

## **TREES**

Kevin Clearing is the engineering manager for the Verdant County Road Commission (VCRC). VCRC has primary responsibility for maintaining the safety of county roads. Verdant County's population has increased by 30% in the past 10 years. This has resulted in increased traffic flow on many secondary roads in the area. Forest Drive, still a two lane road, has more than doubled its traffic flow during this period. It is now one of the main arteries leading into Verdant City, an industrial and commercial center of more than 60,000 people.

For each of the past 7 years at least one person has suffered a fatal automobile accident by crashing into trees closely aligned along a 3 mile stretch of Forest Drive. Many other accidents have also occurred, causing serious injuries, wrecked cars, and damaged trees. Some of the trees are quite close to the pavement. Two law suits have been filed against the road commission for not maintaining sufficient road safety along this 3 three mile stretch. Both were dismissed because the drivers were going well in excess of the 45 mph speed limit.

Other members of VCRC have been pressing Kevin Clearing to come up with a solution to the traffic problem on Forest Drive. They are concerned about safety, as well as law suits that may some day go against VCRC. Clearing now has a plan -- widen the road. Unfortunately, this will require cutting down about 30 healthy, longstanding trees along the road.

Clearing's plan is accepted by VCRC and announced to the public. Immediately a citizen environmental group forms and registers a protest. Tom Richards, spokesperson for the group, complains, "These accidents are the fault of careless drivers. Cutting down trees to protect drivers from their own carelessness symbolizes the destruction of our natural environment for the sake of human 'progress.' It's time to turn things around. Sue the drivers if they don't drive sensibly. Let's preserve the natural beauty and ecological integrity around us while we can."

Many letters on both sides of the issue appear in the Verdant Press, the issue is heatedly discussed on local TV, and Tom Richards presents VCRC with a petition to save the trees signed by 150 local citizens.

Discuss how Kevin Clearing should proceed at this point.

## **COMMENTARIES**

### **Kenneth L. Carper**

Several interesting ethical considerations are raised in this transportation engineering dilemma. The most prominent issue is the conflict between local interests and the interests of the public at large. Other topics that will be discussed in this commentary are: the potential value of effective organized public opposition, the role of the engineer in a governmental planning agency, and the emerging field of environmental ethics.

Transportation planners know that highways generate a great deal of local controversy, perhaps more than any other public works projects, with the exception of airports and nuclear power plants (Goldstein 1987).

"Roads are immensely popular with all those who do not live near them." (Lucas 1987)

Forest Drive has become a main traffic conduit. The population of Verdant County has grown substantially, and

the volume of vehicular traffic on the highway has doubled in the past ten years. Public safety is threatened by the condition of the highway. Thus far, however, fatalities have been limited to drivers who were exceeding posted speed limits. The Verdant County Road Commission, motivated by concerns for public safety and liability, has decided to widen the roadway.

A local citizens' environmental group opposes widening Forest Drive, however, as the quality of the local environment will be diminished. The opposition group does not wish to see a number of healthy trees sacrificed, especially when the problem appears to be driver carelessness.

Moral theory can be employed to support either side in this conflict. Finding a solution entirely acceptable to both sides may not be possible, but the next step ought to be a series of public hearings in which all considerations are fully reviewed.

Objections, aired in appropriate public forums, can be of great value in arriving at the best planning solutions (Lucas 1987). Enlightened planners will not only welcome objections, but will assist in making the objections effective. Considering opposing points of view nearly always improves the quality of reasoned judgment. This process implies open communication and free access to relevant information by all parties.

Communication with the public is a difficult problem for the planner or engineer in itself, but the most important questions are (Goldstein 1987):

- a. How does a planner handle a situation where his client's values are far from his own?
- b. How is the planner to comport himself when engaged on a project which may be nationally (or regionally) highly beneficial but adversely affects a particular locality?
- c. How is the planner to form and express his judgment in matters involving the aggregation of preferences.

In the public forum, planning experts should go beyond a presentation of their recommendations. They should be willing to fully discuss all factors considered in reaching their conclusions, and should actively listen to informed criticism. During the discussions the planner should honestly express uncertainties in planning assumptions. The opposition will likely raise valid arguments, beyond those already presented. In this case, for example, Kevin Clearing will be asked to acknowledge that improved roads generate increased traffic, and he should be willing to honestly respond to this fact. Public hearings have little positive benefit when the opposition parties feel they have not been honestly received.

This raises the topic of the role of the professional engineer in a governmental agency. Governmental bodies are generally more concerned with those issues that affect large segments of the population, and tend to be less concerned with local interests that affect few citizens. The ethical planner will maintain sufficient independence to ensure that local interests are carefully considered. Grave injustices may otherwise be imposed on individuals for the benefit of the majority.

The subject of environmental ethics is also relevant to this case. Most planning engineers are aware that their decisions are environmental experiments as well as social experiments. Their role is as the agents of change. Often the environmental effects of planning decisions are irreversible.

Environmental ethics is a relatively new field of applied ethics, at least in Western philosophy (Martin and Schinzingler 1989). Western philosophers have traditionally held that humans alone have intrinsic value, and that

the natural environment exists for the benefit of humankind. Environmental ethics questions whether morality is purely anthropocentric (humancentered). The environmental ethic suggests that trees (or spotted owls) may also have intrinsic value.

It should be noted that many environmentalists place the interests of humans far above that of objects in the natural environment and the interests of animals. Conservation of the natural environment and its resources can be justified on the basis of concern for future generations of humans who will have intrinsic value. This form of environmentalism is anthropocentric. Environmental conservationists do not necessarily ascribe intrinsic value to the natural environment.

It is not clear from Tom Richard's statement whether he bases his value for the threatened trees on a belief in their intrinsic value, or whether he wants to preserve natural beauty for future generations. A careful reading of his statement suggests the latter. However, it is likely that at least a few members of the opposition group will subscribe to the concepts of the new environmental moral theory. Kevin Clearing should be prepared to consider this viewpoint in the deliberations, which are sure to be lively and spirited.

#### Suggested Readings:

1. Goldstein, Alfred 1987. "The Expert and the Public: Local Values and National Choice," Business and Professional Ethics Journal, Rensselaer Polytechnic Institute, Troy, NY, Vol. 6, No. 2, pp. 2550.
2. Lucas, J. R. 1987. "The Worm and the Juggernaut: Justice and the Public Interest," Business and Professional Ethics Journal, Rensselaer Polytechnic Institute, Troy, NY, Vol. 6, No. 2, pp. 5165.
3. Martin, Mike W. and R. Schinzinger 1989. Ethics in Engineering (2nd edition), McGrawHill, Inc., New York, NY, pp. 262278.

#### **C. Gale Cutler**

Kevin Clearing, as an engineering manager, is confronted with a situation that is typical of many situations in which engineering managers find themselves. He is faced with trying to find a "right" answer to a problem that has no clear cut "right" answer. The approach to such a situation is to list the possible options, consider the advantages and disadvantages of each option and select what appears, after due consideration, to be the best option. (Some engineering ethics courses develop a decision making matrix for situations like this. Using a matrix, alternatives, selection criteria, and weighting factors are used to calculate mathematically what appears to be the optimum solution.)

Kevin Clearing appears to have at least three options:

1. Maintain status quo of the roadway. Reduce the speed limit further.
2. Find an alternate route and eliminate the current roadway.
3. Widen the current roadway at the expense of the 30 trees.

Option #1 does not eliminate the problem because drivers are already known to violate the existing speed limit. (The thought proposed by the environmental group to sue drivers if they don't drive sensibly is an irrational, unenforceable solution and should be rejected.) Option #2, while it could be very effective, is probably not

practical because it would involve a heavy expenditure of funds.

Option #3 seems to be the only workable solution and will involve Kevin's convincing the environmental group that the safety of users of the road is worth the destruction of the trees. To encourage the environmental group to withdraw their objection to this option, Kevin should develop a plan to do new tree and shrub plantings along the newly widened highway to restore its beauty and ecological integrity.

The citizen environmental group is a special-interest group and caution must be exercised in dealing with such a group. While special-interest groups frequently accomplish worthwhile results, they are also frequently guilty of so polarizing a situation that it is difficult to reach a rational decision. In this case, it is unfortunate that a logical best solution was not worked out without the local media adding to the turmoil of the situation.

The special-interest group must be approached in a spirit of compromise, settling differences by mutual concessions and reconciling conflicts through adjustments in attitude and conduct.

### **John B. Dilworth**

Progress on this case can be speeded up by starting with a comprehensive overview, to avoid any risk of our accidentally failing to 'see the wood for the trees'. But seriously, it is helpful to step back from the specifics of the trees and the road in this case. Some general points about different kinds of risks, and their relation to environmental and other benefits, should help to clarify what is at stake in the case. My main emphasis will be on the complexities of decision-making in a case such as this.

There is a general concern in the development of social policy to achieve an acceptable balance between risks and benefits for people. Another way of raising the same or equivalent issues is to think of individual rights and freedoms (including the right or freedom to do things which may be risky or dangerous) as requiring to be balanced against the potential harms to oneself or to others produced by the exercise of one's freedom.

In balancing risks against benefits, it is useful to distinguish two different kinds or categories of risk. The first of these could be called 'inherent risks', and concerns actions, situations, devices etc. which are inherently risky or dangerous. An extreme example would be a hand grenade which has had the pin removed and has been thrown. Such a device is inherently dangerous to a very high degree, because it almost certainly will quickly explode and devastate everything in its vicinity, no matter what anyone tries to do to prevent it.

A more moderate example of inherent risk is provided by the activity of rock climbing. It is generally agreed that rock climbing is inherently risky, because no matter how one tries to minimize the risks and maximize climber safety (through training, stronger ropes, and so on), some significant degree of risk still remains. This is shown by the fact that good climbers are killed or injured in significant numbers every year. The inherent nature of climbing risks has the consequence that the only way to avoid the risk of such accidents is not to climb at all.

Now let us look at the other basic category of risks, namely non-inherent or contingent risks. The important point about this category is that the risk for items falling under it depends on other situational or contextual features, so that members of this category have no standard level, nor any minimum level, of risk associated with them.

For example, the level of risk associated with driving an automobile depends upon indefinitely many other factors, such as the age of the car and driver, the speed, the road conditions, traffic density, and so on. Also, arguably there is no definite minimum level of risk associated with driving, that is, no inherent minimum risk

associated with driving. (Those obsessed with achieving arbitrarily low risk levels could choose to drive only very slowly on empty or private roads, for instance.)

The significance of the basic distinction (inherent versus contingent risks) for public policy is as follows. With inherently risky activities, the risk is a known quantity, or at least a lower bound can be set on it, so that the activity is at least as risky as that lower bound. (For example, perhaps the lower-bound of risk for rock-climbing is something like 1 accident for each 500 person-days of climbing. Doubtless insurance actuaries would have precise figures on this, or at least on average risks for each activity.)

Given that inherent risks have a strength which is a known, relatively unchanging quantity, it is relatively straightforward to compare and balance them against the potential benefits of allowing them to take place. For example, NASA undoubtedly has good calculations on how likely it is that a space shuttle, or an orbiting satellite, will be involved in a collision with a meteorite sufficiently large to seriously damage the space vehicle and abort its mission. (Such a risk is an inherent one because collisions occur randomly, so it is impossible to remove the risk by any alterations to the vehicle, environment or other factors.) With a reliable estimate of the minimum risk, along with the known potential benefits of a flight, it becomes a very routine matter to make a rational 'go/no go' decision on whether to allow a given flight.

Another public policy example would be a decision as to whether to make an influenza vaccine available. This is inherently risky (at a low level of risk), because an irreducible percentage of people will have adverse reactions to the vaccine. But again, a positive or negative decision as to use can be straightforward because the standard minimum risk can easily be compared with the specific potential benefits of the treatment.

On the other hand, risk/benefit comparisons in the case of non-inherent, contingent risks have a fundamentally different structure. It might be thought that their only difference from 'inherent risk' cases is that the risk is a variable quantity, with the particular amount in a given case depending on the specific situations or factors that exist. (For example, driving an old car very fast is likely to be much more risky than driving a new car slowly.)

But in addition to the risk being variable, the overall decision to be made (about whether to engage in an activity, given the benefits and risks involved) is now required to be a much more comprehensive, overall decision about a whole set of risk/benefit data pairs. Recall that for inherent risks, the only decision needed is a yes/no decision based on a single risk/benefit pair. But with a contingent risk case, there are now many possible risks, depending on various factors (the benefits might vary also). These many risks, along with the corresponding specific benefits, define many risk/benefit pairs which somehow must be evaluated as a group.

It will help to clarify things further if we re-introduce the main example from the current case, namely the risk(s) to motorists that they might crash into trees along a 3-mile stretch of Forest Drive road. The risks are of course associated with motorists driving cars along the road. It has already been argued that driving is a contingent risk activity (the risk depending on speed, etc.) Let us concentrate on the trees themselves as the only relevant benefit.

Our general question could be expressed as follows: is it worthwhile for motorists to risk crashing into the trees, given the benefits also provided by the trees? Or, acknowledging that the trees are just one additional risk among others associated with driving, we might ask: are the additional risks of having trees (rather than no trees) fully compensated for by the additional benefits of having trees (over not having trees)?

If we assume that no changes to traffic regulations, etc., are to be made, the relevant risk/benefit pairs are

defined by all socially possible distinct cases of 'a drive' along the road (given present conditions). Each is distinguished on the risk side by driver factors (age, disabilities, driving record, frequency of driving,..), car factors (new/old, brand, maintenance quality, speed,..), road factors (maintenance, traffic density, time of day,..), and environmental factors (weather, immediate environment of road including trees,..). On the benefit side, arguably this too is variable, for example because very fast trips or night versus day driving make visual enjoyment of the trees difficult or impossible.

Somehow, using this potentially infinite set of risk/benefit pairs, some decision must be made about the overall benefits and risks of allowing the trees to remain uncut. One might consider calculating some sort of average or mean value for the risk and benefit, but an overall decision might be dominated by just a small group of high-risk cases. (Some unlikely situations may be so dangerous that a decision to cut the trees is unavoidable.)

In the current case being considered, the possibility of a successful lawsuit if there is an accident is yet another complication. This risk is not itself involved in the initial set of risk/benefit pairs. Rather, given a decision (based on that set) to leave the trees standing, the lawsuit is one of the risks associated with that specific decision.

As if things are not complicated enough already, yet another whole dimension of the problem must briefly be considered. Since we are dealing with contingent risks, it is very tempting to try to 'mould' the overall situation and the factors involved so as to make a desired outcome (e.g., leave the trees standing) highly likely.

For example, new traffic regulations lowering the speed limit, with automatic radar detection and photography of those violating the regulations, could presumably eliminate virtually all of the original high-risk cases associated with speeding. Or should we use some other method instead? What would be the risks and benefits of each? Notice that we now are forced to somehow compare (formally speaking) the risks and benefits of different risk/benefit sets, in making such a decision.

It might be objected at this stage that 'molding' factors so as to get a desired result amounts to simply ignoring the original problem, which is that of which result is socially or morally most desirable. I would concede this point, but it points us toward even greater complexity.

It seems that somehow we have to consider all socially possible 'moldings' of factors relevant to the situation (each with its associated set of risk/benefit pairs), whether the overall outcome for each is 'yes, cut' or 'no, don't cut'. Then somehow (again), the overall risks and benefits of each set have to be evaluated relative to each other, so that a single winner (or group of similar winners) can be chosen. Its (their) decision outcome, as to whether to cut down the trees or not, would finally give us what we have been searching for in this case.

In conclusion, it is worth noting that the complexities in decision-making we have uncovered in connection with contingent risks are particularly common in dealing with environmental public policy issues (e.g., building of condominiums versus preservation of wetlands). Any situations involving loosely related factors and complicated tradeoffs will tend to have at least the same degree and kinds of complexity of decision-making as those discussed here.

## **Joseph Ellin**

I have to confess that I'm biased on this case: I like trees, and I would never hire a road engineer named Clearing. However I don't exactly see an ethical problem either. There's a question of balancing aesthetics and safety, a problem of values to which there's evidently no correct answer. Clearing is an engineer who evidently

favors safety over all other values, but this is not the unanimous view of the citizens of Verdant County. It is not, it seems to me, unethical to take Clearing's position (how can it be unethical to do what you can to protect human life?), though it may very well be unwise, shortsighted, undemocratic and not for the best for the citizens of the county.

Law suits have been filed, and to a certain extent the courts have decided that the trees are not an unreasonable hazard with regard to excessively speeding drivers. Evidently no law suits have been filed against the VCRC by the victims of the five or more other fatal accidents, nor by the victims of the many non-fatal accidents, which is some reason to think that, at least in the opinion of lawyers practicing law in Verdant County, the trees do not represent an unreasonable hazard. One expedient might be to wait until the next accident and the next law suit, and let the courts decide further issues; if the County were to lose a suit on grounds that the trees should not be so close to the road, that would perhaps settle the question. Since the County would be the defendant, they would have to defend their trees in court, and whatever arguments they use can then be used later to protect the trees should the courts rule in the county's favor.

There is a factual question which Clearing should clear up, namely, to what extent the trees are a safety hazard to drivers proceeding lawfully and within the speed limit. If the risk to such drivers is small, the case for retaining the trees is proportionately greater. There is also the question of future road traffic volume as Forest Road becomes more and more a main artery. Some degree of volume growth will inevitably mean the end of the trees, but acting prematurely would be unfortunate. Clearing could also research or devise possible alternative solutions, such as non-rigid barriers to deflect cars from the trees. The point is that everything ought to be done to protect the trees, within reasonable safety limits; but no one can say what these are. The emotional arguments of the environmental group, who seem ready to sacrifice real lives in order to make symbolic gestures, ought not to be taken too seriously, except as political posturing.

There is also the fact that a wide straight road is not necessarily safest, since drivers are encouraged to speed, beat the lights, etc. This is especially true if there is in-coming traffic from unprotected curb cuts, which tends to create hairy battles for road space. Furthermore, even drivers like trees, as long as they don't themselves crash into them, which they think they won't do if they drive safely (here is the factual issue Clearing could resolve). But if the traffic on Forest Drive continues to increase, widening the road will eventually be necessary, in order to avoid traffic congestion if for no other reason. Therefore the VCRC ought to begin planning for this. Consult with citizens' groups to see what they want. Find out if the drivers are willing to assume some risk in order to avoid destroying the trees. Assign more police patrols to keep speeds down. Try to design a safer road which preserves natural beauty. Be prepared to offer new trees, planted in a safe but accessible location, as a trade-off for the ones taken down. Trees don't last forever and (as environmental groups tell you in other contexts) are renewable resources. So sacrificing all other values (safety, speed, convenience in travel) in order to preserve specific trees is irrational. The goal is to preserve natural beauty and other environmental values over-all, not necessarily to preserve specific trees.

### **Wade L. Robison**

Whenever one acts, one is acting within a context, and the context may make some options preferable to others when, all things considered, it would be better to do something else completely different. For instance, in European countries many roadways have trees right near the road. These were often planted, among other reasons, to form a canopy over the road, making the road less likely to be covered with snow in the winter and more likely to be cooler in the summer. No doubt accidents happen there too, but the costs of suits to the

European equivalent of country road commissions has not been so great, for whatever reason, that European countries have felt moved to remove trees for safety's sake. Indeed, even on heavily travelled roads, the autobahn's of Germany, for instance, trees are often planted in the center between the double lanes of traffic in order, among other things, to prevent traffic lights from shining into the eyes of oncoming drivers.

In addition, though widening roadways is the accepted procedure in this country, whenever a road becomes so heavily travelled that the incidence of traffic accidents increases, it is not necessarily the preferred solution if some things were fundamentally different. More public transportation is available elsewhere, and that can help alleviate traffic congestion, and if Americans were willing to use such transportation, and it were cheap and readily available, such a solution might help. In addition, one can build other roads to help alleviate traffic, another two-lane road taking the place of doubling the lanes on an existing road. But such a solution often produces new problems--other land being condemned, other trees being cut, and so on. In addition, it is probably likely that any state or federal aid available is tied to widening existing roads--tied, that is, to what is the preferred solution in this country--rather than anything innovative.

So Kevin Clearing's problem is that there are few choices available to him given, among other things, the state of the law in this country and the likelihood that someone, going within the speed limit, will crash, and sue, and win a large amount of money from the county. There are enormous disincentives to do anything other than widen the road, and there may be enormous incentives, in the form of support from the state or federal government, to do that. One person cannot change an entire system.

Clearing has been asked to come up with a solution to the traffic problem, and he has. He has come up with one that does not try to change those features of the situation that seem to be causing the difficulties--whatever it is about the drivers and the situation that has caused one fatal accident every year and numerous other accidents, whatever is causing drivers to drive too fast on the road, whatever is causing the increased traffic on the road, whatever it is in the system that produces huge amounts of money to those who are harmed in accidents and successfully sue, and so on.

No doubt other options are available besides widening the road--putting speed bumps in the road to slow the traffic, putting guard rails up to keep traffic within the roadway, increasing police patrols, and so on. Each of these options has its advantages and disadvantages, and perhaps one of them, or some combination of them, would succeed in making the road safer.

The decision is ultimately a decision that must be made by the road commission. They pressed Clearing to come up with a solution, and they presumably must ask him to come up with some alternative: it is not clear, that is, that he can act on his own initiative.

If not, then he must act, if he feels impelled, as a private citizen, and he will have to decide whether to bring before the road commission other options he thinks might help. Deciding that will present some problems, for he might be perceived by the road commission as undermining the recommendation he gave them and so undermining the commission itself. So he ought to ask them how they want him to proceed--if he thinks he can do anything further regarding the issue.

If he can proceed on his own initiative, or if the road commission asks him to proceed, he ought to present the reasons for the original solution provided--the concerns about a lawsuit, and so on--and to present alternatives, with all their attendant problems and benefits. Clearing ought to have originally provided the reasons for whatever solution he thinks is optimal, explaining clearly how he is ranking the various values in conflict here, how, that is,



he weighs safety against the concern for the environment represented by the citizens' arguing to save the trees. If he now thinks some other solution may be preferable, he ought to present it, with its attendant benefits and burdens. His obligation, that is, is to further an informed and intelligent dialogue among the interested parties.

It may be that out of that dialogue some alternative solution may emerge. For instance, one easy way to ease the problem caused by crashes is to make it harder for motorists to hit trees, and one way to do that is not to cut down underbrush near the road, as is the preferred option among road commissions throughout the country, but to plant bushes that will absorb the impact of cars, causing minimal damage to them and to their occupants by preventing them from running into something, like a tree, that will not give upon impact. The road would then look far different from how most American roadways look--not cleared verges, with a stand of trees beyond the grass or gravel, but densely planted verges, with bushes close to the roadway. Whether such a dense population of plant life could be maintained in a roadway system that relies so heavily upon salt to clean off ice and snow in the winter is another issue, but the point is not that such planting is the preferred solution, but that making clear the reasons for various alternative solutions can do much to initiate an intelligent and informed dialogue about what ought to be done, about which values ought to be given prominence and which solutions are more likely to preserve those values and cause the least harm to other values at issue.