period it was the richest part of that empire, and since then it has almost always supported one of the three largest cities in Europe, and the largest population.

Seine

With such a wealth of rivers, there has always been a wealth of cities. The largest city in France is Paris, which sits on the river Seine. But this was not always the case. If Paris was nominally the capital of the Frankish kings' domains in France, it was not their preferred location for coronation, which was Reims, nor for their burial, usually at nearby St Denis. For long periods, the king lived in Lyon or Bourges, Chinon or Tours, and finally at Versailles. Somehow, Paris survived this disinterest and maintained its importance, which was governed not by a king's favour, but by its position on a particular river.

Although today the river is 9m deep through Paris, before the hydraulic improvements of the 17th, 18th, and 19th Centuries it was often fordable, where men or horses could get to it. After the river Seine joins its tributary, the Yonne, it starts a series of huge meanders, a sign of flat land. From here to the sea, reaching the Seine is complicated. The valley floor is a flood plain, a marsh for much of the year; and the river itself is fast flowing and deep after rains. For much of the length of the Seine downstream, the river is dammed in by 50m high cliffs of chalk and limestone, mixed with clay, which are often impossible to climb or descend by ox-towed carts, sometimes even on foot. The Seine is most easily crossed at the point where the Ile de la Cité splits the river into two streams in the centre of Paris. It is an ideal point, linking the dry plateaux of Champagne and the Beauce, with their access to Flanders and to the Loire.

Paris was the capital of the Parisi tribe of Gauls, who occupied it at the time of the Roman conquest. While the Romans were busy conquering the Britons and the Belgians further north, Amiens was their preferred location for a capital. Roman Gaul was then split into three, with Reims, Lyon and Toulouse as the capitals. Lyon was much closer to Rome, and the wine that the region exported made it the economic centre of France as well as the political capital. Other cities in the north of France were more important, Sens and Rouen, while Paris, Lutetia as it was called, was just a small town, charging taxes on the bridge across the island.

All this changed with the arrival of the Franks. The Merovingian Franks were just one Germanic tribe to invade France, and they made Paris their capital. For the rest of French history, the area around Paris was the source of most royal income and power. The bridge was maintained and rebuilt, one of the few Roman bridges in France to survive. As the rest of France declined into medieval poverty, the taxes on the bridge helped Paris to become the largest city in Europe. From Paris, the Franks controlled the inland waterways made up of the Seine, Marne and Oise rivers. As international maritime trade became more important than inland trade, especially after the decline of the Champagne fairs in the 13th Century, Paris became the key city in the growing trade between the Mediterranean and the North Sea. Although surrounded by good farming land which could feed it, Paris also imported: wine from Burgundy, salt from Brittany, iron and bronze, and cloth from Flanders, fish from England; and all this came to Paris by river, either down or up the Seine.

The Seine suffered only from the typical seasonal fluctuations, which rendered the channel impassable for one or two months of the year. This was solved in the most unlikely of ways. The great tax-collector known as Louis XIV, disappointed by the flow of the fountains in the garden of his palace at Marly, authorised the damming of the river. A score of machines, mechanical contraptions for lifting the water, were built in the greatest engineering feat of the 17th Century. While Louis enjoyed the company of his mistresses at Marly, the bargees were presented with a problem: there was no lock. The river was only partially dammed, but the narrow channel that was left flowed now at 6 or 8 knots. A dozen horses were needed to tow a barge upriver; and the descent was a wild white-water ride. Crew and spectators, and the odd local washing or swimming, regularly lost their lives in the cataracts.

Other weirs were built on the river, and eventually rudimentary locks, too. Today, the navigable Seine, all 477 km of it, is artificially maintained, limiting the damage from floods, and allowing development on the flood plains. The Seine remains an industrial and commercial river, with both Rouen and Paris among the largest inland ports in the world.

The river Seine is ideal for all kinds of craft. Barges brought wine down river from Burgundy, while barges were drawn up by horses, men or women. The river usually flows slowly. Sailing ships operate as well, as the prevailing wind blows up river, which is wide enough to allow tacking. The tide runs large merchant ships all the way up to Rouen. It was at this point that for many years lay the most important city on the river.

Rouen

Rouen, being nearer the mouth of the river, competed with Paris, and at times it gained and maintained an economic supremacy. Under the Romans, Rouen was the second largest city in Gaul. Rouen has a traditional (customary) monopoly on all shipping up river to Paris. Goods had to be unloaded, offered for sale, and then loaded onto Rouennais barges for transport to Paris. This monopoly has been contested for centuries, not least by the Parisians themselves, and ended only with the fall of the monarchy during the French Revolution. Rouen's taxes were removed by Parisian bureaucratic administrators, financed by Bordeaux businessmen, the Girondins, who wanted to reduce the taxes on shipping wine and salt to Paris.

Rouen's control of the river Seine, and French tax-collectors' attempts to destroy it, started with the conquest of the river basin and the sack of Paris by the Viking, Rollo. The king of France was forced to pay an indemnity to get him to leave, and signed a charter granting him the duchy of Normandy. It was not clear then whether Rollo was a vassal, who owed the king homage; or an equal, with a title of duke as an independent sovereign. In practice, throughout the following centuries, whenever Normandy was independent, whoever had the power to enforce their point of view usually won the argument. For two hundred years, Rouen and Paris grew in importance, as the European economy and population grew.

But outside Rouen and Paris, there were no great towns on the Seine. Partly this was due to incessant feuding. The castle at La Roche-Guyon was built to defend France from Normandy; and Richard I built his great castle, Château-Gaillard, at Les Andelys, but it lasted only a few years before it was besieged and destroyed. The borders were wiped out in the early 13th Century, rendering these castles pointless. But the geographic problems of the Seine, the frequent floods, the marshy ground, the 50m cliffs of chalk and clay, and the political problems of an area at the mercy of the French or English tax-collectors, prevented any long-term investment in industry or transport.

Normandy profited from an economic boom thanks to the taxes collected in England after 1066 and remitted to the continent to build castles, but when William decided to move his capital to Caen, the centre of Norman economy moved, too. Paris and Rouen both declined; it would be a hundred years before they recovered. The Norman empire lasted less than this; the sons of William the Conqueror fought over the spoils, but when the last one died, his enormous wealth was stolen by a Frenchman, the count of Blois, a city on the river Loire.

Loire

The river Loire carves France in two and provides a major barrier to travel between the two halves. It supports little long-distance water-borne trade. The Loire wines are some of the best in France, but they are less known to wine drinkers than those of the Gironde or the Rhone as they are not extensively exported. Why the Loire is so disfavoured is not immediately apparent.

There are some geographic differences between the two rivers that should make the Loire better for trade and industry; while the towns along the Seine developed on the tops of 50m-high cliffs with slippery slopes, the Loire sits on a flat plain where it is easy to find fords, or build bridges. But, in other respects, it fails. The Loire is a fast-flowing river; at Orléans, it is 100m above sea-level, while Paris is only 30m, with a similar distance (375km) to flow to the sea; this makes it difficult to haul a barge up against the faster current. In spring, the flood is faster still, and there is no cliff wall to protect any improvements to roads or farms. The floods brought silt, but also the power to shift the banks of sand in the otherwise shallow river.

Even so, Orléans developed into a rich trading city, as the bridge on the Loire closest to Paris. Orléans was rich enough to have been fought over for a hundred years. While Paris fought against Rouen for access to the sea, Orléans fought against Paris for the power of the kingdom, and a hundred-year civil war led eventually to English involvement. The city was rich enough to afford the new gunpowder weapons that broke the English dominance of the battlefield.

If Orléans became the most powerful city on the Loire, and third city in the realm after Paris and Rouen, it was merely because it had the closest bridge to Paris, and Orléans followed Paris' success. But Orléans' success was usually short-lived.

The main reason for the lack of economic power is that bane of trade and industry, the uncontrolled tax-collector. There were three main problems: the lack of a monopoly of violence, which allowed any local temporary power to enforce protection, collect taxes, or raid, with the inevitable retribution when the situation changed; the political control, such as it was, divided up between the Church, the nobility, and the very limited town corporations; and the physical limitations imposed upon trade by the bridges.

The lawlessness, or rather the assumed power to tax, is well documented by religious writers, like those of Morigny abbey. At the turn of the first Millennium, these monks rented lands from a nunnery in the Beauce, the rich fertile plain north of the Loire; what they took on was at that time a wasteland, ravaged by years of predatory bandits, and through hard work they made it pay. The improvements encroached on rights or land of others, at a time when land ownership was ill-defined and difficult to prove; success merely brought back the bandits, who demanded bran tax, chicken tax, or protection money like any Mafia hoods today. The monks paid off their demands, as the money they raised by selling the surplus on their improved land was far more than that demanded, and worth less than the peace that the payoffs brought. Others were less motivated to work so hard, merely to see the profits go to robber barons. Meanwhile, the real barons were also actively collecting taxes.

The Loire was divided politically, between the dukes of Brittany, who controlled the mouth of the river, and the king of France, who controlled the upper reaches of the river; in between, nominal vassals of the king were the counts of Anjou, Touraine, Blois, and the dukes of Orléans and Burgundy; the French kings fought long battles to force these feudal tax-collectors to pay him homage, and taxes; and succeeded in building their own castles interspersed with theirs along the river. Today, the valley of the Loire is a UNESCO heritage site for its castles, now converted into palaces, that successfully tax the tourists, but in feudal and medieval France, it was a nightmare for merchants and pilgrims.

Orléans was just one of many cities that bridged the Loire. In summer, the course of the river dried up, allowing easy construction of pylons, and its width reduced the speed of the flow in spring. Bridges were soon built in many places along the river, and taxed its trade. Downstream from Orléans, whose bridge was started in 1120, other bridges were built at Beaugency, Meung, Blois, Tours, and Saumur (1162); at Angers, the Loire was already bridged in 869, and the Maine was bridged there first in 1028 and then definitively in 1181; Amboise was first bridged in wood in Roman times, after 376AD, and rebuilt in 878 in stone after Viking destruction. Upriver from Orléans, there were bridges with tolls at Jargeau, Sully, Gien, La

Charité (1520), and Nevers (by 1227). Other bridges were built on tributaries, at Cholet on the Moine, Clisson on the Sevres, Montrevault (1465) and most beautifully at Chenonceau on the Cher. Below Angers, taxes were collected at Nantes, where the Loire was not bridged until 1903, when the transporter bridge was built, by which time the only taxation was the monopoly for its exploitation. Each one of these bridges took a percentage of the trade, and maybe invested it locally; but the overall effect was to stifle entrepreneurs, and long-distance trade. Only the most profitable goods, or those which were easily smuggled, survived the devastation of this tax onslaught.

The concentration of bridge-building and taxation along the Loire is no surprise. The family of the counts of Blois, who dominated the river, and France, at the time, also controlled the county of Champagne, with its rich fairs. They had learnt about tax collection from the stunning success which their neighbours, the Normans, had had in England since the Conquest of 1066. [1] The counts of Blois married Norman princesses and implemented the new techniques of parish church and tithe barns, of feudal castles, and of bridge building and taxing, while paying token honours to the popes in Rome. When the last Norman king of England, Henry I, died, it was the count of Blois who moved fastest and took the throne. The additional revenues from England helped to make Blois the most important city in France for a while.

Another Loire noble family, that from Angers, the counts of Anjou, also made a claim for the English throne by marrying the widowed daughter of Henry, and initially conquered Normandy. The Anarchy that followed destroyed the English and Norman economy for a generation, but firmly implemented those tax collecting principles along the Loire valley.

It's hard to think of a richer property than those counties along the Loire river valley. The land is flat, fertile; it rains regularly, throughout the growing season; there are navigable rivers nearby to export produce and to bring in seed and tools. Today, the Beauce is the bread-basket of Paris; its capital, Chartres, is decorated in its cathedral with one of the wonders of the Gothic age. Yet it was not the birthplace of agriculture, nor of domesticated animals, nor of civilisation. Until Roman times it was not populated at all by anything more than nomadic hunter-gatherers. Anyone ploughing a field would have attracted thieves and murderers; and these would hardly have benefited from taking 10% of his produce. The farmer had no claim on the land other than his physical presence. Only subsistence farming could survive on this land, and no investment in improvement could be afforded. Spare cash for investments needed cash crops, and cash crops needed land improvement, and land improvement needed cash, which did not exist in the Beauce.

For civilisation to appear in the Beauce, as elsewhere, it was first necessary to create a tax-collecting system that could work in the district. A tax system requires a tax-collector, self-anointed or appointed by a greater one, but holding a monopoly of violence; a title to the land that could be sold or transferred; a limitation on the taxes charged. Nowhere in France was feudal tax collection as difficult as on the flat plain of Beauce. For miles, the countryside provides no narrows, straits, gullies in which to hide, to lie in wait, to ambush for theft (100%) or taxation (10%). The peasant farmers would know if any bandits or tax-collectors were in the area, and avoid carrying goods on their ox-drawn carts; any small bands could be dealt with by muscular farm boys used to whipping slaves, cattle and pigs. The hardest thing on a flat plain is to maintain a monopoly of violence, as any well-mounted force can easily enter and leave.

There was no taxation, so there was also no cash concentration, and no investment, no improvement. The Beauce suffered, like so many places in Europe at the time, from an unwillingness to invest; and any investment that led to improvement was immediately taxed or pirated by anyone strong enough to do so, and larger bands would starve. The

[1] For full details, see the author's *Myth of England*.

agriculture remained subsistence farming. Beauce architecture is based around the fortified farm, *la ferté*, the only way for farmers to survive close to their crops and a long way from the towns.

Taxation in the Beauce started in feudal times. It was the Franks who introduced feudalism, but the successful knight, armed with sword and spear, and wearing armour, came from Normandy. His costs were paid by his tenants, and in exchange for his protection, his monopoly of violence, more or less successful, they furnished him with armour and sword. The subsistence farms of the Beauce were not enough to pay for anything more, certainly not a castle, or bridge, or a cathedral; not even a church.

It took the wealth and power of Abbot Suger, of St Denis, to change that. Rich from the pilgrims who came to honour the dead Frankish kings at his abbey church, and the merchants who came to Paris, he was looking for a French, not Norman supply of wheat for the growing population of Paris, as well as any empty land he could farm to produce profits, food and raw materials for the great building he had started, the Gothic Age prototype of St Denis abbey. He funded French peasants in the Beauce to buy a deep iron plough on credit. With such a plough, they could plough further, faster; they could specialise, and divide their labour. The yields rose; and the surplus could be taxed by Suger, and the rest sold on. Merchants came to visit, bringing with them news, advice, and stimulating curiosity. Villages could grow into towns, where trades would develop, and bridges were built. Within a hundred years of Abbot Suger's first plough, Beauce was rich, the count of Blois was king of England, and the Loire was the most bridged river in the world.

To celebrate, the entire area combined to celebrate in the most awesome example of mass hysteria. The chronicles of Chartres' cathedral describe how this was built. The local population worked freely as labourers on the site or in transporting stone from quarries. Taxes were paid in produce to feed the gangs of labourers. There was a great party atmosphere and the spiritual side was not forgotten either. How much of this chronicle is true and how much wishful thinking or revisionist interpretation is impossible now to determine. But, in a period with no television, radio, cinema, or print; limited knowledge of the world and almost no freedom to travel; and no construction since the Roman period more than 500 years earlier, the building site of a cathedral must have been a great fair. The opportunity to make money, to meet people, especially those of the opposite sex, and to see fabulous things, like rich people, engines, foreigners, statues, paintings, animals, all focused around the biggest and most expensive thing that anyone had ever seen, must have presented an amazing and memorable event. [2]

Chartres itself is at the end of the navigable stretch of the Eure river, a tributary of the Seine. From there, the powers of king and abbot in Paris were pushed eastwards and southwards, trying to find the tax-free exit to the sea. By 1215, the English were kicked out of Normandy, and the Seine was free of taxes; and the French king turned his attention to the Loire, extending his domains along its banks, forcing homage from his recalcitrant vassals, until he reached the territory of the independent dukedom of Brittany, and its capital at Nantes.

The count of Nantes had his castle at Bouffany, and taxed all those crossing the river, or sailing up or downstream. The bishop of Nantes built a castle and took the tithe from peasants and artisans in the area, and the produce of the land he controlled. The duke of Brittany built a château in Nantes and taxed the count. Nantes was fortunate to have the greatest salt works in Europe on its doorstep, to fund these three magnates. The great pans at Guérande produced most of the salt for France, and it was shipped upriver to Nantes, where it was taxed and transferred to barges for onward transport to Orléans and eventually overland to Paris,

[2] It was not just at Chartres that the peasants willingly helped the tax-collector build these monstrosities: at Abbot Suger's St Denis, near Paris, the citizens pulled the carts alongside the bullocks to bring the stone faster from the quarry.

incurring taxes all the way. Taxes on the river were charged by shipload, leading to a drive to build bigger and bigger ships. Exemptions, such as were given to abbeys for "one ship per year", also encouraged shipbuilders in Nantes to concentrate on size; Nantes became the largest ship-port in France, and even today the largest ships in France are built in Nantes' avant-port of Saint Nazaire.

However rich the count, bishop and duke became, these were Breton lords, and the French king was jealous, and angry that he had to pay taxes to a count. For three hundred years, the kings of France and the dukes of Brittany fought: the ones to control the taxation at the mouth of Loire, and the other to free his hinterland from this burden. In 1485, the lack of a male inheritor finally solved the problem, and the king married the duchess heiress. France now reached the Atlantic coast.

Gironde

At the same time that the English occupied the mouth of the Seine, and the Bretons the mouth of the Loire, western France's other great river, the Gironde, was occupied by Frenchmen who refused to pay their taxes to the French king. This situation had come about due to the marriage of the heiress of the duchy of Aquitaine to the king of England, Henry II. He was particularly obstreperous because although happy to marry the richest woman in Christendom, she was a divorcée, and her first husband was the French king. Henry II refused to pay homage for his Angevin lands and Normandy, and also for his wife's lands of Aquitaine. This refusal to pay homage encouraged the local tax-payers to refuse to pay their taxes. After 1215, when the English were kicked out of France, they were rarely in the position to enforce taxes in Aquitaine. For two hundred years, the merchants of Bordeaux exported their wine to England, and paid no taxes.

If the Bordelais had been allowed to continue this trade in this manner, European history would have been very different. But the French kings continued their obsession with natural frontiers, and insisted on collecting taxes from those who exported from their territory. France's attempts to take control of Bordeaux would lead to much of the action of the Hundred Years War, and to England's involvement in the vengeful actions which destroyed the vineyards. By the time that the king of France finally conquered the city, there was no trade left to tax. England's abortive raid in 1453 ended with the disastrous battle of Castillon.

Bordeaux suffered for two hundred years, until the growing slave trade, and Britain's growing wealth, once more encouraged the development of the vineyards, and a search for tax-free shipping. When the French Revolution broke out, the Bordelais merchants created their own party, the Girondins, to lobby for laissez-faire government. Their enemies were the Paris-based Jacobins, who wanted to tax the merchants. If the Girondins started the Revolution with a clear idea of what they wanted, the uprising threw them in with multiple groups who were more interested in get-rich-quick schemes. The attraction of war to hide the failure of such schemes was too strong, and when Austria and Prussia declared war, and French exiles looked like they would organise an invasion, France, led by the Girondins, turned to war. Even so, it was only once the Girondins were losing power, and with the European neighbours interfering, that France declared war on Britain and Holland, its major customers for wine. The Revolution, with all its ideals for tax freedom, was lost in the fog of war. It was a loss that would cost the country, and the Bordeaux businessmen, hugely.

Bordeaux still profits from its position to ship wine to England, but its monopoly has been destroyed by wines from Jerez (sherry), Madeira, Porto (port) and even from Burgundy, from the Rhône valley.

Rhône

Many European rivers have their name based on old Indo-European root words relating to water. The Saône used to be called the Arar; the Rhine and the Rhône are neighbours in the Alps though they flow out to different oceans. These names reflect the rumbling sounds of a great river in flood. The Rhône is a great river, a magnificent route for trade, at least downstream, and a wide barrier to communications. For much of the Roman period, it functioned to export the local wine to Rome. For much of the time since the fall of Rome the Rhône was occupied by enemies of the kings of France.

The Hapsburg kings of Austria and Spain controlled Franche-Comté, along the Rhône tributary of the Doubs; the counts and dukes of Savoy controlled the upper Rhône as well as the great capitals of Chambèry, Annecy, and on the Italian side, Turin and Aosta. The Côte d'Azur, with its cities of Nice and Monte Carlo, was occupied by Genoese and Saracens; while the coast from Marseille to today's frontier with Spain was occupied by Catalans. For two hundred years, the popes maintained an enclave at Avignon, and built the bridge which effectively stopped any traffic and taxed it. The Saône was controlled by the dukes of Burgundy at Dijon, built just above the marshy plain of the river. The Burgundians were usually powerful enemies of the kings of France, even if they were also often brothers, cousins or uncles.

The independent counts of Toulouse controlled most of the land from that city to the Rhône and the Mediterranean. As the king of France sought to extend his power southwards, he arranged for a religious war, the Albigensian Crusade, against supposed heretics in the area. The flood of mercenaries, bandits, foreigners and priests destroyed the local economy and consumed the wealth of the county, which succumbed to France in 1229. War with England and Aragon, Majorca and internal conflicts would last another two hundred years. Actual French progress in developing the Rhône route to the sea was slow.

One French king keen to visit the Holy Land on pilgrimage or crusade, bought the town of Aigues-Mortes, a salt pan on the Mediterranean. Here, he built a castle, and granted the panners a tax exemption, to encourage them to stay; Aigues-Mortes would become the largest salt factory on the French Mediterranean coast, and a source of revenue and power for the French king. But surrounding it were major power bases of his enemies; the great cities of Arles, Avignon and Marseilles were independent Imperial cities, and they defended their privileges. France bought Montpellier, and established an important trading port there, but as with Aigues-Mortes, it was an isolated point in a sea of foreigners.

While the Normans, Flemish, Burgundians, Orléanists, Bretons and English attacked Paris and the kings of France, the focus of French expansion was north, and west; but fifty years in the 15th Century changed everything. After the Treaty of Arras in 1435, the Burgundians moved north; 1453 saw the defeat of the last English forces in France; in 1481, the last independent count of Provence died without an heir, and bequeathed the county, with its control of the mouth of the Rhône to the king of France; and in 1485, the latter married the duchess of Brittany, taking over all of her domains.

To take advantage of this freedom, the king of France established a tax-free market at Beaucaire, just south of Avignon on the Rhône, and therefore outside the feudal control of any of his vassals. Although Montpellier and Marseille would continue to be major ports, more trading was handled at Beaucaire in ten days in July, at the annual Fair of the Magdalene, than in those ports during the whole year. A hundred thousand people would attend each fair, and it became the largest trading market in the Mediterranean. A temporary bridge of boats would be built across the Rhone.

From Beaucaire, the produce sold into France would be hauled upriver to Lyon, a journey of a month. Lyon had recovered its position of capital of France. When the dukes of

Burgundy had agreed to leave France, their place on the Rhône-Saône was taken by the French kings. Francis I moved his court to Lyon, from where he waged war across the Alps to Italy, where he had some claims to territory around Milan.

Behind the genealogical claims was a real desire to collect the taxes on trade on both sides of the Alps. The Rhône, in its descent from the high Alps and through Lac Leman, passed Geneva, was only one of many routes across the Alps, which made the family of the counts of Savoy extremely rich. French pressure would eventually push them out of the western slopes, and leave them with a rump state in Turin. French claims against Savoy and Milan were disputed by the Spanish and Austrian Hapsburgs, whose vassals they nominally were, and who profited from the taxes. The wars against the Spanish Hapsburgs were finally resolved through marriage and a permanent border with customs on both sides was agreed across the Pyrenean watershed. But the wars against the Austrian Hapsburgs would continue into the Revolutionary period.

For a while, the French Revolution became the European Revolution, as its armies liberated country after country. Switzerland, Italy, Holland, large chunks of Germany, and Spain were liberated, initially with the support of the population; the popes' enclave at Avignon was incorporated into the new Republic, as were the many other feudal anomalies. Part of the attraction of the revolution was the removal of sales taxes like that on salt, but also the limitations on feudal movement, and customs controls. Europe became a huge tax-free zone, but did not lead to peace.

Liberation quickly degenerated into occupation; administration into oppression. Some countries, like Spain, never really accepted the French at all, and fought a savage guerrilla war against the invaders. Excuses were always found to continue the war, and somebody had to pay for it; gradually, most of the old taxes were reintroduced. Eventually, the British, Prussian and Russian allies succeeded in destroying the revolution. In the agreements signed after 1815, the borders between France and Austria would settle along the watershed of the Alps.

The French Rhine

The last natural frontier sought by France was the Rhine. Flowing from the French-speaking city of Basel through largely German-speaking regions to debouch in the North Sea, the Rhine was attractive for the taxes that could be collected along it, and also for the trade and industry that flourished along its banks, and in the mountains that hemmed it in on its way to the sea.

By now, France was benefitting from the gifts of Nature; it was the largest country in Europe, supported the largest population, and the largest economy. Its industry was the most developed. Starting with the purchase of Montpellier to use as a trading base at the mouth of the Rhône, France had developed a global economy with rich colonies. It invested its profits in guns and gun-powder, and the industry needed to manufacture these in enormous quantities. By the middle of the 17th Century, France was the most powerful military force in Europe. It needed no justifications for its march on the Rhine. All the Hapsburg possessions on the west of the Rhine fell to French cannon, and only the combination of the English, Austrians, Dutch and some German princes prevented France from dominating both sides of the great river.

As England became Britain, and France's military spending stagnated, it was pushed back from the shores of the Rhine in the Netherlands and the Palatinate, but managed to hold onto the Rhine banks between Basel and Mainz. It held this stretch of river for two hundred years; lost it for fifty; regained it for twenty; lost it for five years during the Second World War; before regaining it definitively for now. The river itself is jointly managed with Germany for flood and pollution control, energy generation, canalisation. The European Parliament is in Strasbourg, on the French bank of the river.

Canal du Midi

If Nature had given France many great rivers, it was human endeavour that created a country with natural frontiers to profit from them. The Hexagon, as the French call it, sits upon two mountain ranges, and the great seas of the Atlantic, the Channel, the Mediterranean, and the river Rhine. All that was needed now was to link these waterways internally. France would become the canal pioneer of Europe.

The biggest problem for France was the enormous detour that was necessary to get produce from Bordeaux, on the Atlantic, to Marseilles on the Mediterranean coast; or from there to the Rhine. Just a few hundred miles across land, the route by sea took a month just to round Spain, and more to reach the rich markets of Antwerp, Amsterdam, London and Hamburg. These journeys forced the ships into dangerous waters where they could be attacked by British or Barbary Coast pirates, or blown against the cliffs by the prevailing winds. What was needed was a canal to join the Gironde, and its tributary the Garonne, to the Mediterranean, and from the river Rhône to the Rhine, across the watershed.

Canals had developed alongside the very earliest civilisations, and were probably an integral part of the concentration of people. Early canals were more properly aqueducts, leading water under the force of gravity from a high point to a lower point. The water was not designed to remain level, much less to climb. The water was supposed to descend. Canals for transport, in low-lying areas like Holland, did little climbing, merely using the high tide to fill the canal and then closing the entrance to the sea with a simple lock to keep the water level high. The Chinese and Roman empires were built with extensive downhill and flat hydraulic engineering.

In China, the Great Canal was built to link the grain-producing areas in the south to the capitals in the north. The canals were first built as lock-free waterways on flat land, and later extended to use flash locks. Flash locks are built of only a single barrier, and when it opens, the water and the barge rushes down to the lower level. Only small changes in height can be managed, and usually only a single direction of travel is possible. The large amount of water that descends also usually limits the number of times that a lock can be opened, often no more than once a day. Huge quantities of rice were shipped along these canals, 150,000 tons a year, in the 8th Century AD, some of which was lost in the inevitable accidents that occurred using flash locks. In the 10th Century, the pound lock was developed, which used dual barriers; this much reduced the quantity of water used in each opening, and provided a safe, controlled descent or rise. Canals helped to develop the great Chinese empires, and increased the population to hundreds of millions, making China the capital of the world.

Pound locks arrived in Europe in the 14th Century. The Old Salt Road from Lüneburg to Lübeck, was supported by a canal that joined neighbouring rivers, one a tributary of the Elbe, the other that flowed into the Baltic; in Flanders there was an attempt at a pound lock. In the 15th Century, pound locks were instrumental in developing the complex of canals that surrounded Milan, turning it into the industrial and agricultural power house of Italy. But the canals of Milan and Flanders were built on relatively flat lands in areas where there was a lot of water, and the rivers all formed part of a single drainage basin; and the salt canal was barely deep enough to drown a duck.

The first canal built specifically to push large barges a long way uphill, in an area of low rainfall, was designed by French engineers. From the low point of French technical knowledge, during the Hundred Years' War, France had risen to become the masters of Europe. Their military expeditions to Italy in the disastrous confrontations of the 16th Century had at least taught them about engineering, but they also learned about architecture, and they saw for themselves the beautiful gardens that the popes had built in Rome, or the Medici in Florence, and the greatest of them all, the ones built at Tivoli for France's cardinal d'Este. Italian gardens

boasted water features to keep the garden cool and moist in the hot summer months; these were called fountains. Spanish wives for kings and commoners also brought with them knowledge of the great fountains built in Islamic Granada. It seemed reasonable to suppose that good engineering could make water flow upwards.

Italian hydraulic engineers now came to France and revolutionised the flow of water, at first purely for recreational purposes. After a French king married a Medici woman, she brought with her, her own fountain engineer. He built fountains at Fontainebleau for her, and at Chenonceau for her husband's mistress. After the king's death, she evicted the mistress, and took over the castle for herself, ordering more fountains. The name of both castles reflect a fascination with water, even though the etymology is misleading. For another fifty years, French architecture copied the Italian Renaissance style. But in a sudden outpouring of nationalism, architectural purism, and cultural confidence, the French style was invented in three years, thanks to French taxes, the person of Nicolas Fouquet, and the work of the trio of French genii that were Le Brun, Le Nôtre and Le Vau.

Fouquet would be quickly imprisoned for such pride, and the trio, and the French taxes, were quickly transferred to work on other sites, notably at the vast bus shelter that is Versailles, but also at the hundreds of minor châteaux of France that flourished in the next forty years. Every palace had to have its fountain, and French hydraulic engineering rose to be the wonder of the world. That it should serve such a mondaine world as the palaces of the king and his cronies only served to popularise the industry, and finance the developments of technology and industrial-scale production.

It took half a dozen years after the fall of Fouquet before the great engineering resources now available in France could be turned to something useful, like building canals. In 1666, the project to link the Atlantic to the Mediterranean was set in motion. It would take 15 years, and would revolutionise not only inland navigation but project finance, with a public-private-partnership. The main investors were the king and the local region, but the canal would be owned and operated by M Ricquet, who contributed 20% of the cost, and would pay an annual tax for the operation of the monopoly. Canals were not popular; many ingrained interests in the road and river tolls that canals would bypass defended their rights, and fought to prevent or delay their construction.

The main purpose of a canal from its initial conception in 17th Century France, and throughout its historically-important period in Europe, was not trade but taxation. Specifically, a canal was designed to circumvent the existing taxes, and replace them with a single rate, to the benefit of a single person, the tax farmer. The southern region of France where the Canal du Midi was to be built was uniquely advantageous for canal building, from the French king's point of view, for few of the taxes collected there reached his treasuries in Paris.

The area between the Mediterranean and the Atlantic was far from Paris; its inhabitants spoke a different dialect of French or, worse, Spanish; many of them were Protestants, and had resisted attempts at integration for a thousand years, most recently only ten years before work on the canal started. Memories of Saracen, English and Visigothic rulers did little to endear the French ruling house to the locals. French kings collected most of their taxes in other regions from salt, and the trade in salt between the coasts and the inland areas should have been an important source of revenue, but smuggling and evasion were rife. Recent wars with Spain had further depressed the local economy, and a declining population would be an open invitation to the Spanish population to move into the area. So the Canal du Midi was sold as a tax farm, with the right to collect the salt tax, and to control and sell on the rights to fish and hunt. It was expected that its industrial development, and the agricultural and trade economy that it would sustain, would help to stabilise the area, even lead to its regeneration, and further increase taxes.

Unlike the canals built in Flanders and Italy, or even those in China, the Canal du Midi would have to lift barges from the sea to the watershed at a height of more than a 130m above sea level. The canal and the pound locks that it needed were only a minor engineering difficulty. The major problem with locks at all is that each use requires it to be refilled with water, 2,000 tons at a time for typical French barges. The larger the barge that the canal is designed to transport, the more water is needed to fill the locks. Water can only flow downhill, so a constant supply of water uphill is required. While at sea-level France's great rivers have plenty of water, at the watershed between the Mediterranean Sea and the Atlantic Ocean the available rivers were nothing more than a dribble. For much of the summer and autumn, the area around Toulouse is dry; and the soil is sedimentary rock that allows much of the water to drain into the ground. The biggest technical problem was to keep the canal full.

The developers of the Canal du Midi knew perfectly well the scale of the problem. The first modern canal built in France, at the time of the rush of Italian hydraulic engineers, had joined the Loire river to the Seine. That canal had required a lift of only 85m, and was built in an area of high rainfall. Even so, the canal ran dry in summer for months at a time. In the hot south, with less rainfall and needing to climb 189m, the challenge was much greater.

The solution was the largest dam in the world, flooding a huge reservoir of water in the nearby mountains. Whereas the previous French canal had used multiple reservoirs, here a single massive one was built. It became the largest construction site in Europe. The canal itself soon overtook it in scale, with twelve thousand workers divided up into teams to allow progress across the 150 mile site from Toulouse to the sea. More engineering firsts were added to France's list: the first canal tunnel, the first with concrete roof; oval locks to prevent the pressure of the soil from collapsing them; round locks to allow junctions of 3 canals; multiple locks built as a staircase; and aqueducts to carry the canal across rivers.

The Canal du Midi was an impressive engineering achievement, but a commercial failure by any standards, taking a hundred years to produce a return on investment for its promoter. Only the palace at Versailles was a more expensive construction anywhere in Europe in the 17th Century. The heavy tolls on the canal, and the lack of industry in the area, prevented any great wealth from accruing. The French king, however, took £2 Million French a year from the salt tax farm, and recovered his investment of £7 Million within four years. As for its secondary objectives, the development of agriculture in the region, especially wheat and later wine helped to stabilise the population and bring French order and culture to the region, much to chagrin of the local population.

With the completion of the Canal, the Mediterranean was connected to Toulouse, which lay on the Garonne. The Garonne is a huge river which flows down to Bordeaux and the Gironde estuary. The Garonne river suffers from a high speed current, and frequent rapids, that makes it unsuitable for regular commercial traffic. Seasonal trade was limited to downriver traffic. Only with the construction of the much-later Canal Latéral de la Garonne did barges pass from the Atlantic to the Mediterranean.

Eventually, if after a hundred years, the canal turned in a profit for its promoter. The Canal du Midi would stimulate a canal frenzy in France, with promoters eager to buy what they saw as lucrative tax farms in the same way. France was already the most powerful country in the world when the works commenced, and would remain so for almost a hundred years, partly thanks to its investment in transport.

Even before the Canal was completed, other canals were started: downstream from the Briare canal, a new canal was built from Orleans directly to Paris to carry wood; and a few years later the Briare and the Orléans canals were joined by a third, the Loing Navigation. In 1738, the Seine tributary, the Oise, was joined to the Somme; and this canal was extended by 1810 to link to the Escaut. In 1792, the great moment arrived when the Loire, and with it the

Seine, was finally joined to the Saône and thence the Rhône: the Mediterranean was joined to the Atlantic and the English Channel, just in time for the Revolutionary Wars.

The Canal du Midi was improved, with connections in Toulouse itself, and to other local cities like Carcasonne and Narbonne, along with an inland canal to reach the Rhône, built during the Napoleonic Wars, when the British fleet blockaded the coast.

Even after this first period of canal building, and after the disastrous revolutionary upheavals, France embarked on a second, industrial canal-building programme. This period started even during the Napoleonic Wars, when coal was needed to replace the Newcastle coal now banned by the Continental System. In the Upper Marne region, the river was dredged and improved to allow barges. In 1832, the Rhine was joined to the Doubs-Saône-Rhône, the North Sea to the Mediterranean. That same year saw the Saône connected directly to the Seine with the canal of Burgundy. In Brittany, Rennes was connected to the sea at St Malo by a canal. In the East, the Aisne was connected to the Meuse in 1835. In 1838, the development of heavy industry in the centre of France led to the building of the Lateral Canal of the Loire, and this further increased canal traffic. In 1839, the Canal du Berry opened in this industrial heartland to carry iron and coal. In 1841 another canal linking the Loire to the Seine was opened in the Nivernais, especially built to carry building materials to Paris. 1853 saw the Marne connected to the Rhine at Strasbourg, completing a ring of water in eastern France that tied together the key industrial sites of the Second Empire.

In 1857, the Canal Latéral de la Garonne opened, finally linking the Ocean to the Sea with a proper canal; it was the same year that the railway opened alongside it In the previous year, a hundred thousand passengers had travelled on the canal, along with a million tons of cargo, but the railway killed the canal business. Only the removal of tolls and taxes on the canal revived its trade at the end of the 19th Century, but the railways, and later the roads, dominated transport in the 20th. In other areas, canals survived better.

In 1858, after more than fifty years of works, the Breton canal linking Brest to Nantes opened. Somehow, it survived the advent of rail, and continued to grow its volume of freight and make a profit carrying slate until 1911. In 1890, the Seine basin was further linked with the canal that joined the Oise and the Aisne. In 1907 the Marne was joined directly to the Saône, along the old coal navigation canal. In French Flanders, an area that had been reclaimed from the sea and was already fully equipped with simple canals, more miles of canals and navigations were built, linking to the Belgian network and to the North Sea; and French coal production near Lille to the steel mills near Dunkirk; in 1965, the last wide canal in France was opened, joining Lille to Dunkirk.

Prussia conquered France in the short war of 1870. As France had started the war, Prussia felt justified in taking reparations, and other European countries, still remembering the depredations of the Revolutionary Army and Napoleon, concurred. Prussia kept all of the Rhine and Moselle valleys, with the waterways that went with them. This started a see-saw, with the Great War seeing them return to France, and 1940 their occupation by Germany. Only in 1945 did the border return to its natural state along the river. This allowed its further improvement, with the addition of power stations, flood protection, pollution control, better navigation, salmon jumps and tourist paraphernalia. For much of the border region, the Rhine itself is paralleled by the navigation canal, which cuts out many of the loops in the river.

In 1879, France organised the dredging and widening of all canals to take larger barges, work which took thirty years. Along with the conditioning of rivers to allow for better navigation, the French inland waterway network was and remains the largest in Europe, ahead of the UK, Germany, Belgium and even Holland. Major routes from Marseilles to Le Havre or Dunkirk via Paris, or to Rotterdam via Mulhouse, avoided the danger of storms or pirates at sea, and shortened the route. Paris, Rouen and Marseille remained France's most important ports, with Strasbourg, on the Rhine, Dunkirk, and Le Havre at the entrance to the Seine being

next. The Canal du Midi may have kicked off the craze, but it was not in an industrial area and remained an agricultural canal.

It was a hundred years after the Canal du Midi was started, and while it still remained the greatest example of this art, that it received its greatest accolade. It featured prominently in the *Encyclopédia* of Diderot and d'Alembert, the Bible of the Enlightenment, not only as an engineering marvel, but as a philosophical gem: Man harnessing the powers of Nature for his own ends. Such publicity, along with the detailed technical information that supported it, led to the canal frenzy in Britain, and later to that in the United States.